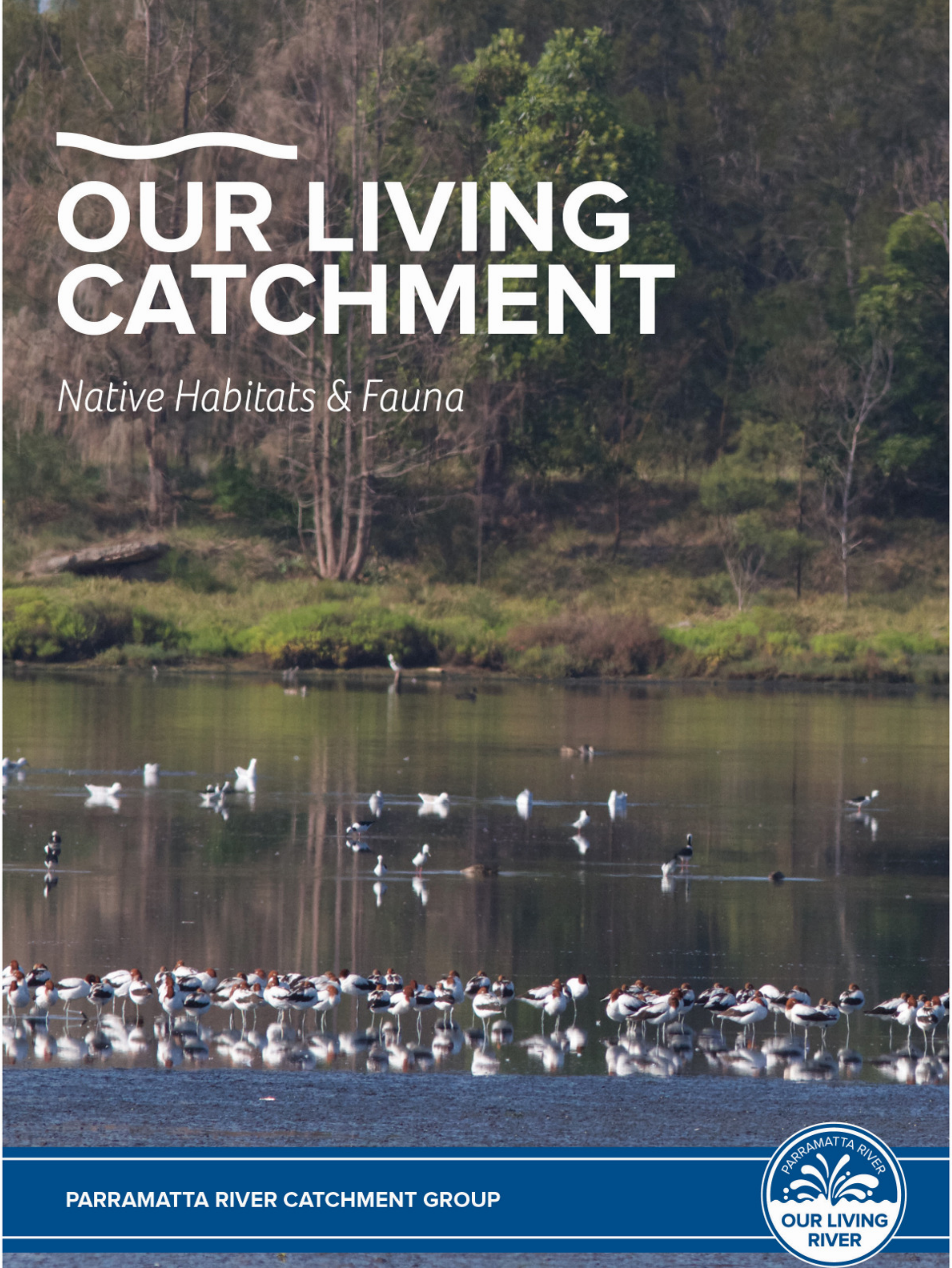
OUR LIVING CATCHMENT

Native Habitats & Fauna



PARRAMATTA RIVER CATCHMENT GROUP

PARRAMATTA RIVER OUR LIVING RIVER

DOCUMENT VERIFICATION

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Client contact	**Rob Stevenson City of Canada Bay**

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EXECUTIVE SUMMARY

The Parramatta River Catchment Group (PRCG) is a regional organisation of local councils, state agencies and community representatives whose aim is to work together to improve the health of the Parramatta River catchment. A steering committee supervised this project and included representatives from Ashfield, Auburn, Blacktown, Canada Bay, Hunters Hill, Ryde, Parramatta and Strathfield Councils, Sydney Olympic Park Authority, and BirdLife Australia.

The Parramatta River is one of the major waterways in Sydney, and is the main tributary of Sydney Harbour. The River extends from Blacktown Creek in the west to the confluence of the Lane Cover River in the east with a catchment of approximately 26,590 hectares. The Parramatta River catchment is highly urbanized and all bushland has some level, usually very high, of disturbance. Despite this, a number of migratory, threatened and rare species persist within the catchment and some native species remain quite common. With the ongoing pressures of urban consolidation, vitally important areas of native habitat require a strategic, catchment-wide management approach to ensure their ongoing survival. Identifying and establishing key linkages between remnant bushland sites helps to retain critical stepping stones for dispersing fauna moving between core areas of habitat.

The study underpins the **Native habitat recovery in the Parramatta River catchment** project, which aims to expand, restore and manage the extent of native habitats in the fragmented landscapes of the Parramatta River catchment. This collaborative project has been funded through a NSW Environmental Trust grant, and involves a series of distinct stages including research, assessment and delivery of on-ground works.

The study was divided into two parts:

PART 1

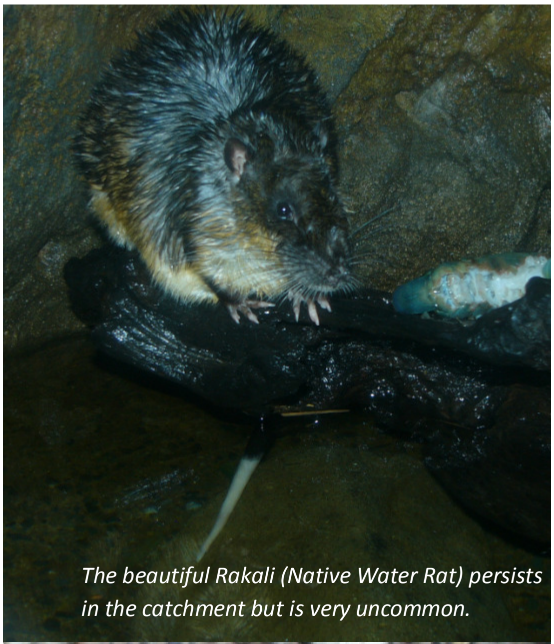
- The collation of existing data (including each Council's fauna studies, HNCMA's Rapid Fauna Habitat Assessment, HNCMA's Draft Native Vegetation of the SMCMA Area report, Sydney Olympic Park Authority's fauna studies, BirdLife Australia's bird data, OEH's Linking Landscapes Through Local Action project and the Atlas of NSW Wildlife)
- Supplementary surveys for areas with poor or no data available

PART 2

- A review of literature relating to the development of urban biodiversity corridors
- Ranking fauna habitat sites based on their fauna species richness
- Identifying key existing and potential vegetation corridors linking high priority sites across the landscape
- The identification of high value sites, potential and existing biodiversity corridors, and recommendations for future works including appropriate revegetation species to improve the overall quality of identified and potential fauna corridors

PART 1

The project approached habitat restoration on a landscape scale through the development of a catchment-wide fauna species richness study. Observations of fauna are kept in disparate sources and the aim of Part 1 of this project was to consolidate current observations into one database, thereby providing a better understanding of the abundance and distribution of fauna species within the catchment. Observations recorded since 2000 were included in the study. Key results include approximately 77,500 records which includes



The beautiful Rakali (Native Water Rat) persists in the catchment but is very uncommon.

The threatened Cumberland Plain Land Snail can be found in larger reserves in the catchment

- 514,500 separately recorded observations of
- 367 species of native fauna

And

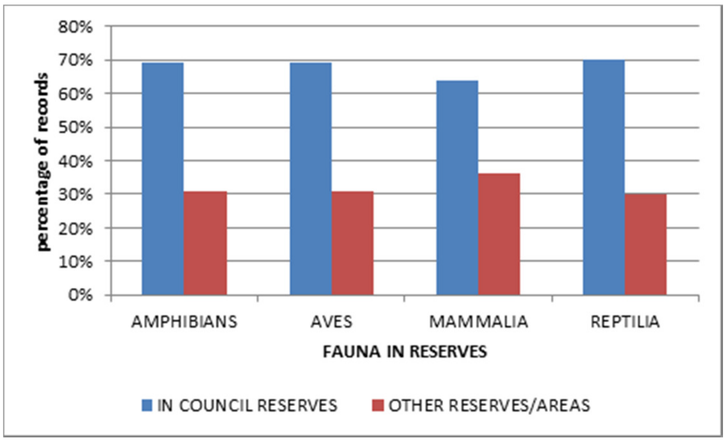
- 8130 separate observations recorded of
- 19 species of exotic/introduced species

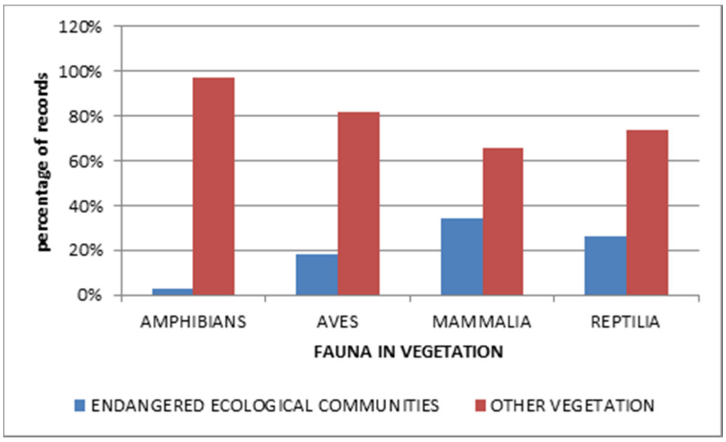
For native fauna, some groups of fauna were recorded more often than others:

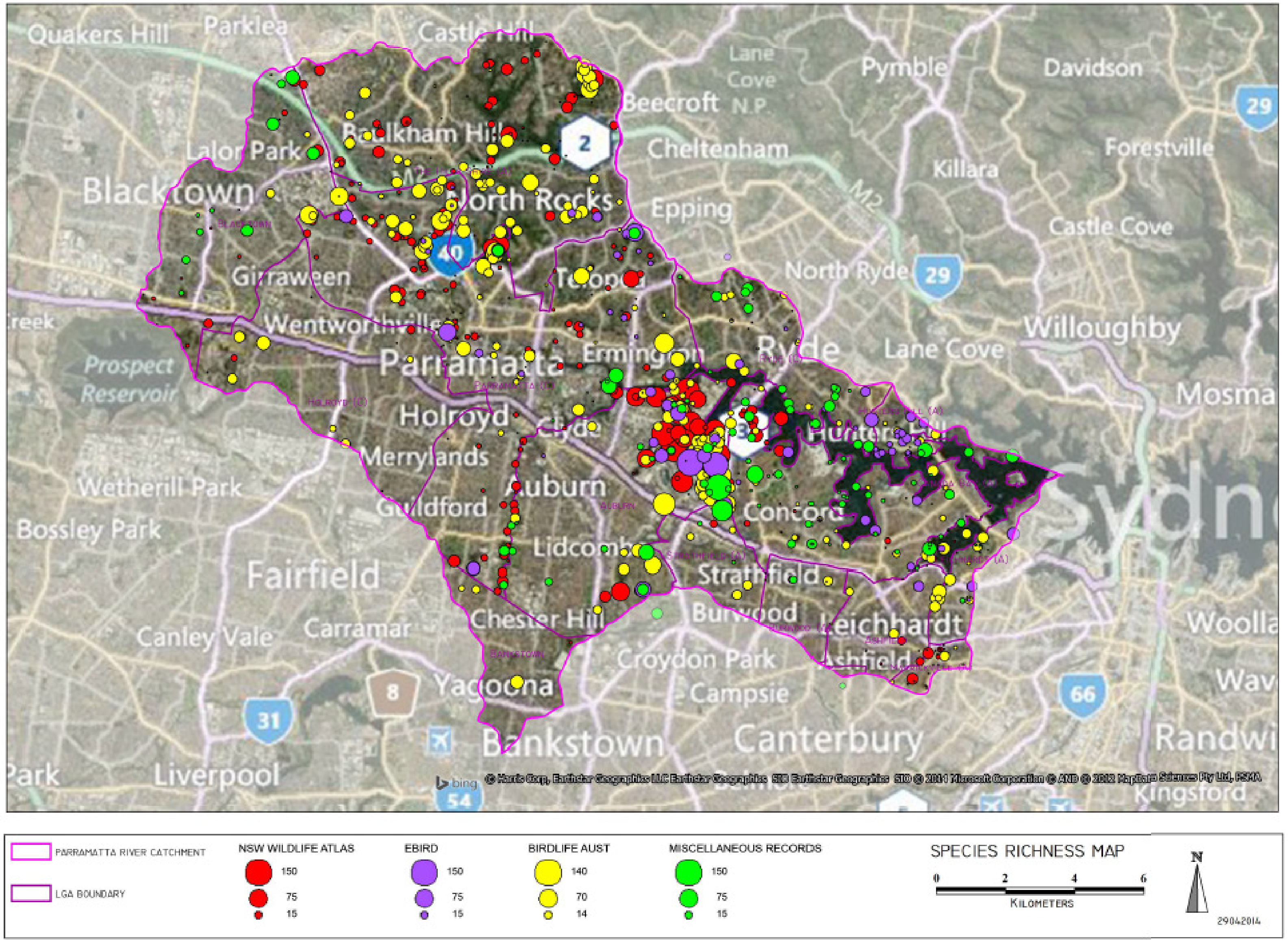
- 2885 records of Amphibia (frogs)
- 73245 records of Aves (birds)
- 700 records of Mammalia (mammals and marsupials)
- 702 records of Reptilia (lizards and snakes)
- 6 records of Gastropoda (snails)

It is important to note that a single record can contain multiple observations, for example: 2 Ringtail Possums or 10 Rainbow Lorikeets or 50+ Red-necked Avocets (see below), hence the differing numbers of "records" vs "observations".

Not surprisingly abundance and species richness were closely linked to the size of the reserve or reserve system (a series of reserves that essentially provide contiguous habitat) and to the number of surveys undertaken in a given reserve. The Sydney Olympic Park and adjacent reserves dominated results, in part due to systematic annual surveys of migratory waders and because of its popularity as a destination for birdwatchers within the region. Despite such biases the project database is a very valuable resource in assessing the current distribution and richness of fauna within the catchment and across the available habitats. Key results included two thirds of fauna occurs in council reserves, indicating that these are playing a significant role in conserving our fauna. However, less than one third were recorded in reserves with Endangered Ecological Communities, so it is really important that we try to conserve all of our bushland. Saline wetland habitats and dry sclerophyll forests support the highest number of species within the catchment, however, the dataset also illustrated that planted native vegetation and high density weed infestations also provide important feeding and roosting resources for a range of fauna species.






PARRAMATTA RIVER CATCHMENT
LGA BOUNDARY
NSW WILDLIFE ATLAS
150
75
15
EBIRD
150
75
15
BIRDLIFE AUST
140
70
14
MISCELLANEOUS RECORDS
150
75
15
SPECIES RICHNESS MAP
0 2 4 6
KILOMETERS
N
29042014

PART 2

The study provided a sound scientific foundation on which to identify and prioritise sites and biolinks/corridors from the perspective of fauna diversity and abundance. The purpose of fauna habitat corridors is to facilitate movement between larger areas of core habitat so that species can:

- Respond to environmental variability, eg move from food/water scarce areas to food/water plentiful areas in response to seasonal changes or events such as bushfires.
- Respond to population pressure - move from over-populated to under-populated areas.
- Access a wider range of breeding partners, thus preventing inbreeding and loss of genetic diversity in a local population

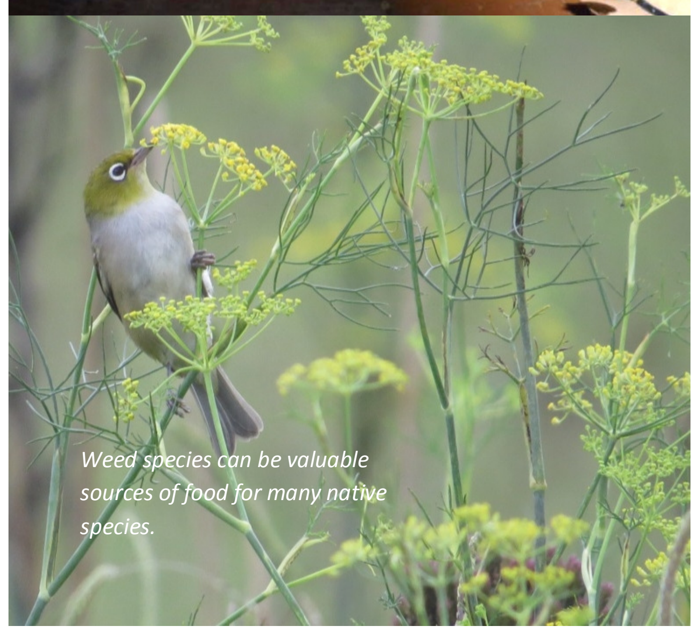
Corridors were prioritized based on 7 elements:

- Provide linkages between core habitat areas
- Degree of connectivity – shorter is better, especially for smaller species
- Quality of core/linear reserves
- Includes areas covered by an existing Plan of Management and linking to existing "corridor" projects
- Linking with local/regional initiatives including areas and opportunities outside the catchment
- Community support/involvement – bushcare group or contractor bush regeneration site
- Opportunity to link with existing development

Core habitat areas were deemed to be sites with high fauna species richness, and included SOPA, Rookwood Cemetery, Lake Parramatta, Duck River reserves, and Toongabbie Creek/Quarry Branch. However, specific potential corridors were identified in each LGA within the catchment. The options for corridors were more limited in the highly urbanised eastern part of the catchment, such as Ashfield, Strathfield and Auburn

Creek stabilisation with revegetation at Troubador Park/Pearce Reserve, Kings Langley

Disused tunnels provide habitat for microbats in Ashfield

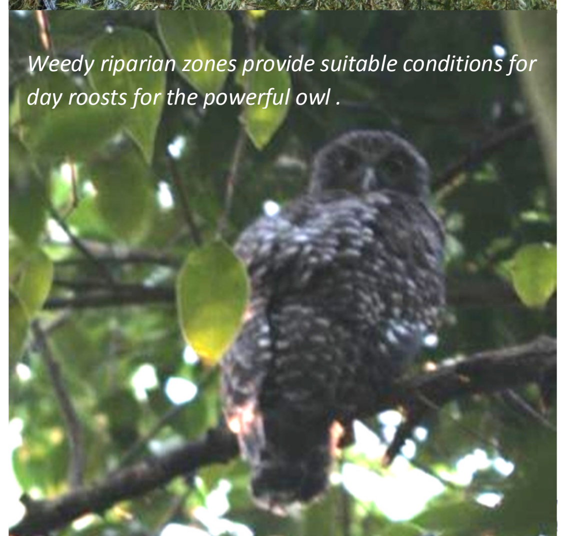


Weed species can be valuable sources of food for many native species.

LGAs. In direct contrast, Parramatta LGA has a good number of well-connected reserves that follow creeks and drainage lines, and these are able to form the backbone of a fauna corridor network. Further west, Blacktown LGA bears the legacy of ongoing urbanisation, and drainage corridors are often over-cleared or retain only very narrow strips of highly degraded vegetation. In the northeast part of the catchment, City of Ryde and Hunters Hill LGAs reflect the well established nature of urban development in these areas. While corridor opportunities are comparatively limited in the parts of these LGAs that fall into Parramatta River Catchment, there are clearly defined reserves with the original native vegetation retained, and often managed through established plans of management with regular works activities conducted by contractors and Bushcare volunteers.

Expanding the habitat resources available to fauna outside bushland parks within biolinks and fauna corridors is an essential part of providing functional linkages. It typically involves adding habitat elements and appropriate landscaping of drainage reserves and streetscapes, along with incentives and education for private landholders within each priority corridor. The report provides specific site based strategies to achieve functional linkages and improve in-park habitat resources. On ground works commenced in selected priority sites in 2014 throughout the catchment.

Several Flying-fox camps are found in the catchment.

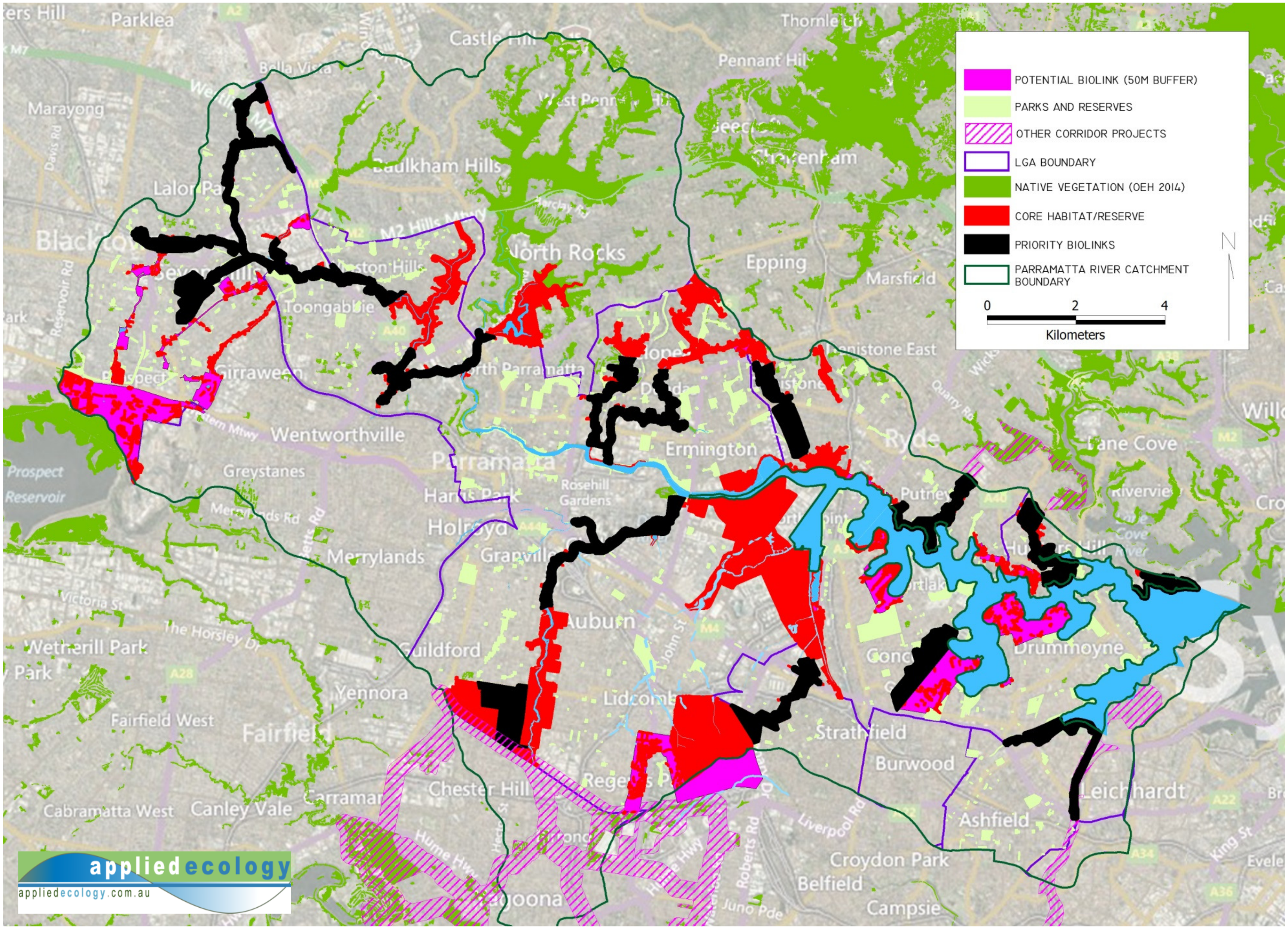


Weedy riparian zones provide suitable conditions for day roosts for the powerful owl .

Saltmarsh and other estuarine communities provides essential habitat for both rare and common shorebirds that inhabit or visit the catchment

Dense mid-storey at Quarry Branch Creek provides excellent foraging habitat and refugia for woodland birds.

HIGH PRIORITY FAUNA HABITAT CORRIDORS FOR PARRAMATTA RIVER CATCHMENT



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PART ONE:

PARRAMATTA RIVER CATCHMENT FAUNA DATABASE

INTRODUCTION

Project context

The Parramatta River Catchment Group (PRCG) is a regional organisation of local councils, state agencies and community representatives whose aim is to work together to improve the health of the Parramatta River catchment. A steering committee is overseeing this project and includes representatives from Ashfield, Auburn, Blacktown, Canada Bay, Hunters Hill, Ryde, Parramatta and Strathfield Councils, Sydney Olympic Park Authority, and BirdLife Australia.

The current study underpins the **Native habitat recovery in the Parramatta River catchment** project, which aims to expand, restore and manage the extent of native habitats in the fragmented landscapes of the Parramatta River catchment. This collaborative project has been funded through a NSW Environmental Trust grant, and involves a series of distinct stages:

- The first phase will involve a study of recent fauna records to determine species richness and distribution across the catchment and within extant vegetation communities and the parks and reserves system (the current study).
- Using this knowledge, high priority sites and potential corridors will be identified in the second phase, and targeted for on-ground restoration and expansion, linking these communities across the landscape (identified in this study).
- The third phase will deliver targeted biodiversity awareness training to council outdoor staff whose work may impact on terrestrial and aquatic biodiversity.

Project background

Strategically approaching biodiversity, particularly native habitat restoration, at a landscape level is not consistently being undertaken in the Parramatta River catchment leaving many sites as isolated islands within the urban environment. These sites become increasingly vulnerable to impacts such as weed and feral animal infestation, genetic seclusion due to reproductive restrictions, the effects of climate change, and local extinction (http://www.parramattariver.org.au). In addition, the Parramatta River catchment has one of the highest rates of human population growth in Australia. With the ongoing pressures of urban consolidation, these vitally important areas of native habitat require a strategic, catchment-wide management approach to ensure their ongoing survival. Identifying and establishing key linkages between these remnant sites provides a critical stepping stone for dispersing fauna moving between core areas of habitat such as the numerous national parks and nature reserves both north and south of the catchment.

When addressing habitat restoration, much of the focus is placed on vegetation. However, vegetation communities co-exist with the fauna that inhabit and symbiotically sustain them. There is an increasing number of studies within the scientific literature to suggest that approaching restoration from the perspective of fauna diversity and abundance is equally important and a potentially more responsive and strategic method of managing biodiversity.

The project will approach habitat restoration on a landscape scale through the development of a catchment-wide fauna species richness study. The study will provide a sound scientific foundation on which to identify and prioritise sites of high biodiversity value. The project will also incorporate the latest vegetation mapping to assist in determining key corridors and linkages between priority sites.

The project will provide a strategic view of where to invest future resources for biodiversity preservation and enhancement across the catchment and will ultimately benefit all residents and visitors to the Parramatta River catchment, by improving the health and vitality of the local environment in which they live and work

The study area

The Parramatta River is one of the major waterways in Sydney, and is the main tributary of Sydney Harbour. The River extends from Blacktown Creek in the west to the confluence of the Lane Cover River in the east with a catchment of approximately 26,590 hectares.

Figure 1 Parramatta River catchment and local government areas

The river is tidal to the Charles Street Weir in Parramatta, some 30 kilometres upstream from Sydney Heads. The total length of waterways in the catchment is 222.4 kilometres. The estuary itself covers 12 square kilometres and is in a constant state of flux with tidal movements and freshwater from the river's tributaries changing the chemical composition of the water on a daily basis. Significant tributaries to the river include: Subiaco Creek, Tarban Creek, Duck River, Duck Creek, Haslams Creek, Iron Cove Creek, Hawthorne Canal and Powells Creek.

The catchment is highly urbanized and all bushland has some level, usually very high, of disturbance. Despite this, a number of migratory, threatened and rare species persist within the catchment and some species remain common. A few native species have benefitted from disturbance and potentially require active management.

Natural resources

The Parramatta River catchment is a unique area with a high biodiversity value. The catchment's natural resources include bushland, rivers & creeks, wetlands, estuaries and cultural heritage. A total of 85 threatened species are found in the Cumberland sub-region, of which the Parramatta River catchment lies within, including:

- 12 Ecologically Endangered Communities
- 32 fauna species
- 31 flora species

Major wetlands include Bicentennial Park Wetlands (nationally significant, JAMBA CAMBA) and Newington Wetlands (nationally significant, JAMBA CAMBA). There is also a wide diversity of aquatic species as well as regionally significant plants and animals throughout the catchment.

Research into historical drawings and writings indicates that the significant stands of mangroves that now exist along the River were far fewer at the time of English colonisation. The foreshores of the River were often sandy beaches and outcrops of rock, with extensive tidal flats around Homebush Bay. Excessive siltation of the river has enabled mangroves to thrive, often at the expense of more fragile vegetation communities such as salt marsh.

Current impacts

The Parramatta River catchment is one of the most highly urbanised catchments in Australia, which means that there are many different issues that are impacting upon the health of the catchment. One of the main causes of poor river health is stormwater pollution. Weeds, introduced animals and erosion also significantly contribute to an unhealthy catchment.

Stormwater

When it rains, excess water is carried through the stormwater pipe network, passing directly from roadside drains to creeks and rivers. Anything that gets washed down the drains, such as oil, litter and pesticides, ends up in the waterways. Weeds, soils and mulch are also easily mobilized during heavy rain. In high rainfall events, large volumes of water enters rivers and creeks, transporting sediment, litter, nutrients, toxic chemicals, herbicides, pesticides, oils and grease, animal waste and sewage. The combined effect of this runoff over time is the degradation and pollution of local waterways as well as siltation and sediment contamination in the Parramatta River estuary.

Weeds

Weeds have a significant impact on native flora and fauna, as well as the health of waterways. They smother and out-complete native plants, modify or destroy the habitat of native animals, contribute to the reduction of water quality, and choke waterways, leading to localised flooding. Most weeds in urban bushland have escaped from urban backyards. Their seeds and cuttings are carried by the wind or animals, or even swept away with the stormwater when it rains. Prunings, cuttings and grass clippings are also dumped in the bushland, allowing weeds to quickly invade and spread.

Introduced animals

The Parramatta River Catchment is threatened by many introduced animals. Cats and foxes are very successful urban predators preying on birds, small mammals and reptiles. Rabbits and some birds also impact on the catchment to varying degrees including damaging vegetation, causing erosion and competing with native animals for resources.

Erosion and sedimentation

When the ground is left bare by human activities, including clearing and building (and related activities), soil is easily washed away when it rains. This erosion removes the fertile topsoil and the soil that is washed into waterways can contain plant nutrients, minerals, organic matter and seeds. It can also contain pesticides and toxic heavy metals. When soil, sand, dust, cement, paint and building debris reach the waterways, they can:

- increase the risk of flooding
- block drains
- spread weeds to bushland
- result in algal blooms
- cause health problems for swimmers
- smother and suffocate water plants and animals and impact on their ability to reproduce

Aboriginal cultural heritage

The Parramatta River is an iconic part of Sydney's European and Aboriginal history. Prior to white settlement, the majority of the catchment was inhabited by the Dharug nation. Like all Aboriginal people, the Darug people did not own the land but belonged to the land. They had a strong connection to the land; respected it and referred to the land as their mother.

Recent excavations in Parramatta have revealed evidence of Aboriginal inhabitation going back 30,000 years. Today, much of the remaining natural bushland in the catchment contains items and places of cultural significance, such as: middens, engravings, scare trees, grinding grooves and shelters.

European history

Parramatta is Australia's second oldest settlement, established on 2 November 1788. The surrounding area was used to farm crops for the new colony as the poor soils around Port Jackson would not support stable food crops.

By the late 1850's Parramatta was the main metropolis of NSW placing considerable pressure on the natural environment. The River foreshore also became the site for heavy industry, resulting in extensive soil contamination which still has a major impact on the estuary today.

METHODOLOGY

To address the requirements of the study, the project was broken into a number of sections. The following project tasks were involved:

a) A review of literature relating to the development of urban biodiversity corridors
b) The collation of existing data (including each Council's fauna studies, HNCMA's Rapid Fauna Habitat Assessment, HNCMA's Draft Native Vegetation of the SMCMA Area report, Sydney Olympic Park Authority's fauna studies, BirdLife Australia's bird data, OEH's Linking Landscapes Through Local Action project and the Atlas of NSW Wildlife)
c) Supplementary surveys for areas with poor or no data available
d) Ranking fauna habitat sites based on their fauna species richness
e) Identifying key existing and potential vegetation corridors linking high priority sites across the landscape
f) The development of a concise report, detailing the methodology used, high value sites, potential and existing biodiversity corridors, and recommendations for future works including recommendations of appropriate revegetation species to accommodate identified and potential fauna usage

Literature Review

A thorough review of all available literature including Council and other Agency (e.g. SMCMA, DECCW/OEH, DII etc) documentation, policy, plans, studies, available mapping and aerial photographs was carried out. This stage comprised the identification, assembly and assessment of the existing data to identify gaps in the existing knowledge base. This stage guided the approach to further studies and gap analysis. Review of available literature included:

- State of the Environment reporting (SOE)
- NSW Atlas data
- DECCW/OEH community wildlife surveys
- Native animal rescue groups eg WIRES records
- Birdlife Australia data
- NSW Bird Atlas records
- Bush regeneration reports (from contractors) and Council reports
- Flora and fauna studies
- HNCMA's Rapid Fauna Habitat Assessment

Desktop Mapping Assessment

Consistent and accurate mapping of fauna habitats is an essential tool for planning and management purposes. Councils need reliable data and accurate maps to make balanced and defensible decisions in relation to initiating on-ground remediation projects, and to undertake day to day operations in areas of high conservation assets. Data collation, mapping review and presentation was carried out using Map Info Professional V12.5 with data geo-referenced to GDA94 MGA Zone 56 projection.

Applied Ecology completed a comprehensive review of data available including an analysis of the quality and usefulness of this data in assessing the species richness and relative abundance of fauna in relation to habitat assets across the catchment. Methods of collection, operators, metadata etc were detailed for each resource. Unreliable data was excluded from the study. Once the data was collected and collated into a uniform format a variety of approaches to mapping the "results" were developed, including simple species richness by habitat area/reserve. Other approaches include mapping evenness (a measure of the relative abundance of the different species making up the richness of an area) or using diversity indices such as Simpson's Index of Diversity. All approaches, because of uneven sampling effort and varying methodologies, were used to provide an indicative assessment of species richness/diversity across the catchment only. Species richness mapping was overlaid on multiple layers of information including existing vegetation, the reserve system and public lands to better understand which species are poorly conserved by the reserve system (if any), potential biolinks and to clearly delineate between assets on private lands and public lands.

Supplementary Survey

The literature review and preliminary mapping identified gaps in fauna data which needed to be targeted in this project. Applied Ecology allowed 16 hours to undertake "gap snapshot surveys" that included an assessment of site habitat values, targeted bird surveys and opportunistic sightings of other fauna.

Reporting

The project report aims to identify options available to member Councils regarding appropriate enhancement of habitat resources for fauna. The key objectives of the final report are:

1. To aid the survival and enhance the adaptive capacity of species, populations and ecological communities of animals endemic to the Parramatta River Catchment and core habitat areas;
2. Identify high conservation value habitats and wildlife linkages that could form bio-links (including ecosystems, habitats and species they contain) that require protection, ecological restoration and/or threat abatement;
3. Encourage and promote the importance of biodiversity protection and restoration and develop a greater understanding of fauna issues, values and solutions throughout the Catchment.

RESULTS

SUPPLEMENTARY SURVEYS

The project brief allowed for 16 hours of supplementary surveys to be undertaken in areas with identified data gaps. The distribution of records across Council reserves was examined with reserve and reserve complexes containing some remnant native vegetation and few or no records prioritised for surveys. The following reserves were surveyed in the Blacktown City LGA: Timbertop Reserve, Mitchell Reserve, Mujar Bija Reserve, William Lawson Park, Leabon Walkway, Eddie Aaw Reserve and various unnamed Reserves. These reserves form a semi-contiguous area of open space, artificial wetlands and remnant bushland in the Blacktown LGA totalling over 60 hectares in size. Surprisingly there are no existing records in these reserves in public databases.

Figure 2 Supplementary survey Blacktown

Figure 3 Cumberland Plain Woodland EEC at Timbertop Reserve.

Surveys at this location were undertaken on the 26th of March & the 28th of April 2014 with two observers for a period of 6 hours (12 person hours in total). 41 species were observed and added to the project database (seeTable 1).

A further 60 hectares were surveyed in the following reserves and public lands in the Auburn City LGA: Webbs Ave Playing Fields, Progress Park, Peter Hislop Park, Upper Duck River Reserve, Auburn Botanical Gardens, Rosnay Golf Course and Princes Park. Again there were no records in many of these reserves despite adjoining good bush in the upper Duck River Reserve in the Parramatta LGA. Surveys were undertaken on the 28th of March 2014 for a period of 4 hours (8 person hours in total). 30 species were observed and added to the project database (see Table 1). Reserve boundaries were not clear so some species were recorded in adjacent reserves.

Figure 4 (right above) this Spangled Drongo was observed hawking on the edge of Princes Park

Figure 5(right below) This Australasian Grebe was observed on a dam on Rosnay Golf Course

Figure 6 (left) Supplementary survey Auburn

Figure 7 Duck River riparian corridor behind Progress Park was occupied by numerous Australian White Ibis.

Table 1 Species list supplementary surveys

RESERVE	Auburn Community Picnic Area & Botanic	Auburn Golf Course ACC	Mitchell Reserve, Prospect BCC	Mujar Bija Reserve BCC	Orana Park Prospect BCC	Princes Park ACC	Timbertop Reserve BCC	William lawson Reserve, Prospect BCC	Total
SPECIES	**COUNTS**								
Australasian Grebe		1							1
Australian Magpie	1	2		1		2	2	4	12
Australian Raven	1	2	1		8				12
Australian White Ibis	8	3			5	8		7	31
Australian Wood Duck	10	2			7			12	31
Brown-striped Frog							7		7
Common Eastern Froglet							10		10
Common Myna		3	7	2	3				15
Common Starling		16							16
Crested Pigeon	8					1	2	8	19
Dusky Moorhen	4		2					3	9
Eastern Spinebill						2			2
Eastern Water Dragon	1								1
Eurasian Coot	5							5	10
Golden Whistler						1		1	2
Great Egret		1						1	2
Grey Butcherbird							2		2
Grey Fantail				1					1
Grey Teal			6		4			13	23
Hardhead			3		2			8	13
Hoary-headed Grebe			2						2
House Sparrow								7	7
Intermediate Egret	1								1
Little Pied Cormorant			1					2	3
Magpie-lark		2		1	1	2	2		8
Mallard								2	2

RESERVE	Auburn Community Picnic Area & Botanic	Auburn Golf Course ACC	Mitchell Reserve, Prospect BCC	Mujar Bija Reserve BCC	Orana Park Prospect BCC	Princes Park ACC	Timbertop Reserve BCC	William lawson Reserve, Prospect BCC	Total
SPECIES					**COUNTS**				
Masked Lapwing		2	2			3		2	9
New Holland Honeyeater						3			3
Noisy Miner	13	7	12	2	6	5	2	12	59
Pacific Black Duck	6							6	12
Pied Currawong	2	2		1					5
Purple Swamphen	3							2	5
Rainbow Lorikeet		12					2	4	18
Red Wattlebird						2			2
Red-browed Finch						3			3
Red-whiskered Bulbul		3				3			6
Royal Spoonbill								1	1
Rufous Fantail						1			1
Spangled Drongo						1			1
Spotted Turtle-Dove			2		2	2	2		8
Superb Fairy-wren		8				6			14
Welcome Swallow	3		4			4		4	15
White-faced Heron			1						1
White-plumed Honeyeater						2			2
Willie Wagtail	1	2	1			1			5
Total	**67**	**68**	**44**	**8**	**38**	**52**	**31**	**104**	**412**

THE FAUNA DATABASE

DATA CURRENCY

Data was compiled from records from 1st of January 2000 to January-February 2014. Miscellaneous records were added between February 2014 and July 2014. This approach allowed for the use of records with reasonable currency and reflects a time period where the key source information from semi-professional and amateur groups was systematically collected. To ensure that there was not a significant change in species composition between the earlier records and the present day the database was split roughly in half and species gained (Table 2) and lost (Table 3) were assessed.

Table 2 Species recorded 2007-2014 not recorded 2000-2006

SPECIES "GAINED" SINCE 2007	
Acritoscincus platynota	Red-throated Skink
Aegotheles cristatus	Australian Owlet-Nightjar
Alectura lathami	Australian Brush-turkey
Artamus personatus	Masked Woodswallow
Burhinus grallarius	Bush Stone-curlew
Cacomantis variolosus	Brush Cuckoo
Charadrius bicinctus	Double-banded Plover
Chthonicola sagittata	Speckled Warbler
Cincloramphus mathewsi	Rufous Songlark
Circus assimilis	Spotted Harrier
Cladorhynchus leucocephalus	Banded Stilt
Climacteris picumnus	Brown Treecreeper

Corvus mellori	Little Raven
Corvus orru	Torresian Crow
Coturnix pectoralis	Stubble Quail
Crocothemis nigrifrons	Black-headed Skimmer
Demansia psammophis	Yellow-faced Whip Snake
Egretta sacra	Eastern Reef Egret
Entomyzon cyanotis	Blue-faced Honeyeater
Eulamprus heatwolei	Yellow-bellied Water-skink
Euploea core	Common Crow
Excalfactoria chinensis	King Quail
Falco subniger	Black Falcon
Falsistrellus tasmaniensis	Eastern False Pipistrelle
Geopelia cuneata	Diamond Dove
Glyciphila melanops	Tawny-crowned Honeyeater
Haematopus longirostris	Australian Pied Oystercatcher
Litoria phyllochroa	Leaf-green Tree Frog
Litoria tyleri	Tyler's Tree Frog
Lophochroa leadbeateri	Major Mitchell's Cockatoo
Melithreptus brevirostris	Brown-headed Honeyeater
Meridolum corneovirens	Cumberland Plain Land Snail
Milvus migrans	Black Kite
Motacilla tschutschensis	Eastern Yellow Wagtail
Neochmia modesta	Plum-headed Finch
Ninox connivens	Barking Owl
Nyctophilus gouldi	Gould's Long-eared Bat
Oxyura australis	Blue-billed Duck
Pandion cristatus	Eastern Osprey
Petroica goodenovii	Red-capped Robin
Phaps chalcoptera	Common Bronzewing
Phaps elegans	Brush Bronzewing
Pluvialis fulva	Pacific Golden Plover
Pseudonaja textilis	Eastern Brown Snake
Pseudophryne australis	Red-crowned Toadlet
Pseudophryne bibronii	Bibron's Toadlet
Ramphotyphlops nigrescens	Blackish Blind Snake
Rattus fuscipes	Bush Rat
Rostratula australis	Australian Painted Snipe
Sericornis magnirostra	Large-billed Scrubwren
Sericulus chrysocephalus	Regent Bowerbird
Stipiturus malachurus	Southern Emu-wren
Strepera versicolor	Grey Currawong
Tachyglossus aculeatus	Short-beaked Echidna
Tringa glareola	Wood Sandpiper
Turnix varius	Painted Button-quail
Vanellus tricolor	Banded Lapwing
Vespadelus regulus	Southern Forest Bat
Wallabia bicolor	Swamp Wallaby
Xenus cinereus	Terek Sandpiper

Table 3 Species recorded 2000-2006 not recorded 2007-20014

SPECIES “LOST” SINCE 2007	
Botaurus poiciloptilus	Australasian Bittern
Cacomantis pallidus	Pallid Cuckoo
Calyptorhynchus lathami	Glossy Black-Cockatoo
Chalinolobus dwyeri	Large-eared Pied Bat
Cheramoeca leucosterna	White-backed Swallow
Cincloramphus cruralis	Brown Songlark
Cinclosoma punctatum	Spotted Quail-thrush
Dendrocygna arcuata	Wandering Whistling-Duck
Dendrocygna eytoni	Plumed Whistling-Duck
Gelochelidon nilotica	Gull-billed Tern
Geopelia striata	Peaceful Dove
Irediparra gallinacea	Comb-crested Jacana
Ixobrychus dubius	Australian Little Bittern
Lichenostomus leucotis	White-eared Honeyeater
Merops ornatus	Rainbow Bee-eater
Ornithorhynchus anatinus	Platypus
Petroica phoenicea	Flame Robin
Platalea flavipes	Yellow-billed Spoonbill
Polytelis alexandrae	Princess Parrot
Sericornis citreogularis	Yellow-throated Scrubwren
Stictonetta naevosa	Freckled Duck

The increase in species diversity may be a reflection of the focus of surveys or changing conditions within the catchment (for example -improved vegetation management practices) or regional, broad scale influences such as prevailing rainfall both locally and broadly across the state. For example the appearance of water fowl in the Parramatta River catchment that are generally present west of the ranges may indicate a lack of resources, particularly open water, for these species within their normal distribution during times of drought. Major long term changes in the catchment are obvious from a comparison of historic and current aerial photography noting that forested areas may have actually improved in quality despite hardening of the catchment.

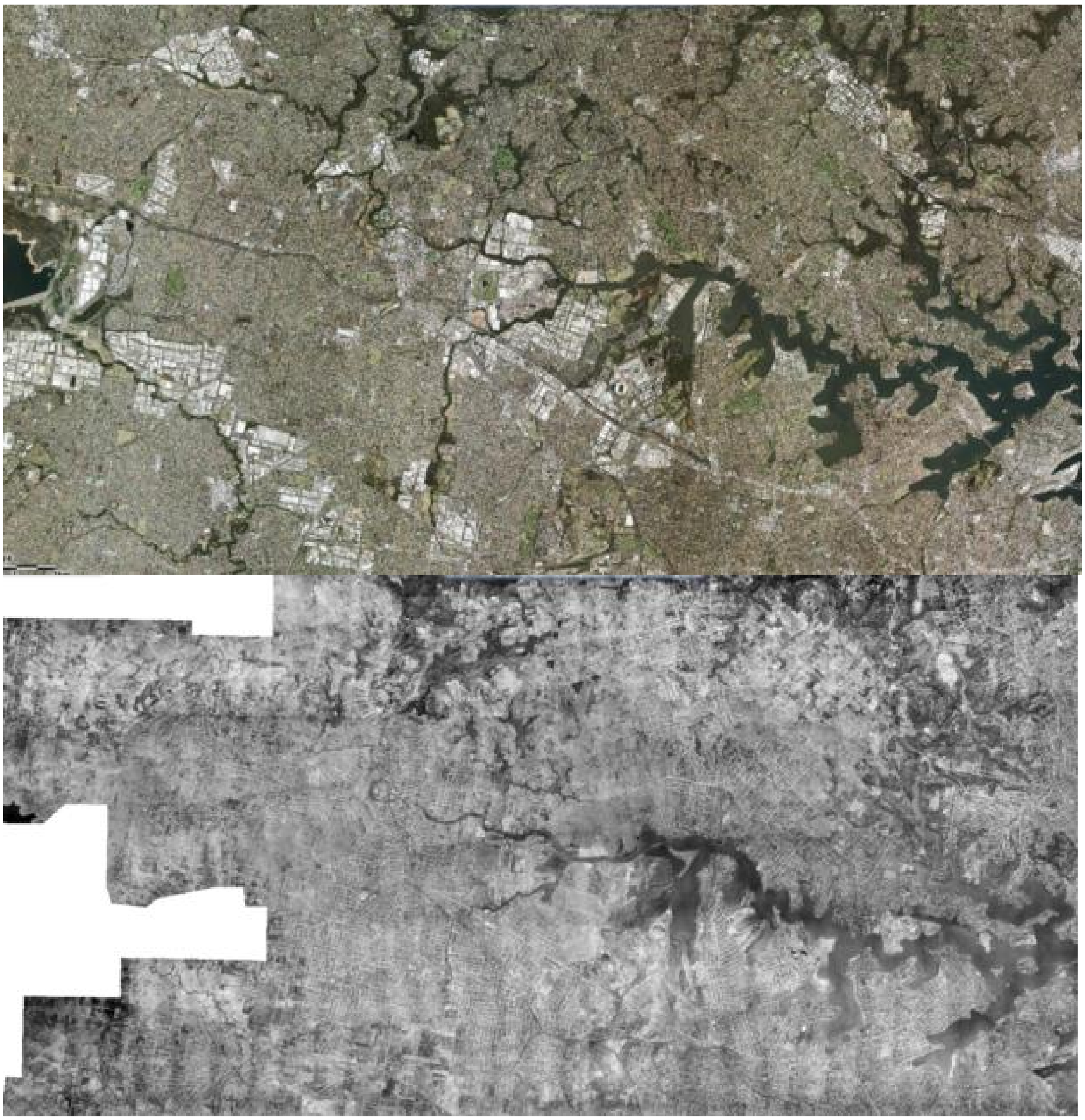

Figure 8 (top) Current aerial photography for the Parramatta River catchment; and (bottom) 1943 aerial photography for the same catchment (Six Maps)

DATA SOURCES

The project database consists of records extracted from three large existing databases and other miscellaneous records. Details of these sources are provided in the following sections.

NSW BIRD ATLAS

Data for the study area was purchased from the NSW Bird Atlassers Inc (NSWBA) in February 2014. The NSWBA database contains in excess of 3 million records. Records for this database are obtained from members who submit records on a standard Atlas proforma. The NSW Bird Atlas is currently derived from records from over 172,000 atlas sheets that have been submitted by members, plus some data from other bird watching groups.

The accuracy and completeness of all records in the database is reviewed on a regular basis by a panel of 3 expert field ornithologists. This panel also evaluates records of species reported outside their normal/published range. Either a NSW appraisal committee or a national appraisal committee assesses records of the rarest species or those otherwise considered unusual. For such species, only reports accepted by one of these committees are retained as valid records within the database.

Records from this database are generally stored in grid cells of 10’ of latitude by 10’ of longitude. This resolution was not suitable for inclusion into the project database. Records containing co-ordinates or with specific location details, for example “Lake Parramatta Reserve” were assigned coordinates and incorporated in the project database. Less than 5% of this data was able to be accommodated in the current project (Table 4).

Birdlife Australia Atlas

Data for the study area was purchased from the BirdLife Australia Atlas in February 2014. Established in 1998 the Birdlife Atlas 1998 has over 7000 atlassers and has amassed over 420,000 surveys, comprising over 7.1 million bird records. Records are uploaded via the “birddata” portal by registered users. Preferred methods for Birdlife Australia atlassers are 20minute searches of a 2 hectare area to be surveyed at least once every 12 months, fixed route monitoring, small or large area searches and incidental records of rare, uncommon or unusual species or surveys of specific groups such as waders. There is emphasis on repeating surveys where possible. Data accuracy is monitored by experienced ornithologists.

Bionet

Bionet/The Atlas of NSW Wildlife (the Wildlife Atlas) is the Office of Environment and Heritage’s (OEH) database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the Threatened Species Conservation Act) and some fish. The flora and fauna records in the Atlas come from various sources including:

- survey data held in the Atlas’s in-built systematic survey modules (fauna survey and VIS Flora survey)

- OEH, including data from the Royal Botanic Gardens herbarium database, and from National Parks and Wildlife staff and:
  - Australian Museum
  - Coffs Harbour Herbarium Specimen Register
  - Department of Primary Industries (Forests NSW)
  - Department of Sustainability, Environment, Water, Population and Communities – Australian Bird and Bat Banding Scheme data for NSW; and
- data submitted by ecological consultants, research scientists, and others (as part of the scientific licence procedure)
- data provided by other agencies, such as Forests NSW, the Australian Museum and the Australian Bird and Bat Banding Scheme
- historical reports
- the general public

Data accuracy is monitored by OEH staff.

Miscellanous sources

Records were collected form a variety of other miscellaneous sources including

- Ebird (moderated location based data -now sharing data with Birdlife Australia Atlas)
- Council staff observations
- Bushcare records
- Bush regeneration (Council) contractors
- Internal & public Council documents such as REFs, Plans of Management, flora and fauna surveys

SUMMARY DATA

Approximately 78,250 records of native fauna are included in the project database which includes 515,434 species observations.

Table 4 DATA SOURCES

DATA SOURCE	TOTAL RECORDS	USED
EBIRD	1907	1716
NSW BIRD ATLAS	46280	1936
BIRDLIFE AUSTRALIA	38414	27460
OEH DATA FROM SCIENTIFIC LICENCES DATASET		44231
AUSTRALIAN BIRD & BAT BANDING SCHEME		6
NSW BIRD ATLASSERS INC.		235
OEH DEFAULT SIGHTINGS		174
SYDNEY METRO CMA RAPID FAUNA		431
OTHER		2364

Exotic species were recorded in all of the key database sources. Native and exotic species were separated into 2 databases. Exotic species were not included in species richness calculations or mapping (unless specified otherwise). Summary findings include the data in the following Tables:

Table 5 SUMMARY DATA - TOTAL NATIVE AND EXOTIC SPECIES

PROJECT DATA > YR 2000	
PARAMETER	NUMBER
NATIVE SPECIES RECORDS	78254
NATIVE SPECIES FAMILIES	98
EXOTIC SPECIES RECORDS	8153
EXOTIC SPECIES FAMILIES	17

Table 6 SUMMARY- SPECIES RECORDS PER CLASS

CLASS	COUNT
AMPHIBIA	2895
AVES	73850
GASTROPA	7
MAMMALIA	757
REPTILIA	745

Table 7 DATA SUMMARY BY LGA (RECORDS WITHIN PARRAMATTA RIVER CATCHMENT)[1]

LGA/AREA	RECORDS	OBSERVATIONS	SPECIES RICHNESS
ASHFIELD	713	1329	60
AUBURN	46110	275978**	261
BANKSTOWN	253	384	38
BLACKTOWN	2840	2848	123
BURWOOD	99	447	24
CANADA BAY	2961	9444	165
HOLROYD	202	221	73
HUNTERS HILL	383	957	97
LEICHHARDT	3347	5899	71
MARRICKVILLE	309	710	44
PARRAMATTA	10190	143013*	237
RYDE	955	1621	136
STRATHFIELD	1824	4682	130
THE HILLS	4744	7604	210
THE RIVER	3087	60151	117
THE CATCHMENT	78254	515434	392

* Figure Dominated By Grey-Headed Flying-Fox Counts

** Figure Dominated By Shore-Bird/Wader Counts

[1] Full species lists and counts by LGA can be found in Appendix 6

Seven Councils within the catchment are undertaking onground works as part of the ongoing larger project deliverables. Better understanding of the distribution of fauna across these LGAs would assist with prioritising onground works, so to this end the data for these Councils was separated from the project database. A further refinement was to group Council reserves by combining reserves that were less than 30m apart into one functional complex. This allowed areas of contiguous vegetation or open space to be treated as “one reserve” to better understand how fauna is distributed across the catchment. 583 parks and parks”groups/complexes” were identified within the subject LGAs. Less than 100 of these contained fauna records, so that a total of 90 reserve groups were assessed. Detailed site descriptions and species lists for these locations are provided in Appendix 5 of this report. Within these locations the following 2 tables list the most commonly observed species.

Table 8 TOP 25 OBSERVED SPECIES IN ALL RESERVE & RESERVE COMPLEXES

CLASS NAME	SCIENTIFIC NAME	COMMON NAME	COUNT
Aves	*Himantopus himantopus*	Black-winged Stilt	28232
Aves	*Limosa lapponica*	Bar-tailed Godwit	23786
Aves	*Chroicocephalus novaehollandiae*	Silver Gull	20689
Aves	*Anas castanea*	Chestnut Teal	20095
Aves	*Calidris acuminata*	Sharp-tailed Sandpiper	19379
Aves	*Anas gracilis*	Grey Teal	11140
Aves	*Threskiornis molucca*	Australian White Ibis	9988
Aves	*Fulica atra*	Eurasian Coot	7572
Aves	*Malurus cyaneus*	Superb Fairy-wren	7137
Aves	*Corvus coronoides*	Australian Raven	5693
Aves	*Hirundo neoxena*	Welcome Swallow	4987
Aves	*Recurvirostra novaehollandiae*	Red-necked Avocet	4800
Aves	*Elseyornis melanops*	Black-fronted Dotterel	4718
Aves	*Vanellus miles*	Masked Lapwing	4697
Aves	*Gallinula tenebrosa*	Dusky Moorhen	4591
Aves	*Anas superciliosa*	Pacific Black Duck	4365
Aves	*Trichoglossus haematodus*	Rainbow Lorikeet	4245
Aves	*Phalacrocorax sulcirostris*	Little Black Cormorant	4088
Aves	*Manorina melanocephala*	Noisy Miner	3992
Amphibia	*Crinia signifera*	Common Eastern Froglet	3597
Amphibia	*Limnodynastes peronii*	Brown-striped Frog	3426
Amphibia	*Litoria aurea*	Green and Golden Bell Frog	3387
Aves	*Porphyrio porphyrio*	Purple Swamphen	3013
AVES	*Pelecanus conspicillatus*	Australian Pelican	2966
Aves	*Petrochelidon ariel*	Fairy Martin	2782

The second table excludes data collected in the SOPA precinct as the shorebird counts undertaken there dominate results.

Table 9 TOP 25 OBSERVED SPECIES IN ALL RESERVE & RESERVE COMPLEXES (EXCLUDING SOPA)

CLASS NAME	SCIENTIFIC NAME	COMMON NAME	COUNT
Aves	*Calidris acuminata*	Sharp-tailed Sandpiper	1256
Aves	*Cacatua sanguinea*	Little Corella	1010
Aves	*Trichoglossus haematodus*	Rainbow Lorikeet	878
Aves	*Threskiornis molucca*	Australian White Ibis	775
Aves	*Manorina melanocephala*	Noisy Miner	728
Aves	*Cacatua galerita*	Sulphur-crested Cockatoo	642
Aves	*Chroicocephalus novaehollandiae*	Silver Gull	568
Aves	*Malurus cyaneus*	Superb Fairy-wren	557
Aves	*Eolophus roseicapillus*	Galah	547
Aves	*Himantopus himantopus*	Black-winged Stilt	530
Aves	*Corvus coronoides*	Australian Raven	477
Aves	*Hirundo neoxena*	Welcome Swallow	469
Aves	*Strepera graculina*	Pied Currawong	464
Aves	*Cracticus tibicen*	Australian Magpie	422
Aves	*Grallina cyanoleuca*	Magpie-lark	377
Aves	*Ocyphaps lophotes*	Crested Pigeon	352
Aves	*Zosterops lateralis*	Silvereye	350
Aves	*Anthochaera carunculata*	Red Wattlebird	326
Aves	*Neochmia temporalis*	Red-browed Finch	306
Aves	*Dacelo novaeguineae*	Laughing Kookaburra	296
Aves	*Lichenostomus chrysops*	Yellow-faced Honeyeater	295
Aves	*Vanellus miles*	Masked Lapwing	280
Aves	*Anas castanea*	Chestnut Teal	278
Aves	*Rhipidura leucophrys*	Willie Wagtail	271
Aves	*Cracticus torquatus*	Grey Butcherbird	258

PRESENTATION OF MAPPED DATA

The following section includes a selection of maps produced from the project database that may assist with visually understanding the distribution of fauna across the LGA. Included in this set are data by grid and point data. Using a standard 1km x 1 km grid allowed comparison of data over a consistant geographic unit that was at a scale that was suitable to encompass the whole catchment. Point data maps provide finer scale analysis. Note that point data from a given survey is most often placed at a single location (given by coordinates) this is often the centroid of the study area. A single point can represent hundreds and hundreds of observations or one observation. To better display this visually we have dispersed the points randomly (computer generated) around the point location. Each dispersed dot represents a species but not the count. Included in the map set is a visual representation of "effort" as species richness was, in part, determined by the survey effort in a given location. As a surrogate for having specific survey effort data we have used the number of "survey" days with survey days being the date of a given observation. We recognised that there would be more records from accessible areas with good habitat and the grid analysis certainly supports that.

Figure 9 THIS FIGURE ILLUSTRATES THE SAME DATA-RAW DATA POINTS (LEFT) AND DISPERSED POINTS (RIGHT)

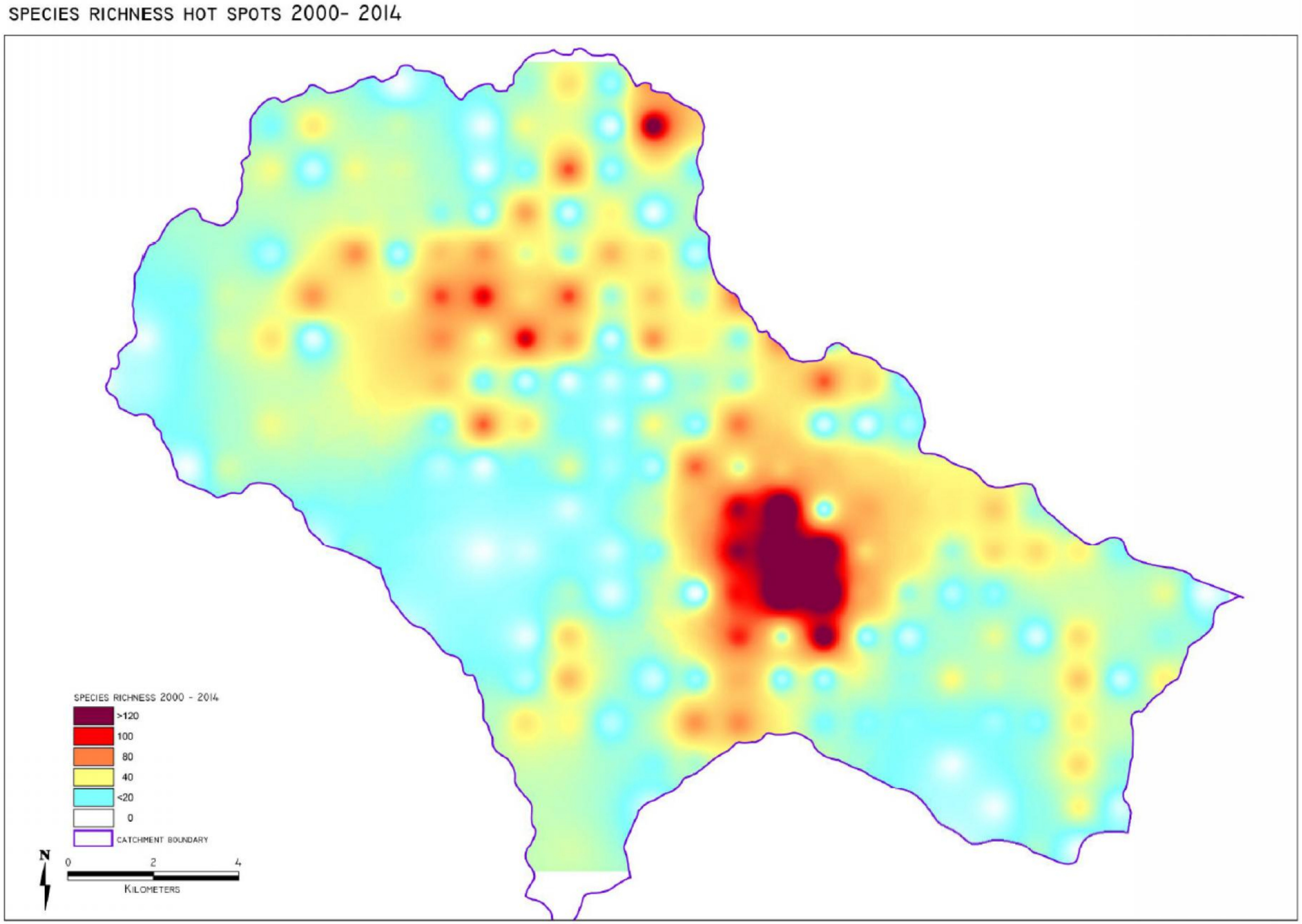

Figure 10 Species richness based on records from fauna databases from 2000-2014

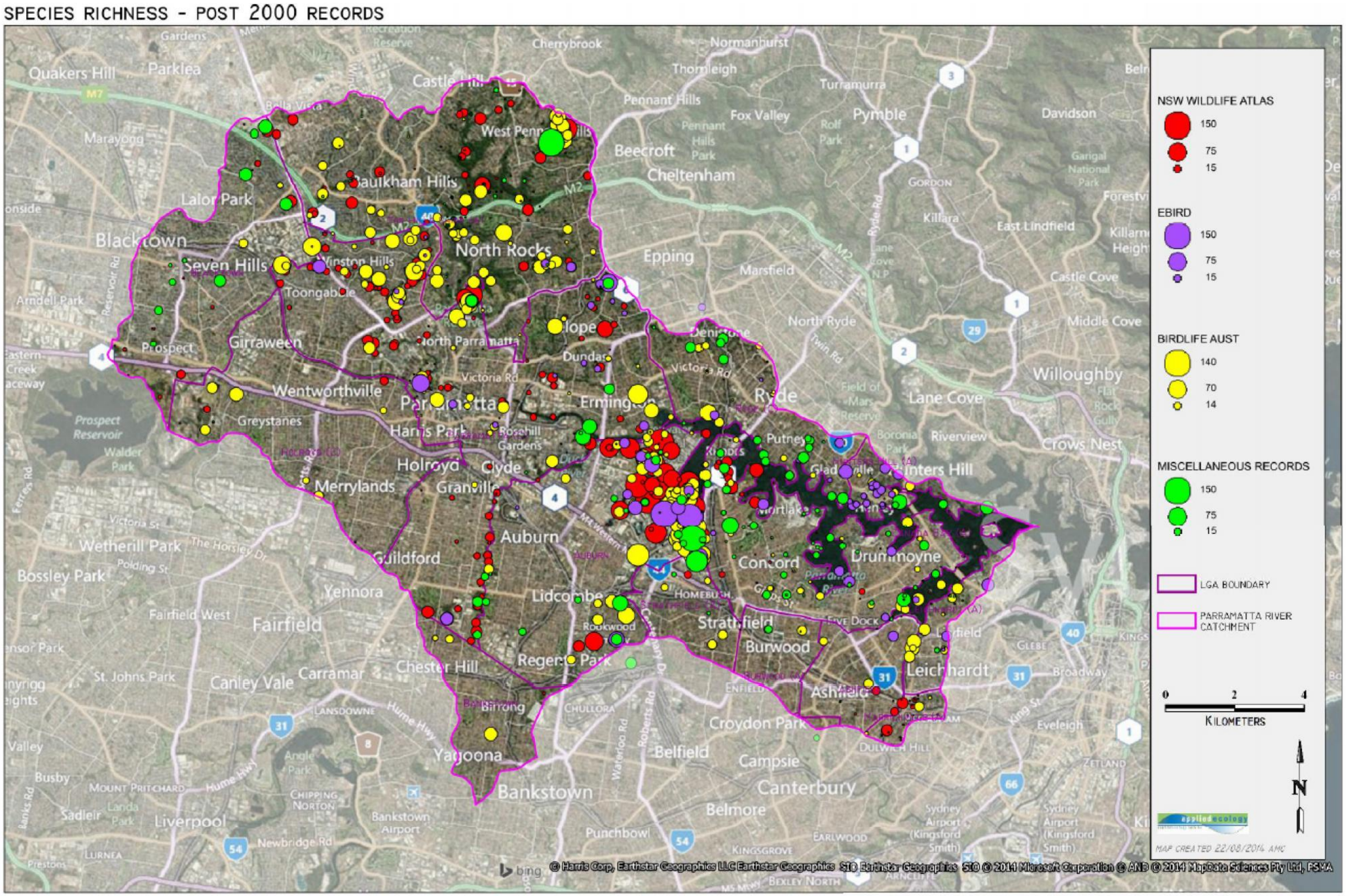

Figure 11 Species Richness (2000-2014) by data source for the Parramatta River Catchment

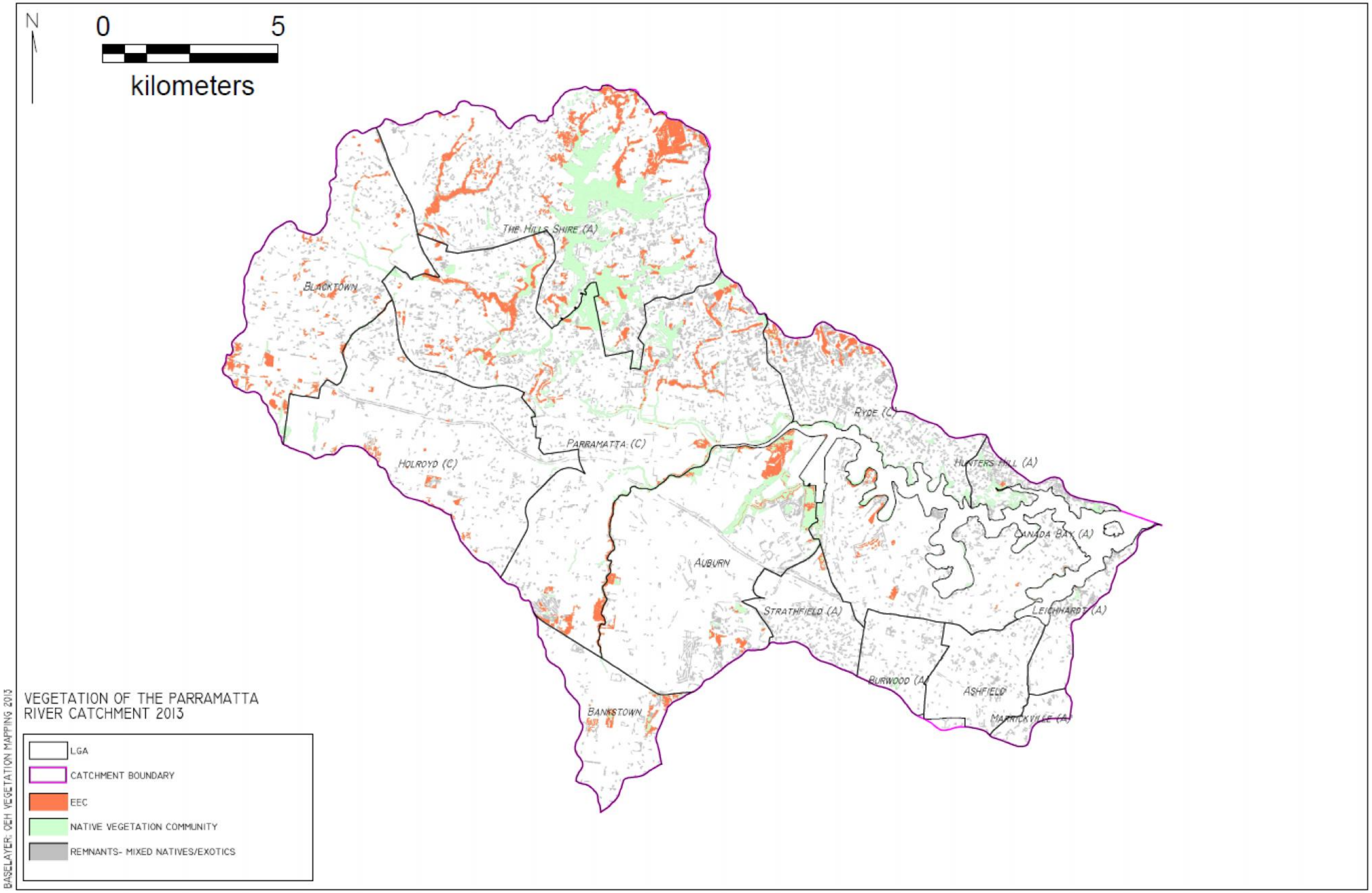

Figure 12 Vegetation of the Parramatta River Catchment

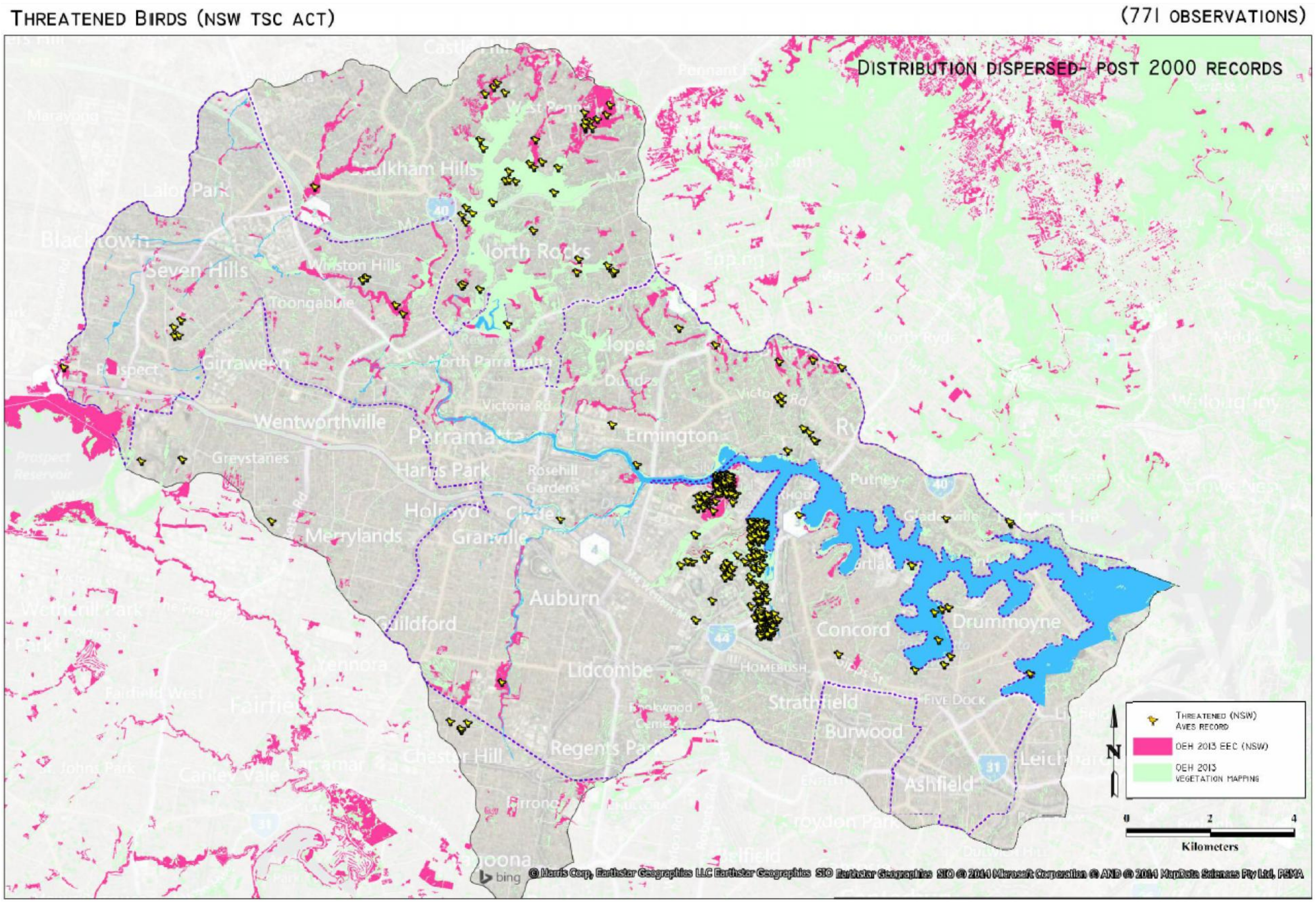

Figure 13 Threatened Aves

THREATENED FROGS (NSW TSC ACT) (712 OBSERVATIONS)

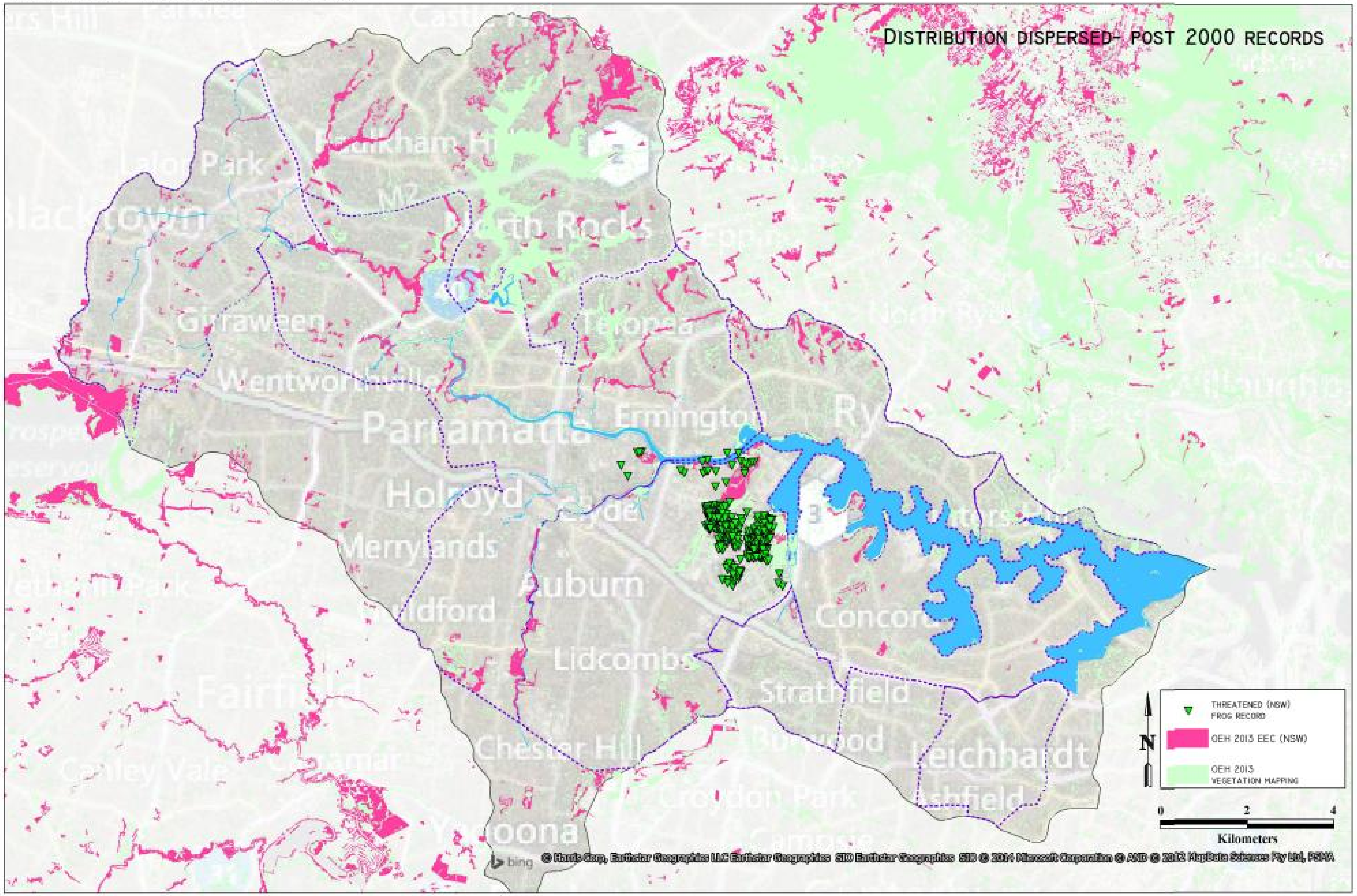

Figure 14 Threatened amphibians

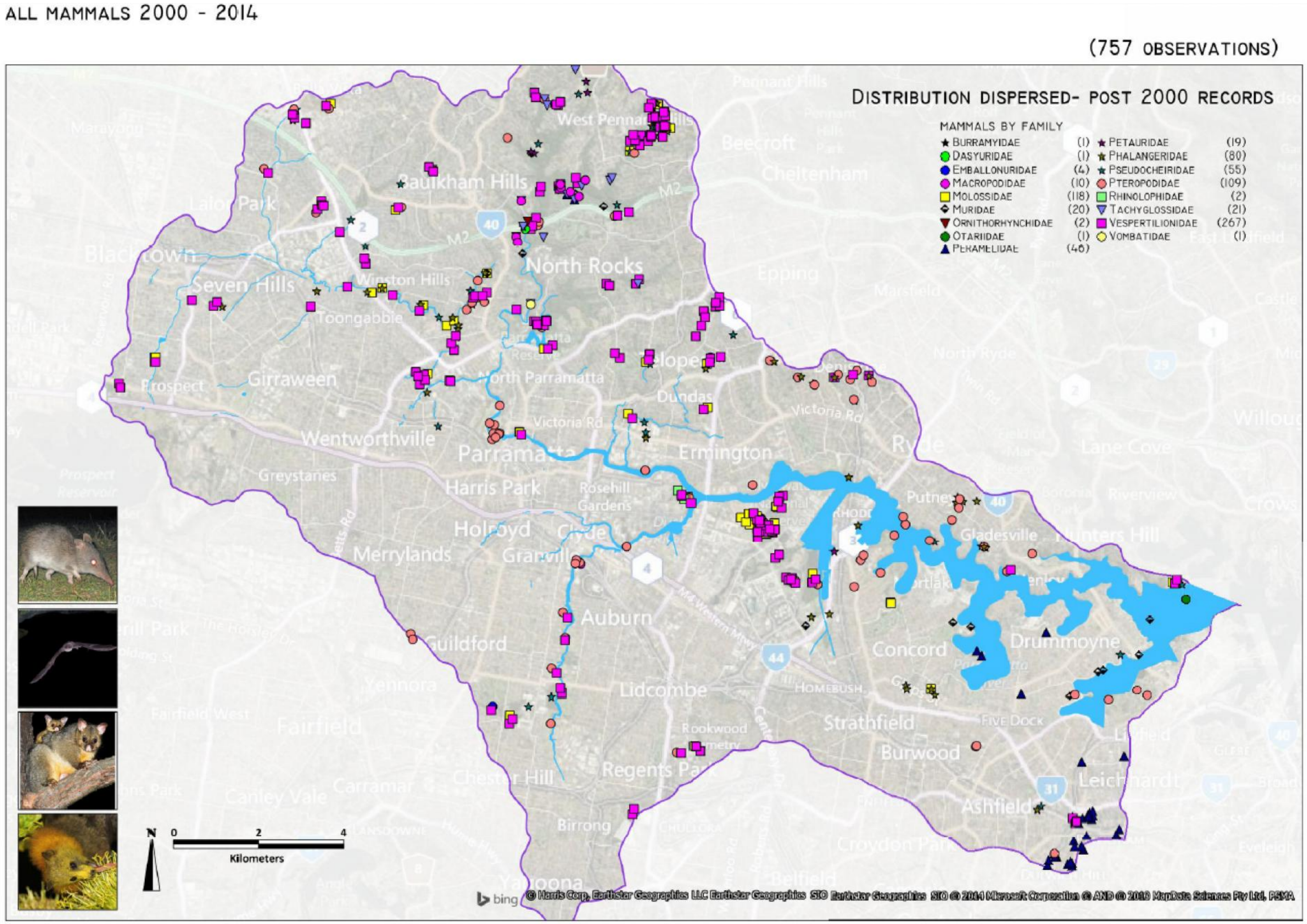

Figure 15 All Mammals

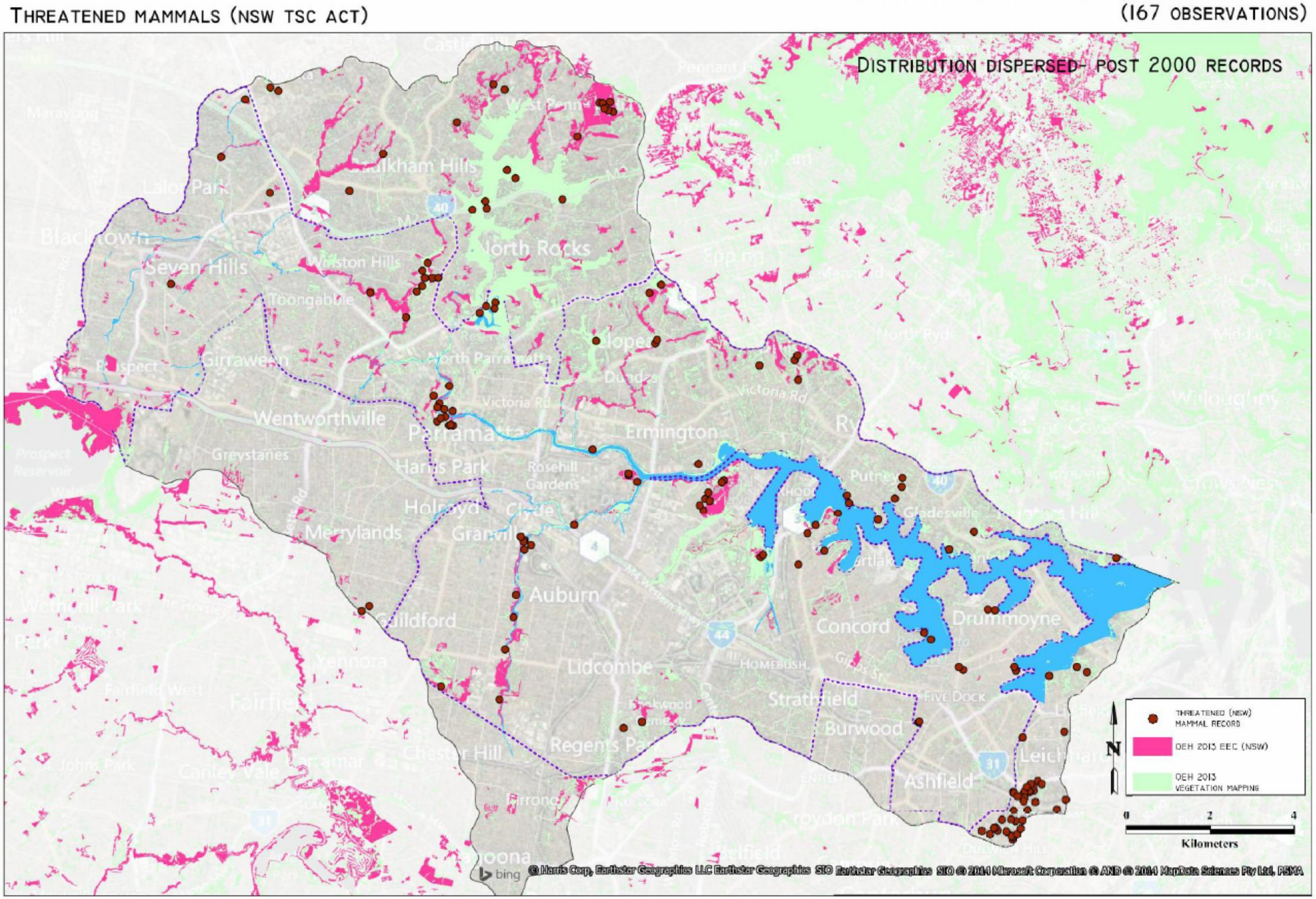

Figure 16 Threatened Mammals

SPECIES RICHNESS BY 1KM X 1KM GRID

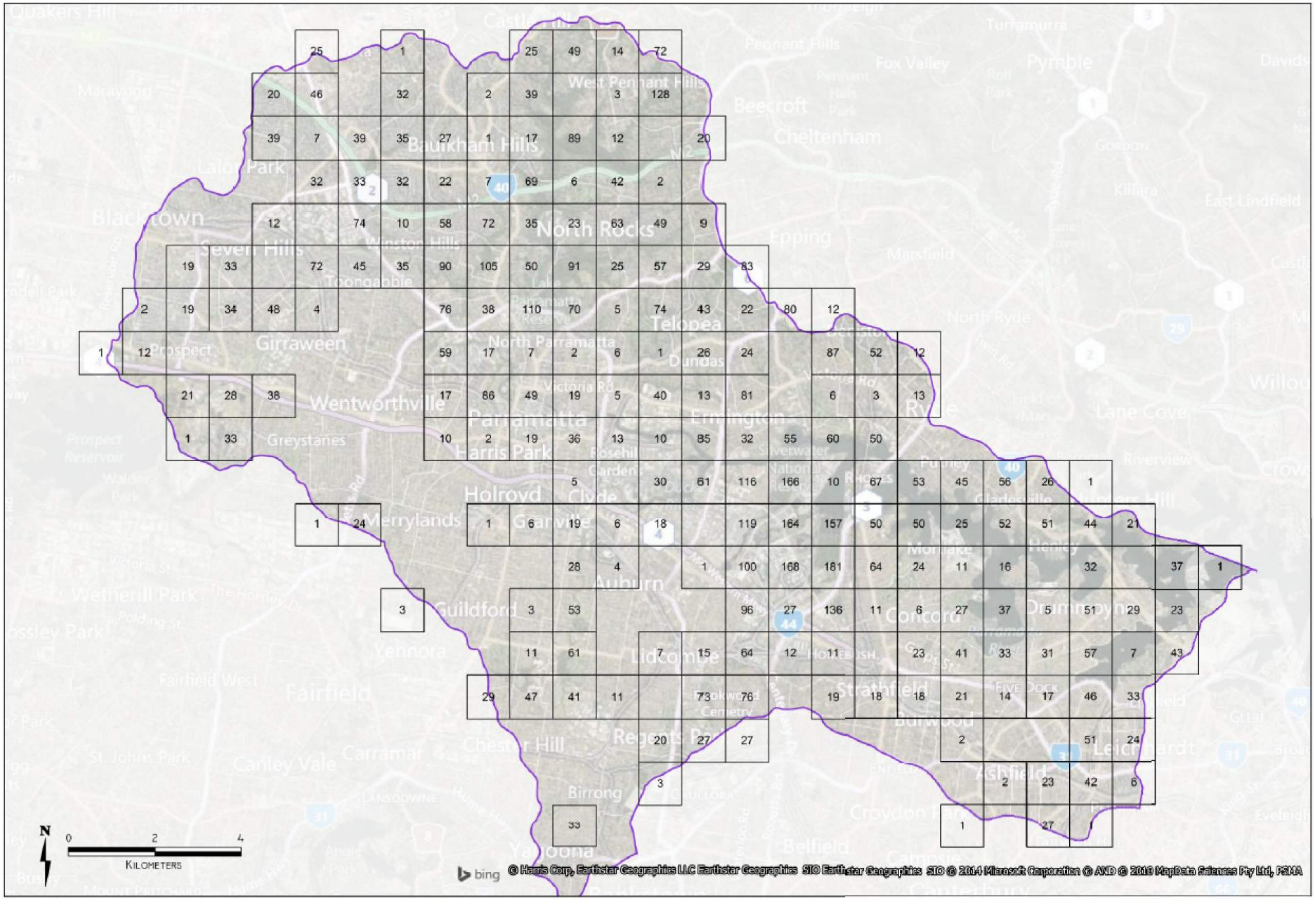

Figure 17 Species richness across Parramatta River catchment using a 1km2 grid (range: 1 to 168)

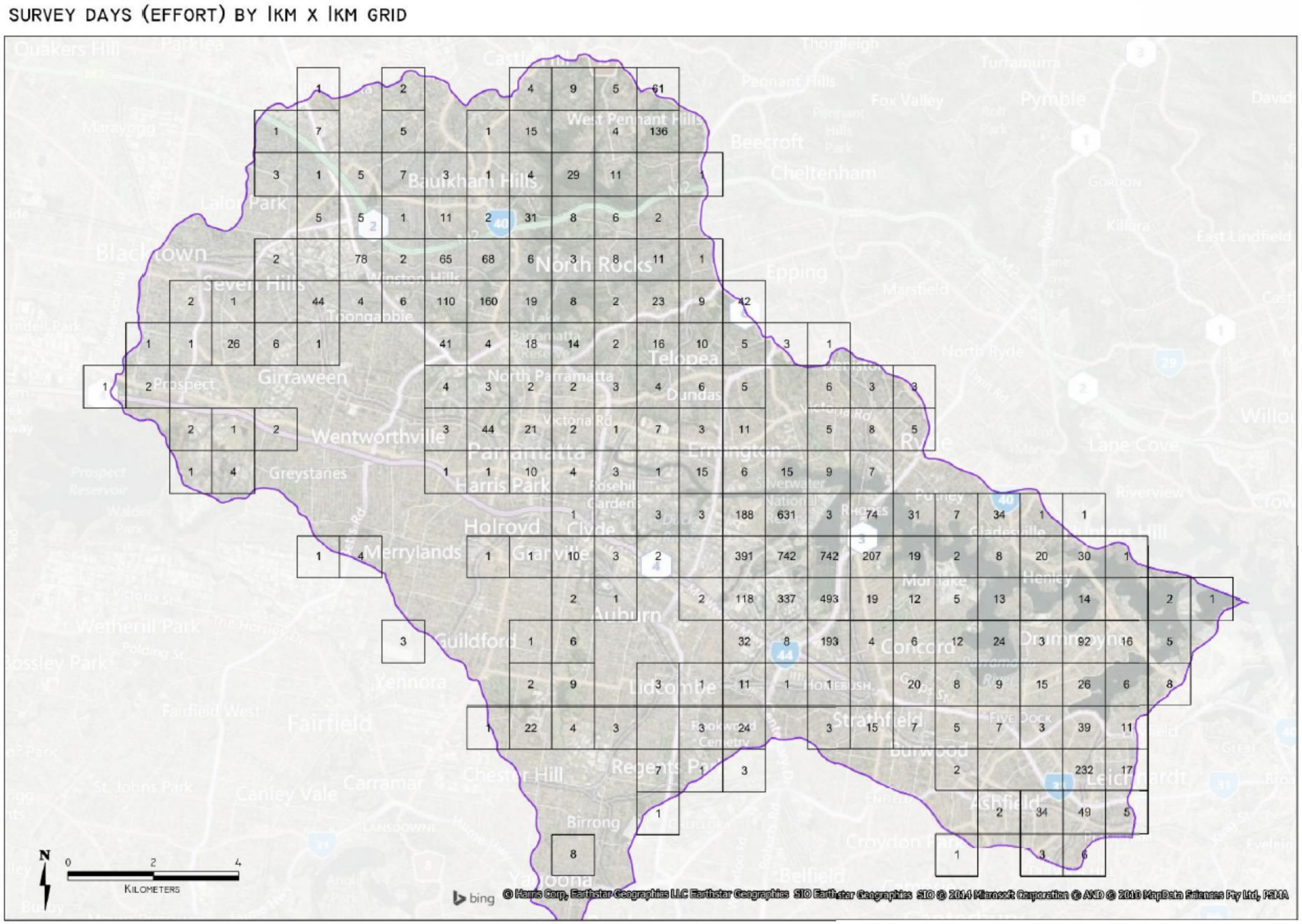

Figure 18 Survey effort for Parramatta River catchment using a 1km2 grid (range: 1 survey event to 742 survey events)

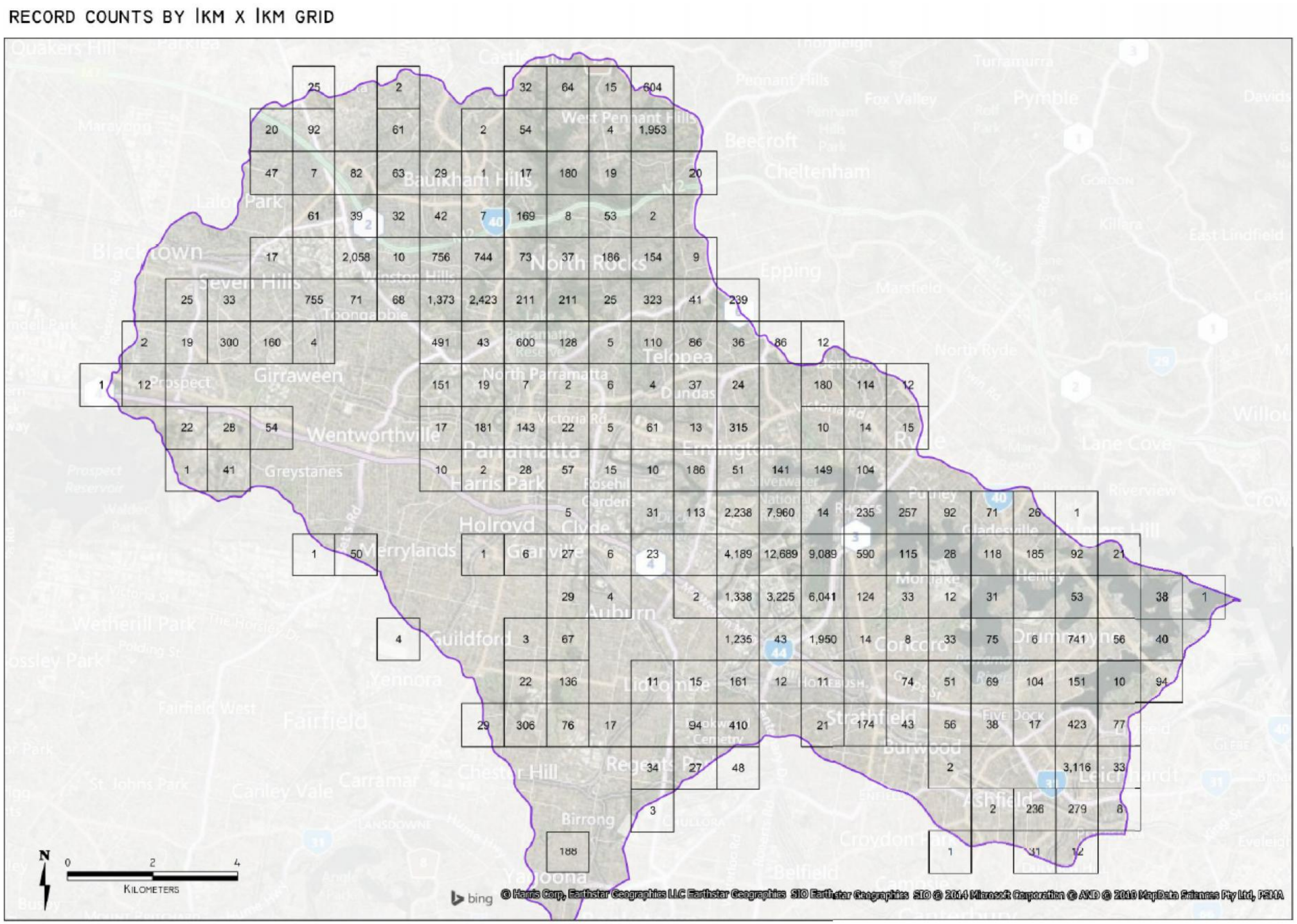

Figure 19 Distribution of fauna records across the Parramatta River catchment, based on number of species and number of observations (range: 1 record to 12,689 records)

FAMILIES:ARDEIDAE (2134 OBSERVATIONS)

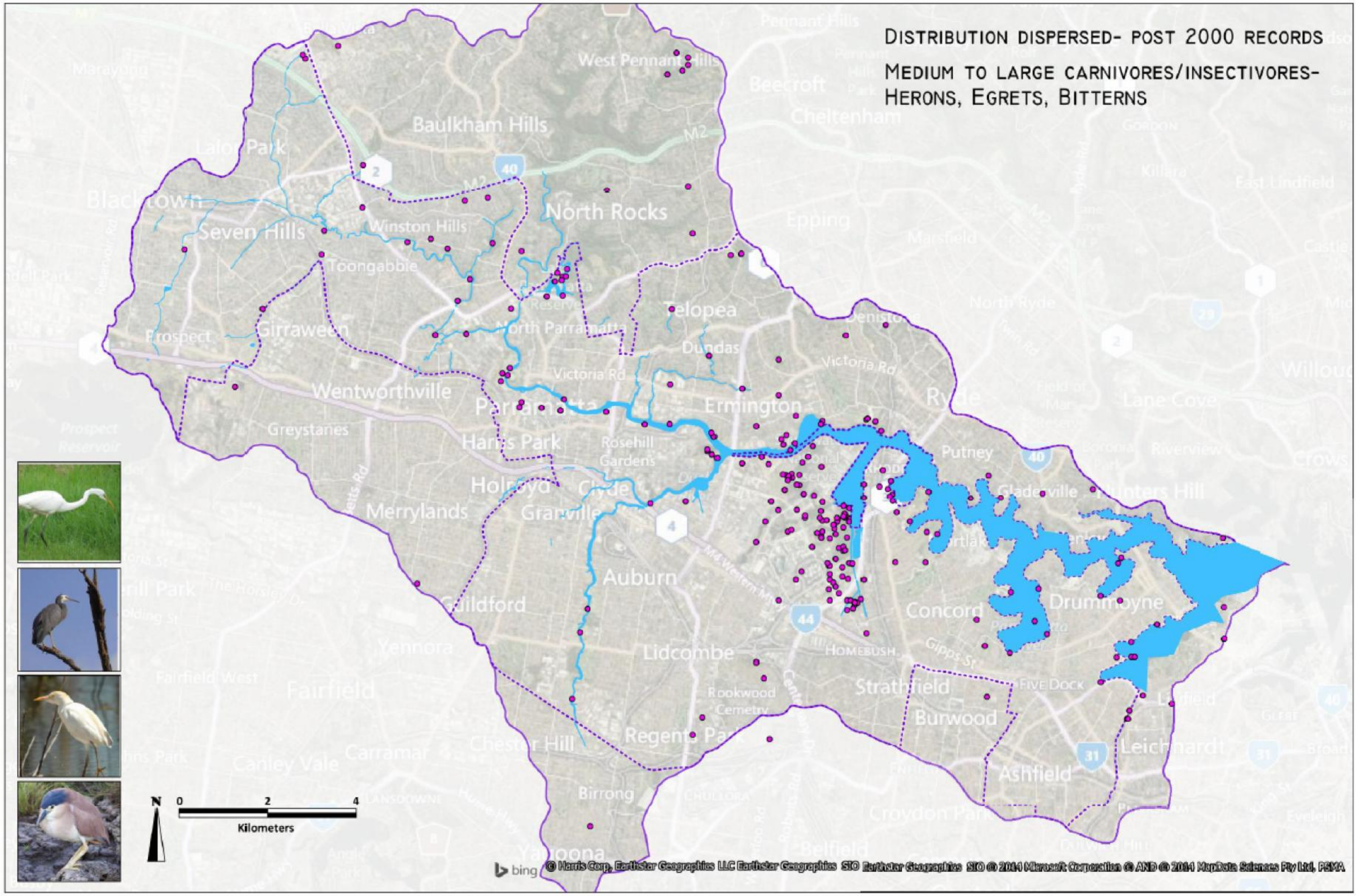

Figure 20 Guild maps – Herons, Egrets, Bitterns

Families:Meliphagidae

(7542 observations)

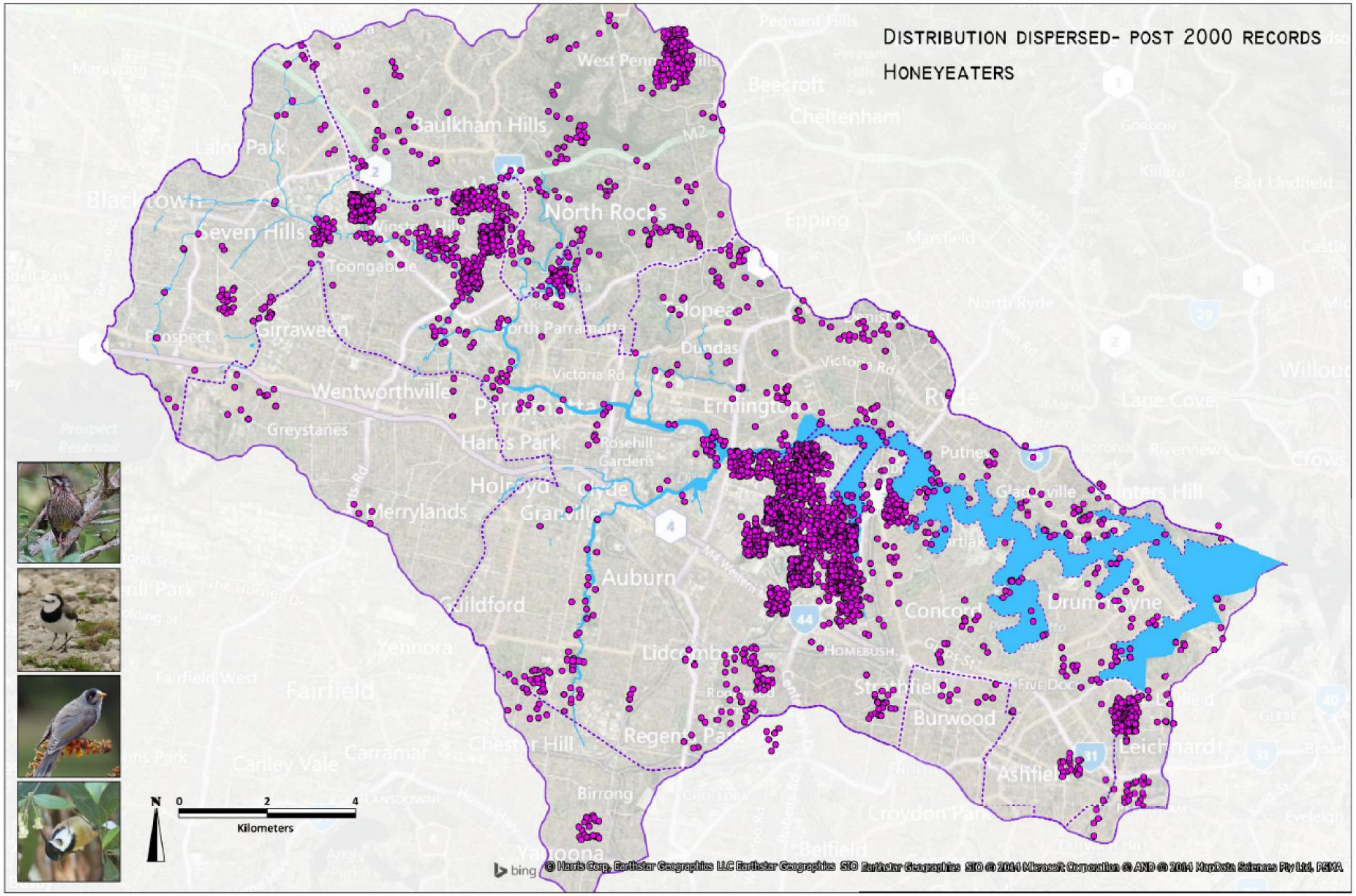

Figure 21 Guild maps- Honeyeaters

FAMILIES:CAMPEPHAGIDAE, CAPRIMULGIDAE, CORACIIDAE, CORCORACIDAE, CUCULIDAE, DICRURIDAE; JACANIDAE, MEROPIDAE, MONARCHIDAE, MOTACILLIDAE, PSOPHODIDAE, TURDIDAE & APODIDAE

(4668 OBSERVATIONS)

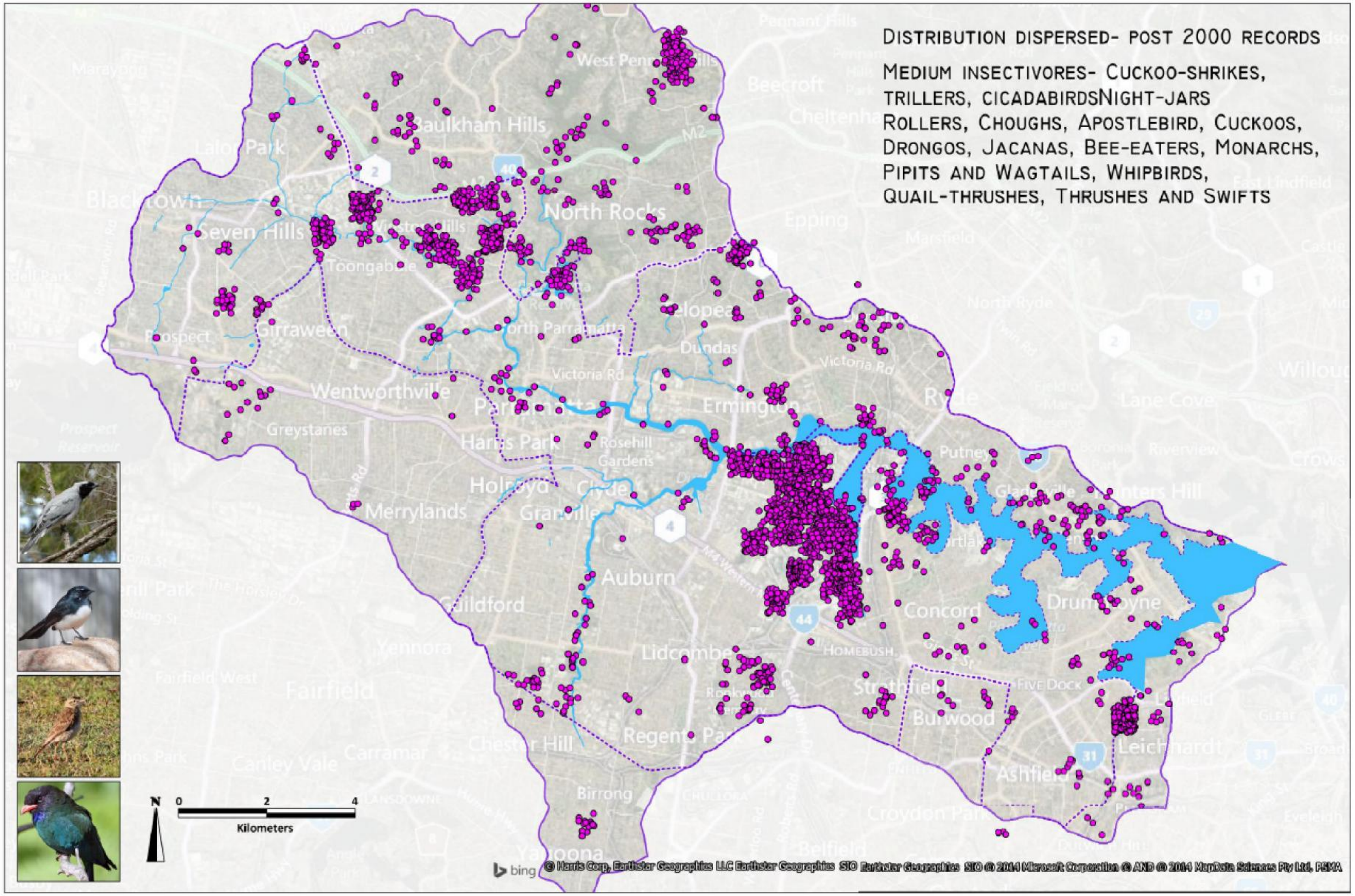

Figure 22 Guild maps- medium insectivores

FAMILIES: PODICIPEDIDAE, ALCEDINIDAE & CHARADRIIDAE (4972 OBSERVATIONS)

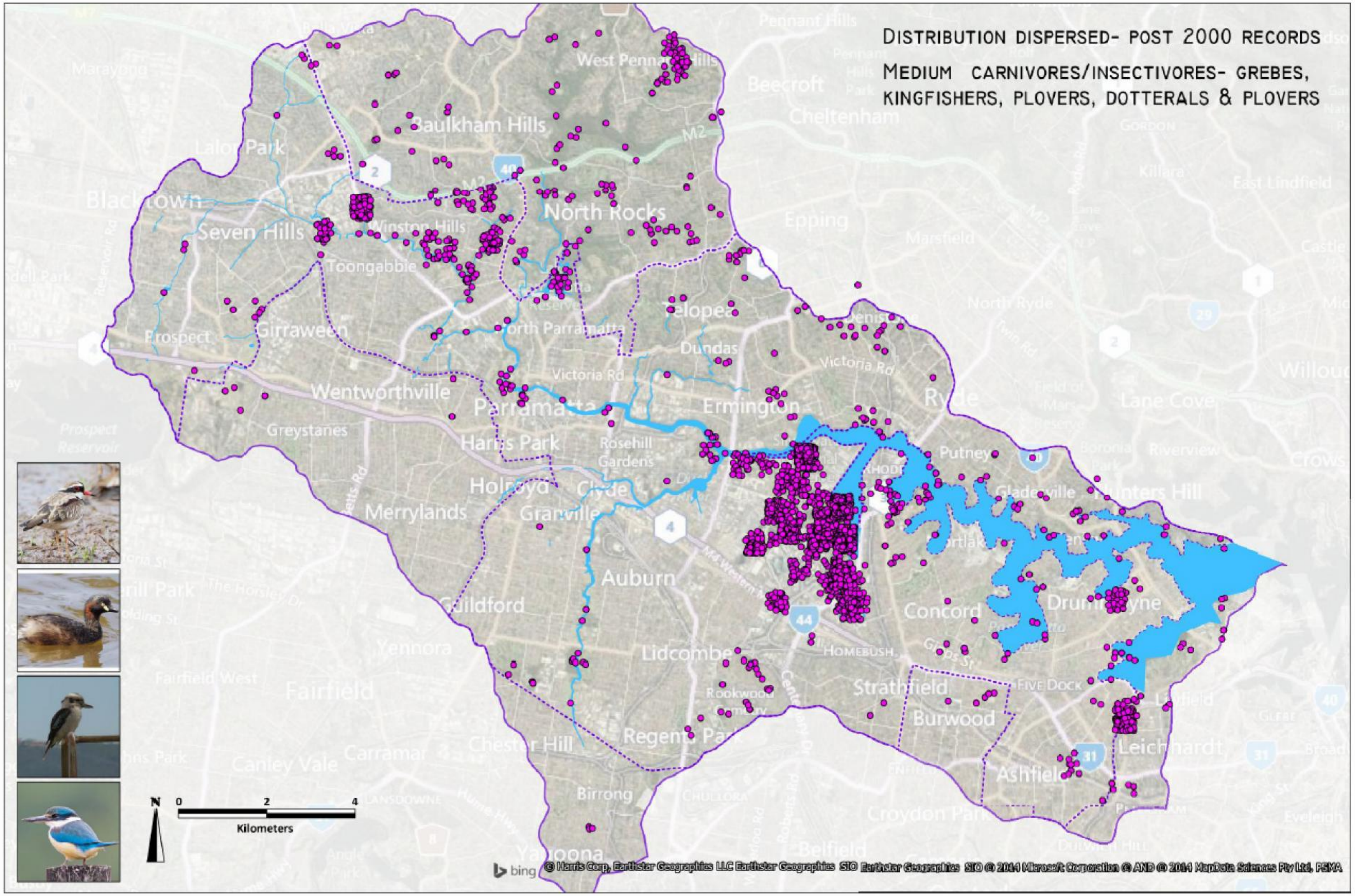

Figure 23 Guild maps- riparian zone medium insectivores

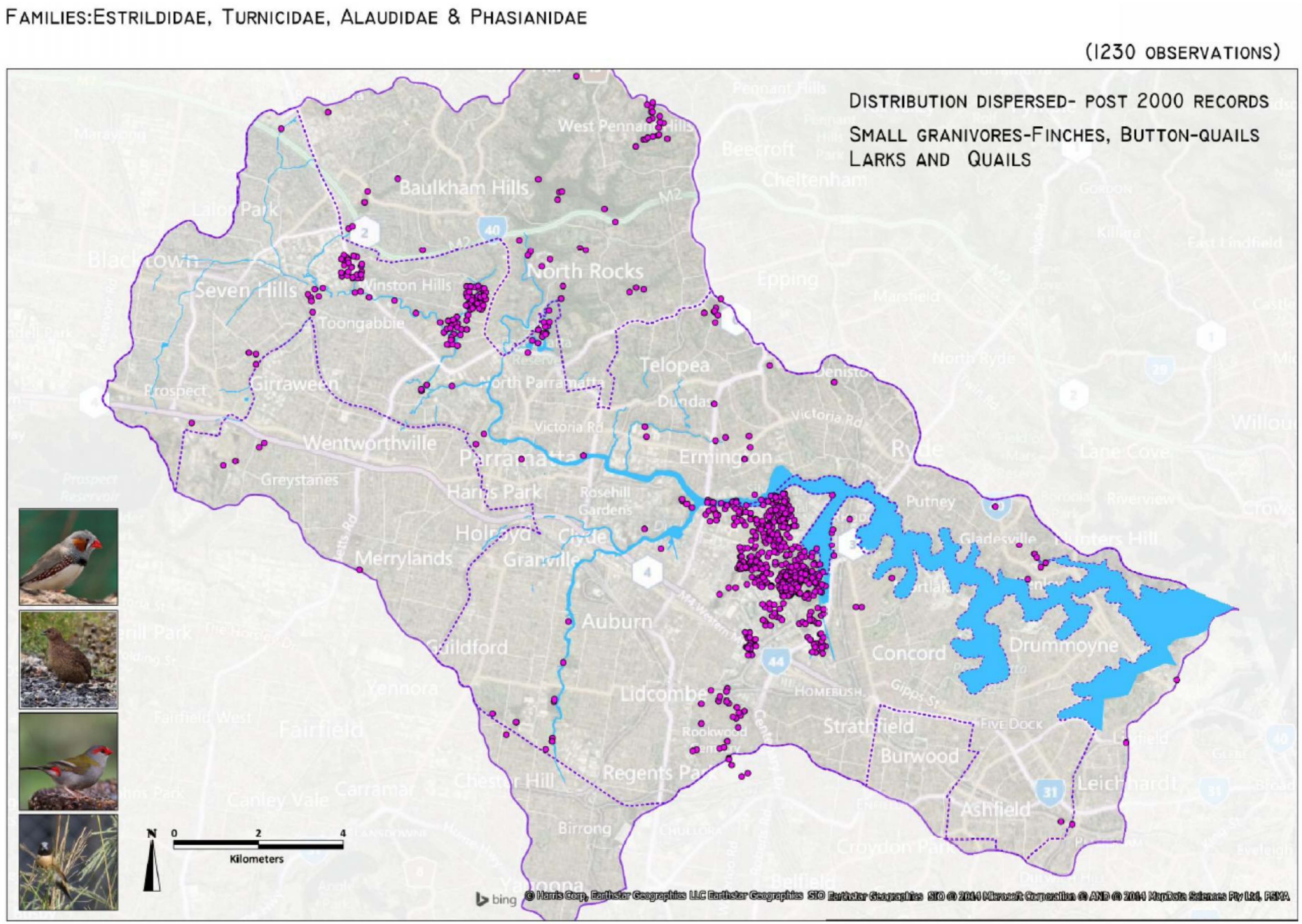

Figure 24 Guild maps- small granivores

FAMILIES: ACANTHIZIDAE, ACROCEPHALIDAE, CISTICOLIDAE, CLIMACTERIDAE, HIRUNDINIDAE, MALURIDAE, MEGALURIDAE, NEOSITTIDAE, PARDALOTIDAE, PETROICIDAE, RHIPIDURIDAE, PACHYCEPHALIDAE, PITTIDAE, & TIMALIIDAE

(16142 OBSERVATIONS)

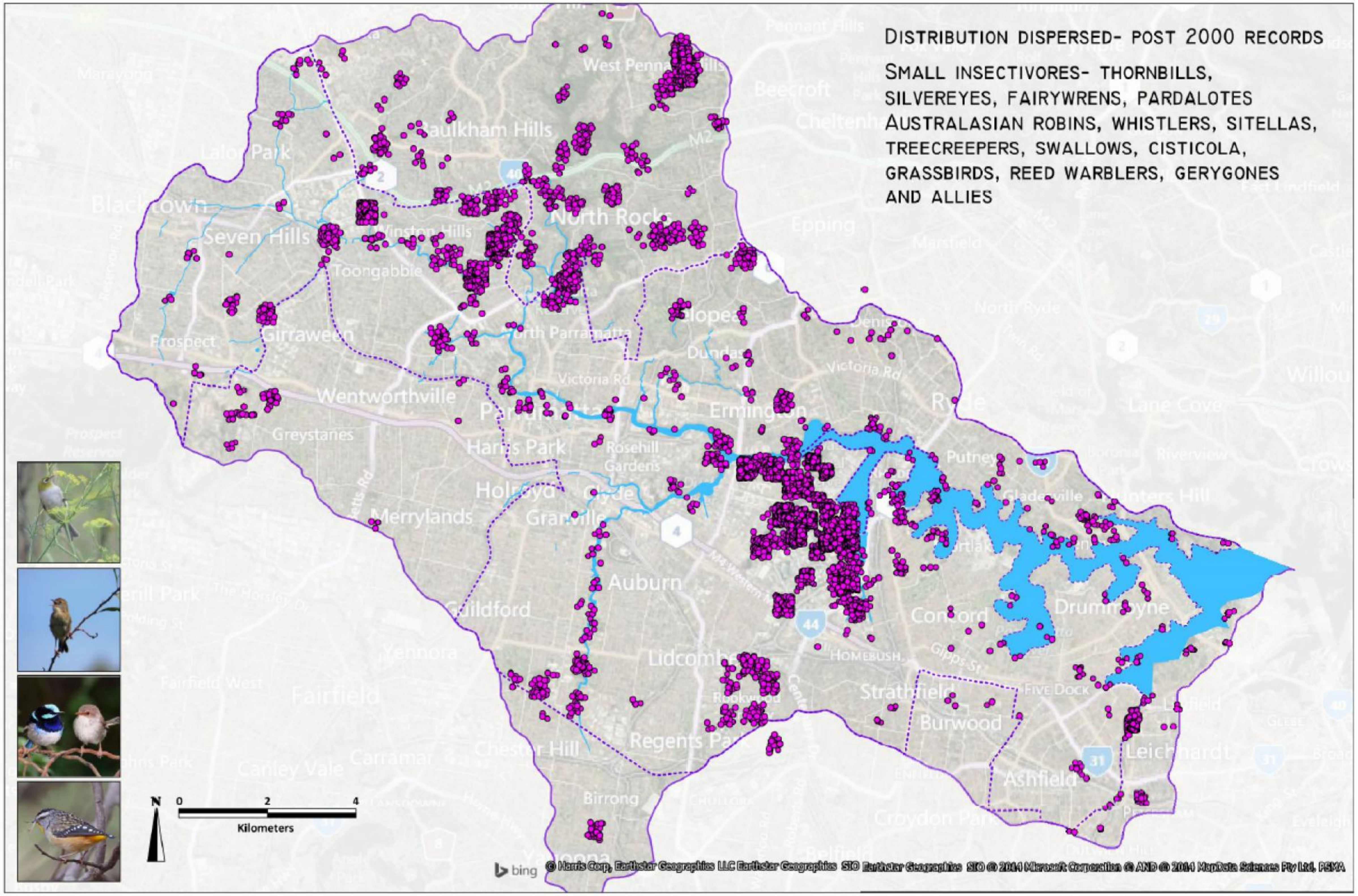

Figure 25 guild maps- small insectivores

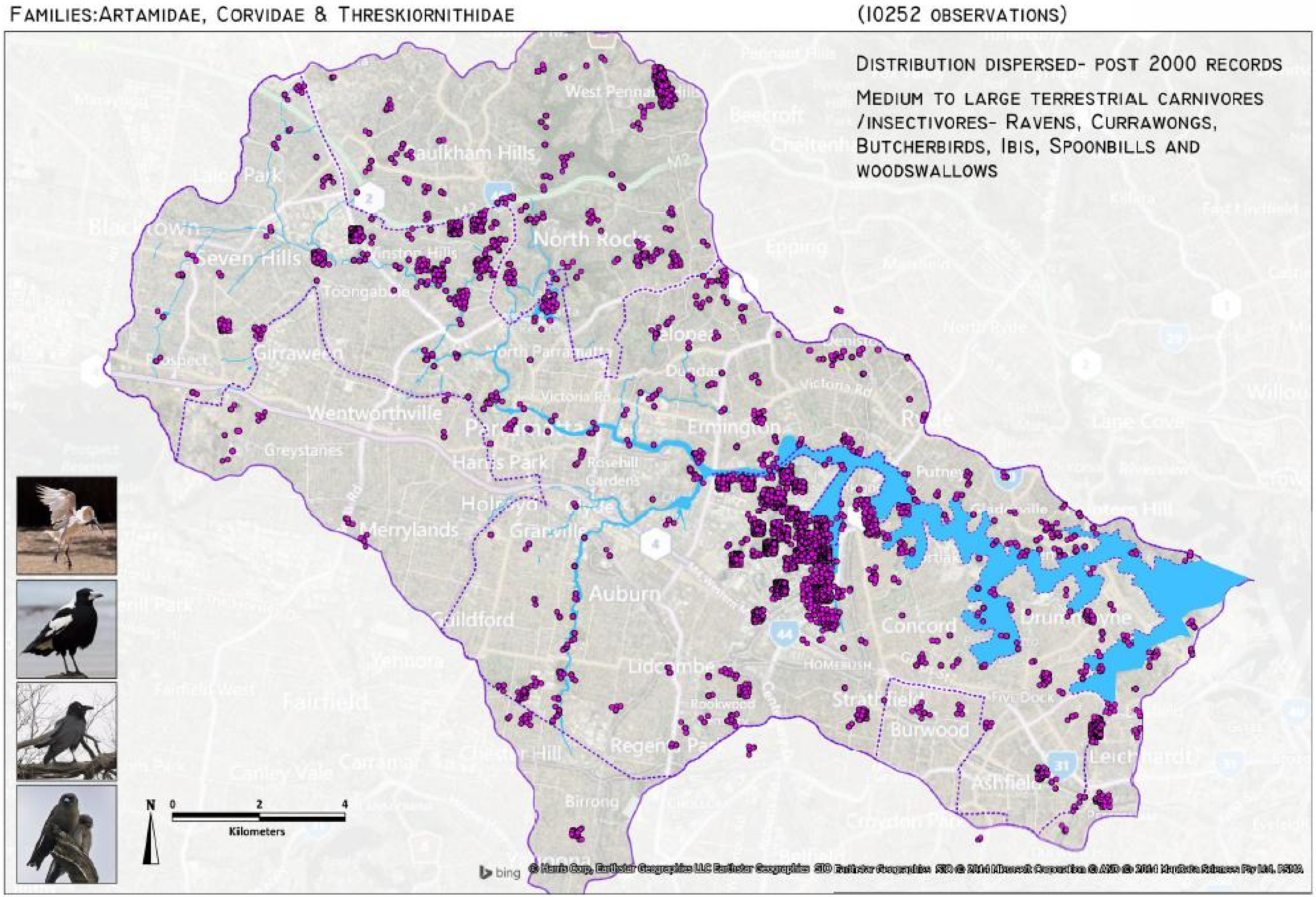

Figure 26 Guild maps- medium to large carnivores/insectivores (1)

FAMILIES: ACCIPITRIDAE, BURHINIDAE, CENTROPODIDAE, FALCONIDAE & PODARGIDAE (1258 OBSERVATIONS)

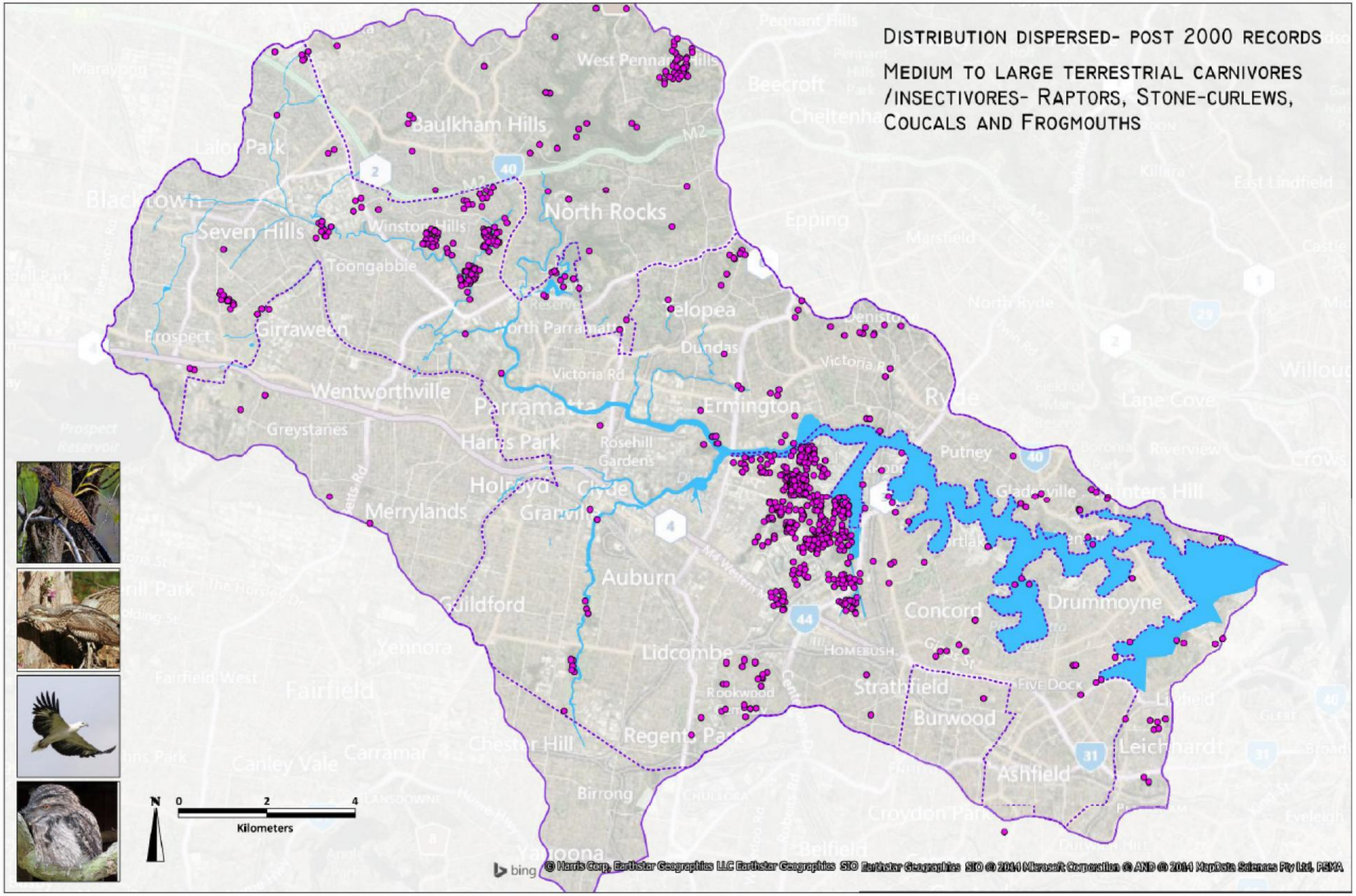

Figure 27 Guild maps- medium to large carnivores/insectivores (2)

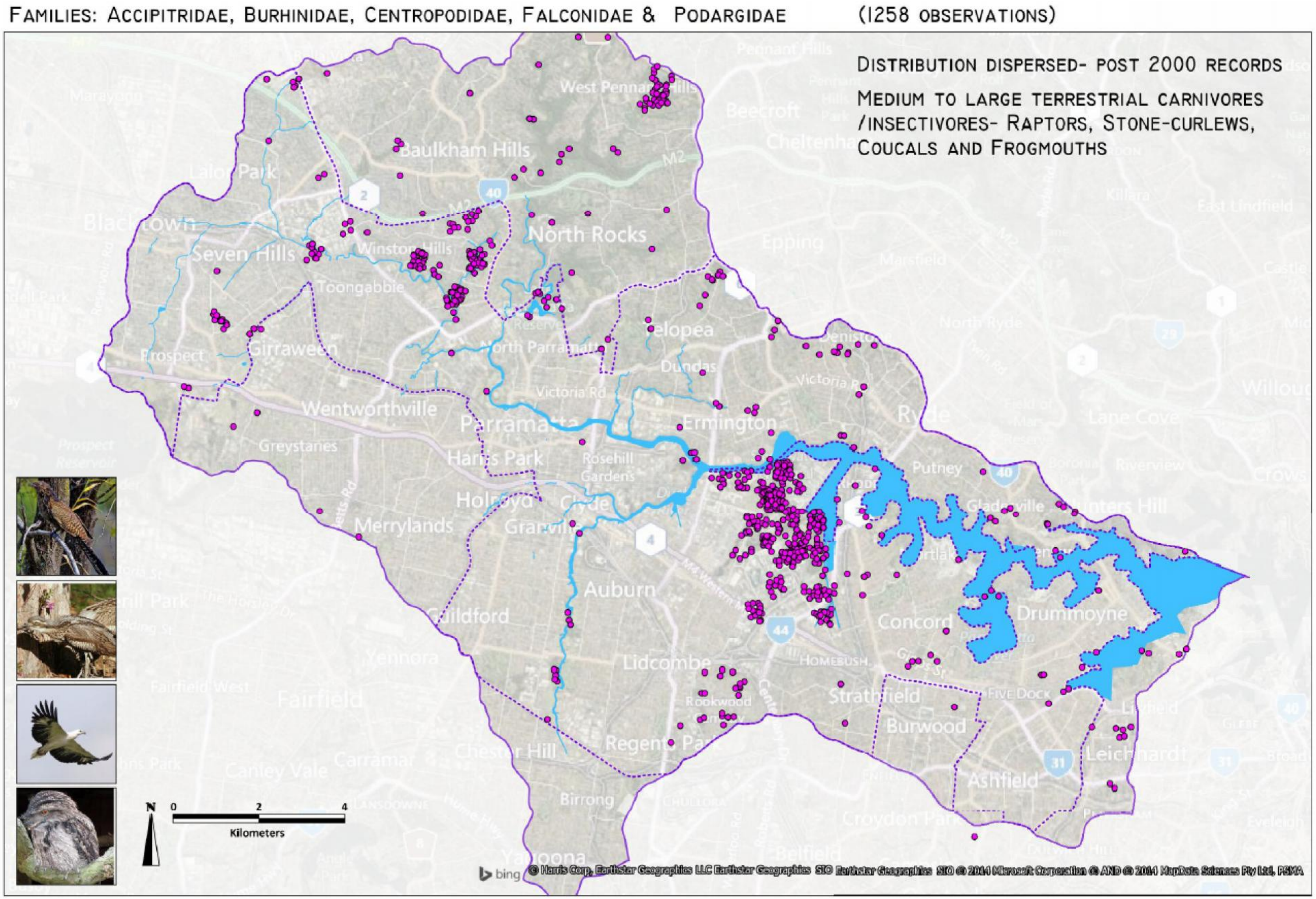

Figure 28 Guild maps- medium to large carnivores/insectivores (3)

FAMILIES: ANHINGIDAE, PELECANIDAE, LARIDAE & PHALACROCORACIDAE (5952 OBSERVATIONS)

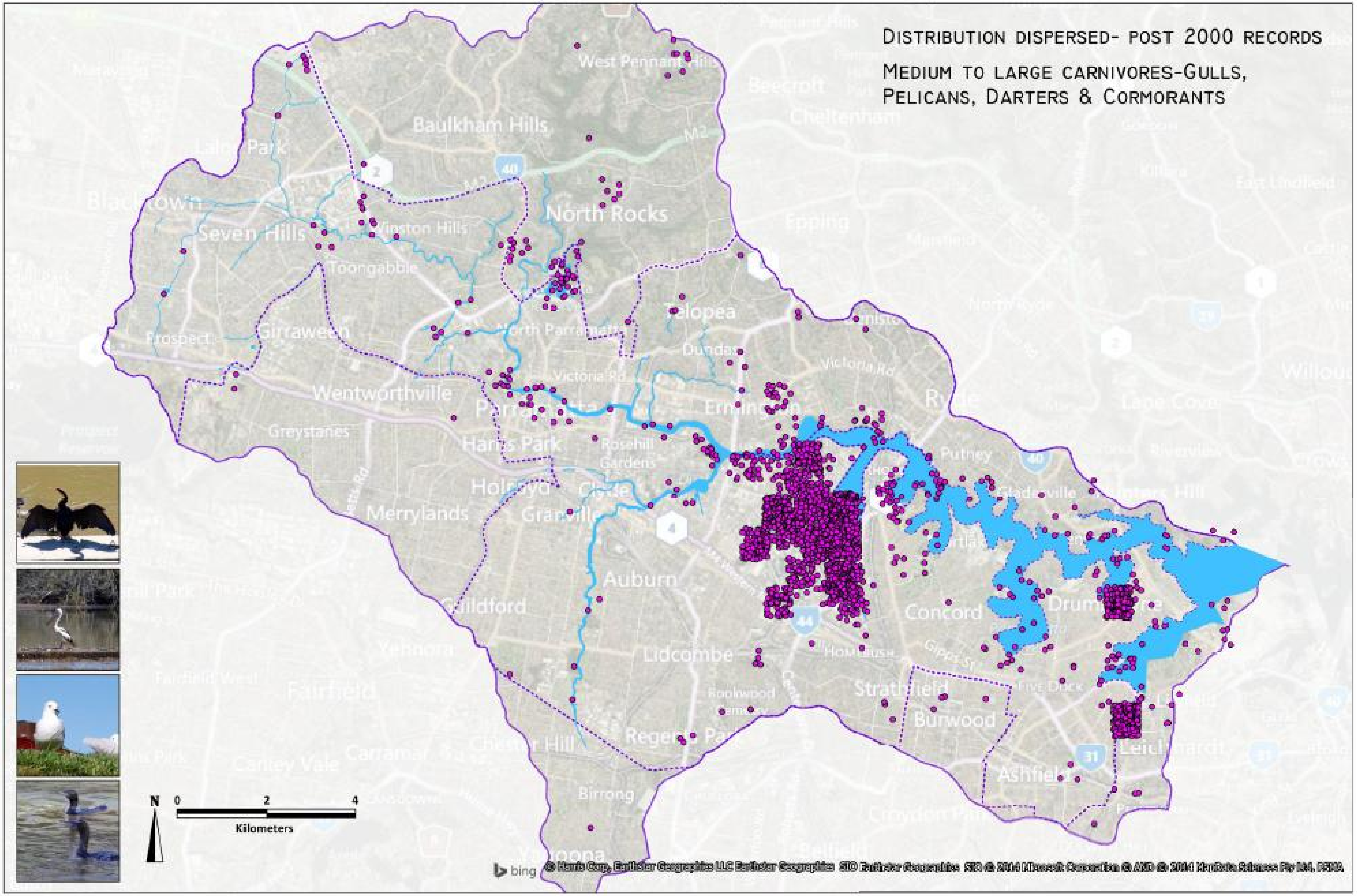

Figure 29 guild maps- Medium to large water birds

Families:Rallidae, Recurvirostridae, Rostratulidae & Scolopacidae (6933 observations)

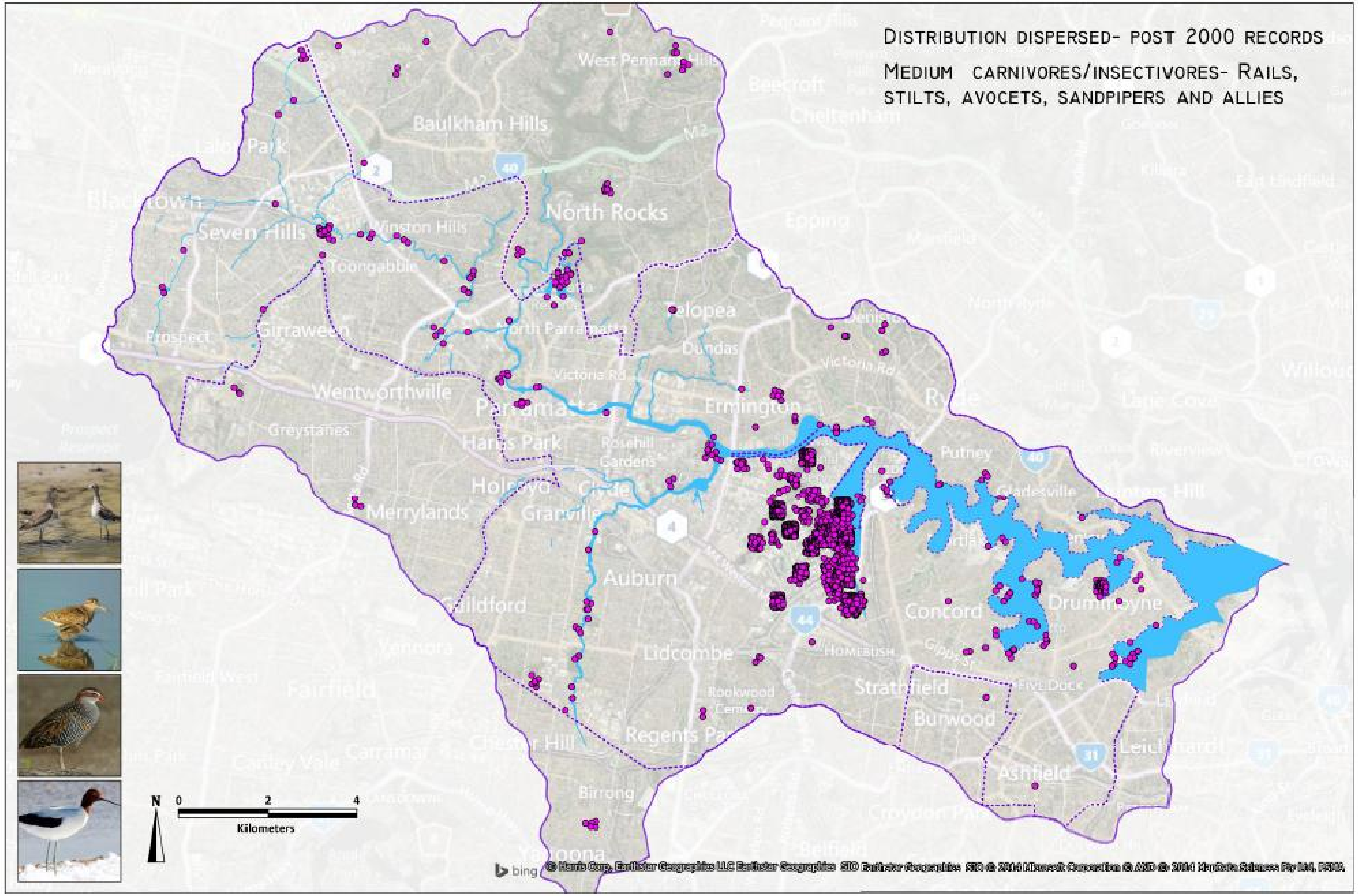

Figure 30 Guild maps - Waders/shorebirds

FAMILIES:COLUMBIDAE, CACATUIDAE & PSITTACIDAE

(9074 OBSERVATIONS)

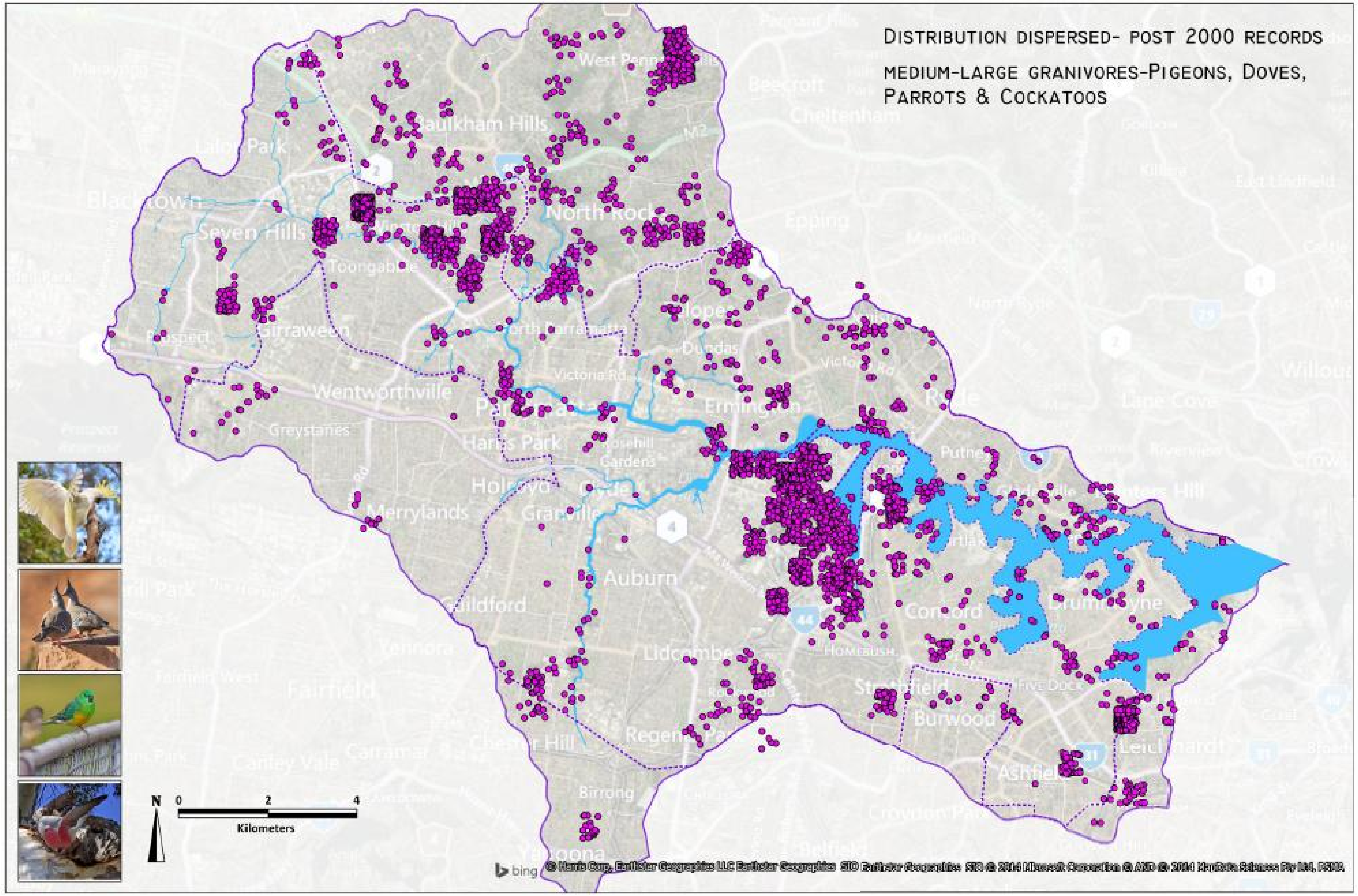

Figure 31 Guild maps- Large granivores

UNDERSTANDING THE DATASET

Some of the key questions that need to be answered for this type of project relate to existing methods of allocating funding. To assist with decision making in this area, the following questions were addressed:

- Where is the best fauna habitat?
- Does this fit with existing funding targets (such as EECs/TS)?

To begin the process of answering this, the collated dataset was assessed using a number of techniques to determine species richness and abundance, which combine to give diversity for a given "community" of individuals.

MEASURING ECOLOGICAL DIVERSITY

A simple count of species gives no information about their relative frequencies. For two theoretical communities, both have four species giving equal species richness, but differ in the abundance of each species (Figure 32). For one habitat the species are present in equal abundance, giving a high diversity. For the other habitat, one species almost completely dominates and the community has low diversity.

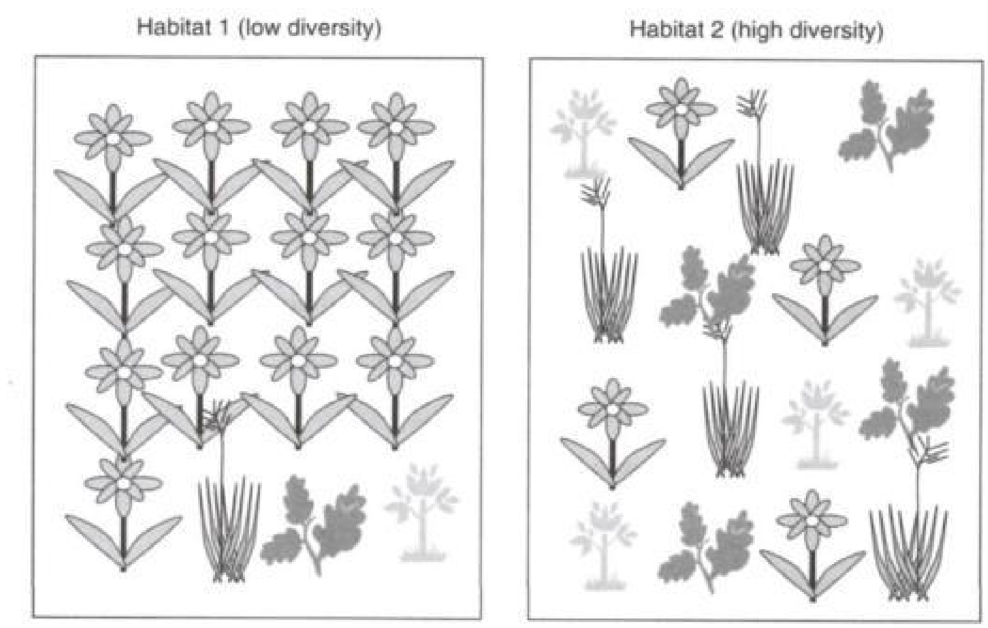

Figure 32 The difference between species richness and diversity – both have 4 species, so richness is equal, but the abundance of each species is different, so diversity is not equal (Shaw, 2003)

The aim of diversity indices is to encapsulate these concepts in one number, which can then be used to compare the relative diversity of two or more communities. The two most commonly used indices in ecology are the Simpson's index and the Shannon-Weiner index.

- **Simpson's index** – uses probability of repeated samples from a population containing the same species. The higher the diversity the less likely this is to happen, at which point Simpson approaches a maximum value of 1.0)

- **Shannon-Weiner index (H)** – based on number of species and relative abundance. The maximum value occurs when all species occur at equal frequency

Diversity indices are based on a combination of species richness, species abundance, and probability of selection per sample. Comparing these can be problematic, and a common solution is to use the effective number of species (ENS). Effective number of species gives a measure of true diversity, and is commonly calculated as follows:

- Gini-Simpson index uses 1/(1-Simpson value)
- exp(Shannon-Weiner value)

Using exp(S-W) reduces bias towards rare or common species, therefore "fairest" index, and has been calculated for each group of reserves collated in the current project (Figure 33; and see Appendix 5).

SUMMARY STATISTICS - FAUNA RECORDS POST 1 JANUARY 2000 (~14 YEARS)

INDEX	SCORE
SPECIES RICHNESS	**89**
TOTAL NUMBER OF RECORDS	305
SURVEY DAYS	15
SIMPSONS INDEX OF DIVERSITY 1-D	0.96
SHANNON-WEINER INDEX	4.02
EFFECTIVE NUMBER OF SPECIES (EXP(S-W))	56

Figure 33 Example of summary statistics collated for each group of reserves – this is for the Duck River group on the boundary between Auburn and Parramatta LGAs

DATA ANOMALIES

Presence-only data

A number of factors relating to the type of data collated have influenced the way the data has been interpreted. Presence-only data consist of records describing known occurrences (presence) of species, but lacking information about known absences. The dataset used for this project consists entirely of presence-only data. Attitudes to the value of presence-only data are remarkably varied. Some acknowledge that their predictions would be more robust if presence-absence or abundance data were available—a view that has substantial implications for the type of data which ecologists should aim to collect (Elith & Leathwick, 2009).

An advantage of presence-absence data is that it conveys valuable information about surveyed locations (enabling analyses of biases) and prevalence (Phillips et al. 2009). However, absence records can introduce confounding information because they can indicate either habitat that is unsuitable or habitat that is suitable but is unoccupied, perhaps because of inaccessibility. The dataset used in this project relies on presence-only data, and care should be taken that a lack of record for a species in an area is not automatically interpreted as an absence of that species.

Uneven survey effort

Presence-only data provides a more reliable dataset if the survey effort is equal, so that the same number of survey events were conducted on the same days by operators using the same methods and criteria, or conducted in similar weather conditions by operators using the same methods and criteria, so that the likelihood of recording an animal is equal for each site that is surveyed.

The current project uses data collated from a broad range of survey events. Attempts were made to regulate the reliability of the data by excluding observation records that did not meet the required standards (use of common names, genus name only, traces or calls rather than direct observation, etc). On-ground survey effort across the catchment based on a 1km2 grid, however, ranged from 1 survey event to 1011 survey events per grid. Often, no information was available about the actual survey effort that was encapsulated in each "survey event". Based on information from previous fauna studies in Parramatta LGA, this actual effort could range from 20 to 30 minutes observations in a smaller, poor quality habitat reserve to several hours or more of observation in conjunction with rigorous searching of habitat niches. In a number of cases, "survey effort" also included passive trapping techniques such as hair tubes, bait stations, motion detecting night vision cameras, and anabat detection, or active trapping with Elliott traps, pit trapping, etc.

Overall, there was no consistency in survey effort based on operator experience, season, time of day/night, weather conditions, number of days/events, method of observation (call records, searches of habitat niches, especially for reptiles), or degree of targeting of species (eg. anabats for microbat detection and identification). As a result, a number of faunal groups are chronically under-surveyed, while others may actually be under-recorded. Reptiles, microbats and other nocturnal mammals tend to be under-surveyed, unlike birds which are the most common focus of sampling activities. Even avian fauna records, however, show strong bias in both the guild selected for targeting (such as waders), and the tendency to only record "noteworthy" species.

Waterbirds dominate the species list, with 8 species in the top 10 species recorded, and 16 of the top 25 species recorded. Migratory waders were of particular interest, with 5 species in the top 25 species recorded. Similarly, frogs are popular for observing and recording, and the state and federally listed threatened Green and Golden Bell Frog (*Litoria aurea*) comes in at number 22 on the list! This is more likely to be a testament to the enthusiasm of frog observers and monitoring of this species by SOPA than to the success of government initiatives for habitat restoration.

This bias towards "noteworthy" species such as listed threatened species is evidenced at a number of reserves. One species of fauna was recorded twice at Bayview Park in City of Canada Bay, where a local incidence of Long-nosed Bandicoots was noted. Rydalmere Park in Parramatta LGA is an open mown grass space, yet was found to be "home" to the vulnerable Little Lorikeet (*Glossopsitta pusilla*), the vulnerable Powerful Owl (*Ninox strenua*), and the Australasian Figbird (*Sphecotheres vieilloti*) which has a preference for wet sclerophyll forests, but is often found in urban parks and gardens with figs and other fruit trees. None of the more common species were recorded from this reserve.

Assumptions about equilibriums

Perhaps one of the greatest issues associated with the use of this type of dataset is that data records were collected across a period of 14 years. During these 14 years there has been some development in the Parramatta River catchment, so that areas that were previously vegetated are now cleared and hardened. As a result of these changes in the extent and/or quality of habitat available, there are likely to be some changes in the suites of species that are able to be supported in some areas. The result of this can be a set of species records that are unrepresentative of the new conditions. An example of this is Birnie Avenue Reserve in Auburn (Figure 34).

GROUP 320
LGA(S): AUBURN

INCLUDES PARKS: BIRNIE AVENUE RESERVE
TOTAL AREA: 0.8 HECTARES

AREA VEGETATED: HECTARES 0.5 (55%)

VEGETATION DESCRIPTION OEH 2013						
FORMATION	SYDNEY METRO	EEC FEDERAL	EEC NSW	NSW PLANT COMMUNITY TYPE	HECTARES	% OF TOTAL AREA
Other Vegetation	Urban Native and Exotic Cover				0.45	55.83%

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SUMMARY STATISTICS - FAUNA RECORDS POST 1 JANUARY 2000 (~14 YEARS)

INDEX	SCORE
SPECIES RICHNESS	96
TOTAL NUMBER OF RECORDS	1235
SURVEY DAYS	32
SIMPSONS INDEX OF DIVERSITY 1-D	0.98
SHANNON-WEINER INDEX	4.22
EFFECTIVE NUMBER OF SPECIES (EXP(S-W))	68

SPECIES LIST - FAUNA RECORDS POST 1 JANUARY 2000 (~14 YEARS)

FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	COUNT
AVES			
Acanthizidae	*Acanthiza nana*	Yellow Thornbill	2
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	1
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	4
Accipitridae	*Accipiter fasciatus*	Brown Goshawk	4
Accipitridae	*Elanus axillaris*	Black-shouldered Kite	7
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	8
Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler	25
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	8
Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	2
Anatidae	*Anas castanea*	Chestnut Teal	25
Anatidae	*Anas gracilis*	Grey Teal	25
Anatidae	*Anas superciliosa*	Pacific Black Duck	25
Anatidae	*Aythya australis*	Hardhead	21
Anatidae	*Biziura lobata*	Musk Duck	11
Anatidae	*Chenonetta jubata*	Australian Wood Duck	9
Anatidae	*Cygnus atratus*	Black Swan	24
Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck	1
Anatidae	*Stictonetta naevosa*	Freckled Duck	1
Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	3
Anhingidae	*Botaurus poiciloptilus*	Australasian Bittern	2
Ardeidae	*Ardea modesta*	Eastern Great Egret	14
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	16
Ardeidae	*Ixobrychus dubius*	Australian Little Bittern	5
Artamidae	*Cracticus tibicen*	Australian Magpie	27
Artamidae	*Cracticus torquatus*	Grey Butcherbird	6
Artamidae	*Strepera graculina*	Pied Currawong	23
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	15
Cacatuidae	*Cacatua sanguinea*	Little Corella	2

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Figure 34 Excerpt from site summary data showing the current extent of the reserve, with high species diversity associated with the previous extent of the reserve

The reserve extent is 0.8ha, with 0.5ha of vegetation, forming a long narrow strip of land between several factory buildings and the M4 Motorway. Fauna surveys were carried out on 32 days in 2002-3, and the result was 96 species of birds, including several threatened species and numerous waterbirds. Clearly this reserve no longer supports this suite of fauna. Some care needs to be taken with the interpretation of the dataset at certain locations for this reason.

WHERE IS FAUNA LOCATED?

In the last five years there has been considerable work directed towards a single robust set of vegetation community mapping and descriptions. Towards this end the SMCMA developed a draft "Native Vegetation of the Sydney Metropolitan Area" (SMCMA, 2009), which was recently finalised following extensive ground truthing and verification. The latest version (OEH, 2013) has updated vegetation communities, mapping and descriptions, and forms a reasonably reliable and consistent way of analysing the relationships between fauna distribution and vegetation communities present.

Some anomalies exist in the vegetation mapping, however, with some areas lacking mapped vegetation. Contrary to expectations, and perhaps relict from the non-equilibrium condition of the catchment, a number of areas of "unmapped" vegetation have high numbers of species observation records in the same area (Figure 35).

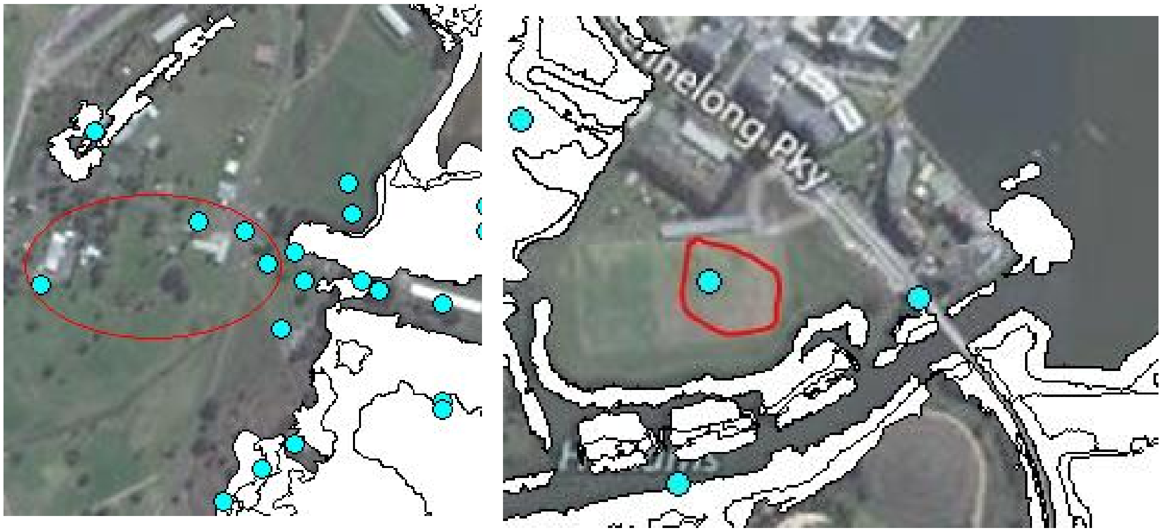


Figure 35 Blue dots indicate locations of fauna observations. Left: 165 records in unmapped veg (circled); Right: 690 records in unmapped veg (circled)

Many of the data records are located in areas that are currently appear as cleared or partially cleared, a condition that may or may not be consistent with the situation when the observation was originally reported. For amphibians, birds and reptiles, more species were recorded in areas with “unmapped” vegetation than areas with a vegetation community mapped as present (Figure 36).

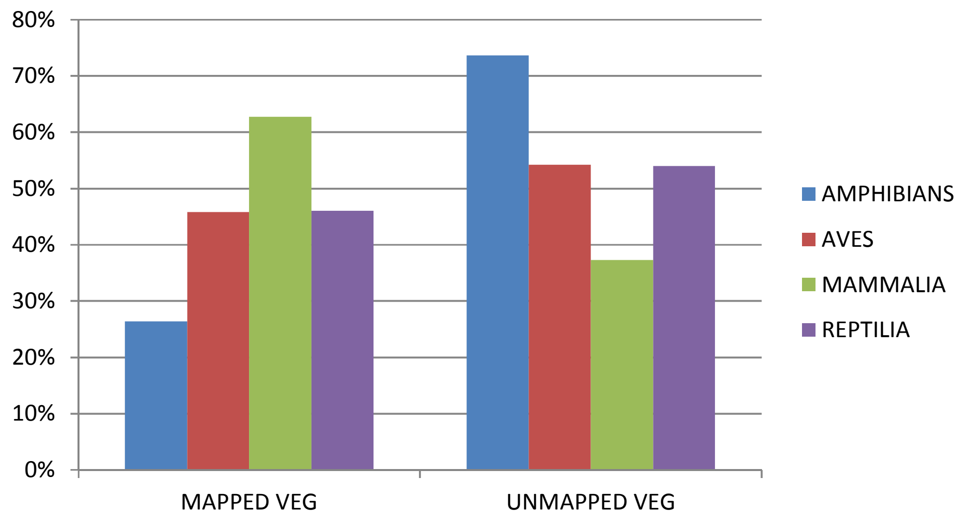


Figure 36 For amphibians, birds and reptiles, more species were recorded in unmapped vegetation areas

From this, mammals are better conserved in areas where there is a mapped vegetation community, unlike frogs which were typically recorded from areas where no vegetation community has been mapped but water bodies may be present. It is possible this may be an artefact of amphibian the sampling process and direction of survey effort.

Local government funding expenditure for conservation of biodiversity is currently targeted primarily at council owned and managed reserves. On average, two thirds of all fauna records were for species located in LGA reserves (Figure 37). In direct contrast, less than one third of all fauna observations were located directly in areas of Endangered Ecological Communities (Figure 37). For most faunal groups the number of records in EECs was considerably less than one third, with less than 20% of observations of birds reported from EECs, and less than 5% of observations of amphibians reported from EEC areas.

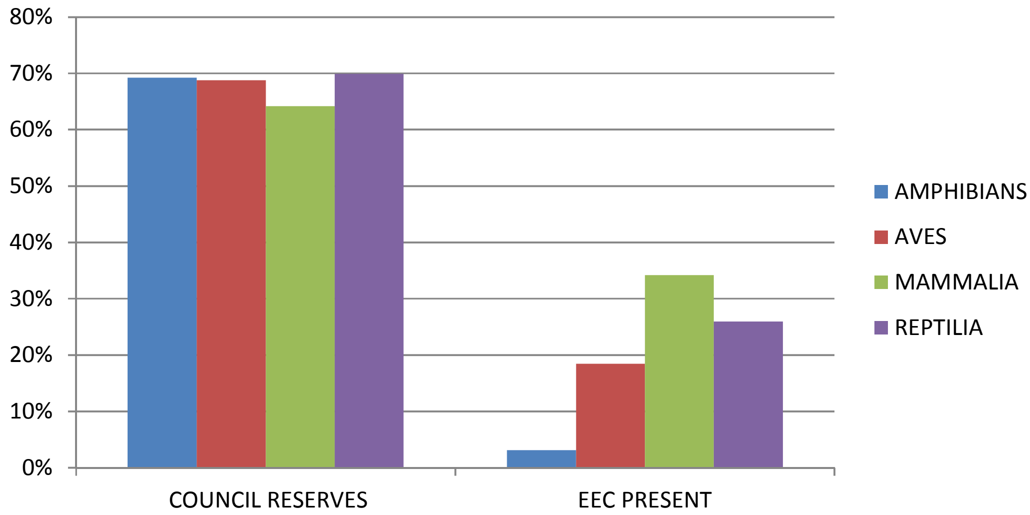


Figure 37 Number of fauna records reported for (left) council reserve areas, and (right) in Endangered Ecological Communities, expressed as a percentage of all observations

From this, funding that is directed towards EECs may not be contributing effectively to the conservation of many faunal groups. Again, this observation should be taken with some caution as it is likely to be an artefact of the survey effort, at least for some part.

LINKING FAUNA WITH VEGETATION:

Several approaches were taken to identify any key relationships between fauna diversity hotspots and aspects of vegetation in the Parramatta River catchment. These included determining the nature of relationships between:

- fauna and vegetation structure
- fauna in Endangered Ecological Communities
- fauna outside of Endangered Ecological Communities

This is described in more detail in the following sections.

FAUNA AND VEGETATION COMMUNITY STRUCTURE

Many of the faunal groups and guilds within groups do not strongly differentiate between specific vegetation communities. For example, the small granivores guild includes finches, button quails, larks and quails that feed predominantly on a mixture of grains from grasses and some herbs. As a result, they are generally found in a range of grassy woodlands and dry sclerophyll forests, and may be found in wet sclerophyll forests and some areas of “other vegetation”.

To help understand how fauna is distributed in the Parramatta River catchment, each of the mapped communities with fauna present were allocated to vegetation structural groups (Table 10).

Table 10 Vegetation communities with fauna present allocated to vegetation structural groups

DRY SCLEROPHYLL FORESTS	FORESTED WETLANDS	GRASSY WOODLANDS	SALINE WETLANDS	WET SCLEROPHYLL FORESTS	OTHER VEGETATION
Castlereagh Ironbark Forest	Coastal Flats Swamp Mahogany Forest	Cumberland Shale Plains Woodland	Estuarine Saltmarsh	Blue Gum High Forest	Urban Native and Exotic Cover
Coastal Sandstone Foreshores Forest	Cumberland Swamp Oak Riparian Forest	Cumberland Shale Hills Woodland	Estuarine Mangrove Forest	Sydney Turpentine-Ironbark Forest	Weeds and Exotics
Coastal Enriched Sandstone Dry Forest	Cumberland Riverflat Forest			Coastal Enriched Sandstone Moist Forest	Unmapped vegetation
				Coastal Shale-Sandstone Forest	Plantations

Each of the structural groups includes at least one Endangered Ecological Community, except for those grouped as “Other Vegetation”. This category includes all the fauna that isn’t directly located in a mapped vegetation unit.

VEGETATION STRUCTURE AND FAUNA

Over 90 reserves/reserve groups contained fauna records and in the Parramatta River catchment (see Appendix 4 for detailed site analysis). These were grouped into vegetation structure based on the structure of the dominant vegetation community mapped for that reserve group. Mean number of fauna species recorded (with range of species richness scores) was determined for each category of vegetation structure (Figure 38). The greatest species richness was recorded in a Saline Wetland (the SOPA site), while the greatest average number of species was recorded in Dry Sclerophyll Forests.

Given the extremely high survey effort, and the focus on migratory waders and wetland species as well as other faunal groups and guilds at the highly diverse SOPA site, this site was removed from the assessment to determine if this clarified any trends present (Figure 39).

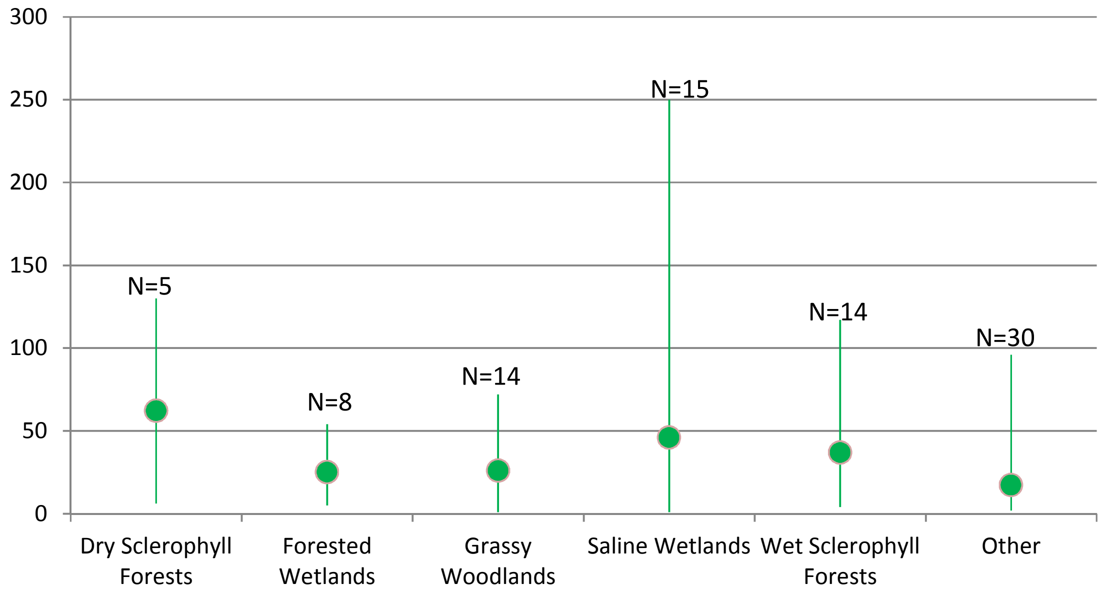


Figure 38 Mean number of species, with range of values, for reserves in each vegetation structure category (n= number of reserve groups in each structural category)

Without the SOPA site the Saline Wetlands no longer dominated the assessment. Mean values for species richness in Dry Sclerophyll Forests was double that for most other categories of vegetation structure, and nearly double those reported for Wet Sclerophyll Forests.

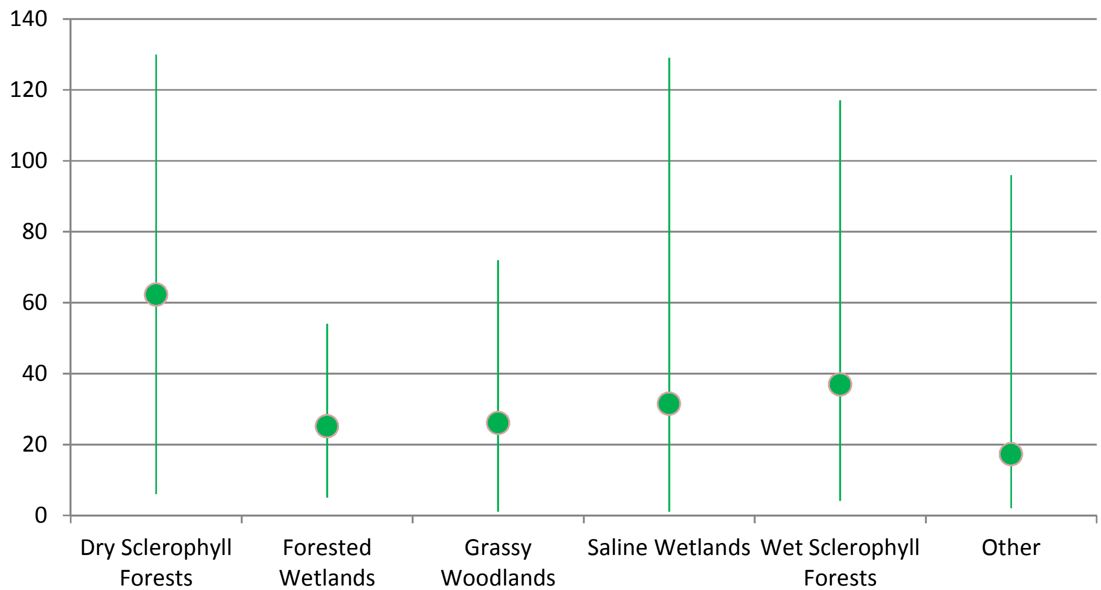


Figure 39 Mean number of species, with range of values, without SOPA site, for reserves in each vegetation structure category

The greatest faunal diversity was most consistently reported from Dry Sclerophyll Forests, which includes Castlereagh Ironbark Forest EEC, Coastal Sandstone Foreshores Forest, and Coastal Enriched Sandstone Dry Forest.

FAUNA IN ENDANGERED ECOLOGICAL COMMUNITIES

Reserves and reserve groups were allocated to EECs based on the dominant mapped vegetation community. For reserves/groups which did not have an EEC as the dominant vegetation (such as a number of major reserves in Parramatta LGA), but did have an EEC as a significant minor vegetation community (between 20% and 50% of the reserve extent), these reserves were also allocated directly to the EEC category as these reserves are generally eligible or in receipt of funding on this basis. Mean and range of faunal species richness was compared for each EEC category (Figure 40).

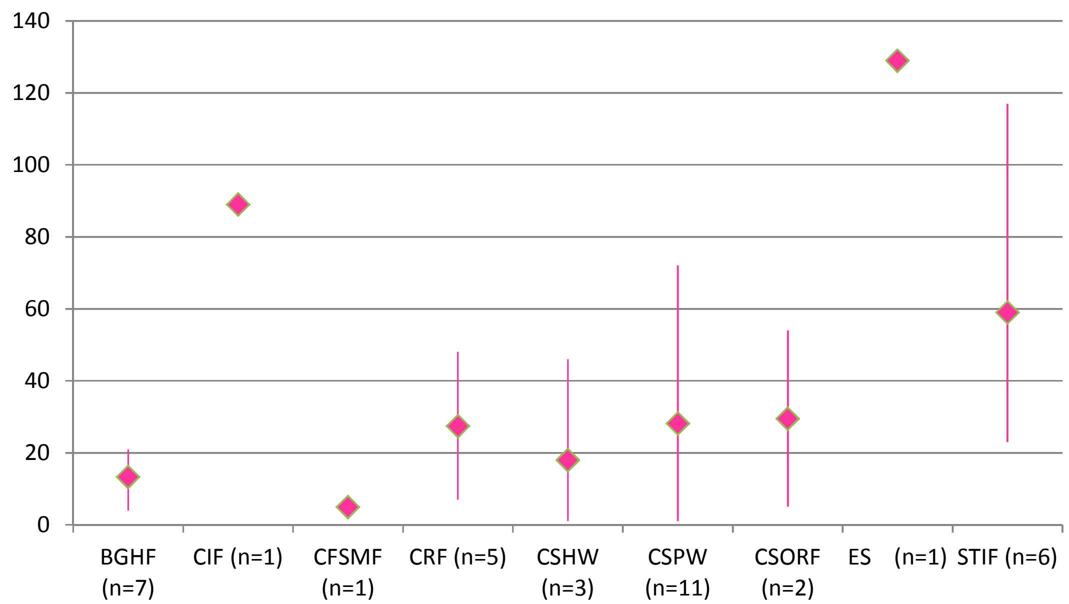


Figure 40 Mean number of species, with range of values, for reserves in each Endangered Ecological Community category (see Table 11 for an explanation of abbreviations; n = number of reserves/groups with that EEC present)

Table 11 Explanation of abbreviations used for Endangered Ecological Communities

ENDANGERED COMMUNITY	ABBREVIATION	ENDANGERED COMMUNITY	ABBREVIATION
Blue Gum High Forest	BGHF	Cumberland Shale Plains Woodland	CSPW
Castlereagh Ironbark Forest	CIF	Cumberland Swamp Oak Riparian Forest	CSORF
Coastal Flats Swamp Mahogany Forest	CFSMF	Estuarine Saltmarsh	ES
Cumberland Riverflat Forest	CRF	Sydney Turpentine-Ironbark Forest	STIF
Cumberland Shale Hills Woodland	CSHW		

Of the 15 saline wetlands, only one site was an EEC – Estuarine Saltmarsh EEC. The greatest species richness (129 species) was recorded for this EEC, followed most closely by Castlereagh Ironbark EEC (89 species in a Dry Sclerophyll Forest). Both these EEC groups included a single sample site which is providing effective habitat for a diverse suite of fauna. Relatively high species richness was also reported from Sydney Turpentine Ironbark Forest EEC (a Wet Sclerophyll Forest) with a mean of 59 species, and a range of 23 to 117 species for the 6 reserves/groups in this EEC category.

This suggests that some EECs may support greater species richness than others, but that the actual species richness present will also be dependent on other factors, such as reserve size and shape, floristic diversity, level of ongoing perturbation, and degree of connectivity.

FAUNA OUTSIDE ENDANGERED ECOLOGICAL COMMUNITIES

Fauna observations were also recorded from reserves that did not have a specific vegetation community present. Reserves/groups which were not able to be allocated to a dominant or co-dominant vegetation community were assessed separately to determine the role these areas have in conserving faunal biodiversity (Figure 41).

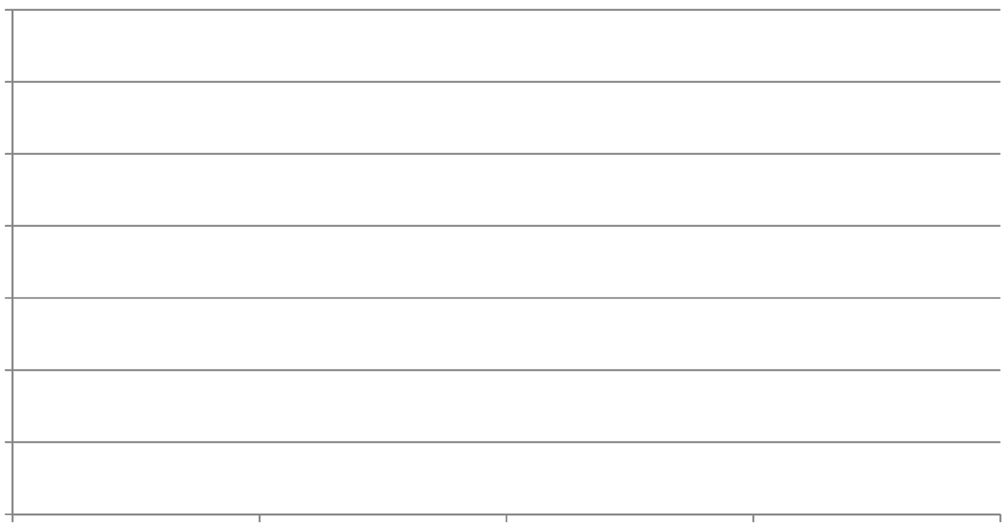


Figure 41 Species richness for reserves lacking mapped vegetation communities (n = number of reserves per category)

Over 25% of the reserve groups assessed in the Parramatta River catchment have vegetation that is comprised of “Urban Native and Exotic Cover”, which typically includes areas of highly degraded vegetation that consists of some remnant native species, along with high density weed infestations. It also includes areas of planted native species. Greatest species diversity was reported for this vegetation category, with a mean diversity of 16 species and range of 2 to 61 species present. This data is significant as it acknowledges the role that high density weed infestations can play in providing feeding and roosting resources for a range of fauna species (Figure 42, Figure 43).

Care should be taken to ensure that reserves with degraded vegetation are managed in a manner that ensures that fauna habitat resources are maintained or supplemented during weed control and revegetation activities.

Figure 42 Left: Red-browed finch eating seed of *Bidens pilosa* (farmers friends); right: Eastern Spinebill eating nectar from *Cestrum parqui* (green cestrum) (photos from Hunters Hill bird corridors)

Figure 43 Button Quail forage in weeds and amongst dumped rubbish along a road edge

PART TWO:

PARRAMATTA RIVER CATCHMENT HABITAT CORRIDORS

REVIEW OF LITERATURE FOR HABITAT CORRIDORS

Introduction

The importance of conserving our wildlife has been recognised and incorporated into a number of legislative instruments, ranging from federal law (EP&BC Act, and others) through state legislation (including Threatened Species Conservation Act, Native Vegetation Act, and others) to regional and local government agreements, policies and plans.

Fragmentation of habitat has been recognised as one of the greatest threats to native fauna and flora species. A number of approaches have been adopted to counteract the impacts of fragmentation, including wildlife or biodiversity corridors, connectivity plans and agreements, and private landholder initiatives such as Backyards for Wildlife, Birds in Backyards, and a number of biolink projects (examples include River2Rivers – City of Ryde and Hunters Hill Councils, Rockdale Biolinks - Rockdale City Council, Sydney Greenway: Cooks River to Iron Cove, Cardinia Environment Coalition Biolinks – through the Westernport Catchment Landcare Network, Vic).

Development of a good corridor linkage program requires an understanding of a number of factors:

- Spatial arrangement of existing reserves and their habitat quality
- Opportunities for linkage corridors on public land
- Opportunities for linkage corridors on private land
- Target fauna species and their habitat requirements
- Pre-disturbance vegetation communities and requirements for regeneration and/or revegetation

Two main approaches have been used to determine the current condition and/or potential for fauna habitat (Ferrier et al, 2010). One is to survey and assess the vegetation condition of reserves and potential corridor areas, and relate that to the habitat requirements of pre-disturbance fauna species. The other is to directly survey and assess fauna populations in the area. Fauna surveys are potentially more time consuming and complex than flora/vegetation surveys. A more accurate picture of the current condition of local species and populations requires repeated surveys over a number of key lifecycle seasons to identify species present and their population size, and evaluate the nature and extent of resources they are currently utilising in their environment.

In contrast, vegetation surveys can be adequately conducted during late spring to early summer as this will enable identification of most of the flora species present. Additional attention must be given to the assessment of habitat resources available and evidence of their utilisation by local wildlife. While this does not give an accurate understanding of the local fauna, it does clearly identify the potential for an area to support a particular species or suite of species. In many cases, habitat creation is an essential component of a long term conservation strategy for native fauna.

A number of ecological condition assessment protocols have been developed, and are currently used to a greater or lesser degree in various parts of Australia. The Common Nature Conservation Classification System (Chenoweth et al, 2000) was one of the earlier holistic attempts to assess and understand the current condition of ecosystems, and was a precursor to the Biodiversity Assessment and Mapping Methodology (Qld EPA, 2002), an updated form of which is still widely used in Queensland. This is a complex assessment process that gathers information about a range of criteria at a range of spatial scales. Many of the techniques that underpin this methodology were adopted for the current project. The BioCondition Assessment (Eyre et al, 2006) is a more simplistic process that relies on direct observation of a site, and has less relevance to the current project. Each of these assessment tools are reviewed in more detail in Appendix 1.

Current theory for wildlife connectivity corridors and government initiatives that target their creation are discussed in the next sections. This is followed by a review of some of the main methods for assessing biodiversity condition. The next section summarises some key aspects of corridor design, followed by a review of government programs that have brought this into the urban environment. The final section of this literature review describes some of the key corridor requirements for faunal groups in the Parramatta River Catchment and participating LGAs.

Some important definitions

Biodiversity Significance is the ranked significance of an area according to specified biodiversity values to account for ecological concepts such as rarity, diversity, fragmentation, habitat condition, resilience, threats, and ecosystem processes. Biodiversity Planning Assessments identify three levels of Biodiversity Significance – State, Regional and Local.

Core Habitat is a combination of Essential and/or General Habitat (as defined by the experts) where the identified areas are important for the taxon concerned, whether or not the taxon has actually been recorded there.

Critical Habitat – as declared under the Threatened Species Conservation Act 1995. “Critical Habitat” is habitat that is essential for the conservation of a viable population of protected wildlife or community of native wildlife, whether or not special management considerations and protection are required. A “Critical Habitat” may include an area of land that is considered essential for the conservation of protected wildlife, even though the area is not presently occupied by the wildlife.

Essential Habitat is an area or location with essential resources for the maintenance of populations of priority taxa. Essential Habitat may be defined from known records or considered potential according to expert knowledge of habitat relationships. Essential Habitat is considered known where the taxon is present (based on accurate records) and there are indications of reproduction, or where a significant number of individuals are present, or important resources (such as nest sites, roost caves, major food sources) are present, or where important movement corridors for breeding and/or non-breeding (including migratory) individuals have been identified. Alternatively, Essential Habitat is considered possible where there exists suitable habitat of a size capable of supporting one or more breeding units, and important resources (such as nest sites, roost caves, major food sources) are present, or the area is proximal to populations, or may act as a potentially important corridor.

General Habitat is an area or location that has been used by transient individuals of a Priority Taxon, or where a Priority Taxon has been recorded but there is insufficient information to assess the area as essential. General Habitat may be defined from known records or considered potential according to expert knowledge of habitat relationships, and may include areas of suboptimal habitat for a Priority Taxon.

Habitat Value is expressed using categories of relative significance of an area for Priority Taxa designated as Essential or General Habitat with an assigned level of confidence (Known, Possible). Habitat Value may be defined by expert opinion or by some combination of spatial analysis and expert opinion.

Priority Taxon refers to flora or fauna species currently listed under State or Commonwealth legislation (Presumed Extinct, Endangered, Vulnerable, Rare or of Cultural Significance), or identified in various Action Plans as being of concern, most transcontinental migrants listed under international agreements (eg, CAMBA and JAMBA), as well as taxa at risk or of management concern within specific bioregions based on the written opinion of experts, or taxa of scientific interest as relict, endemic or locally significant populations (such as a flying fox camp or heronry) based on the written opinion of experts.

Wildlife corridors

What are Wildlife/Biodiversity Corridors?

Wildlife corridors, also known as biodiversity corridors, are corridors of land planted with appropriate vegetation, which allow flora and fauna to move across a wider territory. This allows the wildlife to:

- Respond to environmental variability, eg move from food/water scarce areas to food/water plentiful areas.
- Respond to population pressure - move from over-populated to under-populated areas.
- Access a wider range of breeding partners, thus preventing inbreeding and loss of genetic diversity in a local population (Scott, 2003)

In many parts of Australia, over-clearing of native vegetation has created a sea of urbanised or agricultural land dotted with the occasional island of preserved native forest or scrub. To allow for wildlife movement, these fragments need to be reconnected, by establishing vegetated corridors, using locally indigenous species, on previously cleared or degraded land where possible.

Connectivity Conservation

Connectivity Conservation is a relatively new approach to maintaining and improving the linking of landscapes and habitats, to help reduce the effects of fragmentation and climate change on plants and animals, however for more than a decade it has been the focus of considerable effort by scientists around the world. Connectivity conservation is the focus of the a number of state and federal programs, including the Great Eastern Ranges Initiative, Western Woodlands Way, Summit2Sea, and the recent Kanangra Boyd to Wyangala Link. It is a socially-inclusive approach (Dunn et al, 2012), recognising the importance of maintaining, reconnecting and restoring habitats and ecosystems to help:

- reduce the rapid rate of decline in environmental health and species extinction
- increase the resilience of ecosystems so Australia's unique native plants and animals are more able to deal with a range of threats

Connectivity can be described as the connections of habitats in the landscape, facilitating the movement of species across the landscape and between habitats. Habitat connectivity is an important outcome of conservation (Mackey et al, 2010). It allows species and communities to progressively adjust their ranges in response to threats such as climate change. Native species and communities may find it difficult to adapt to climate change in highly modified and fragmented landscapes. Science has comprehensively demonstrated habitat fragmentation results in the decline and loss of species all over the world, and is a key reason for Australia's high extinction rate.

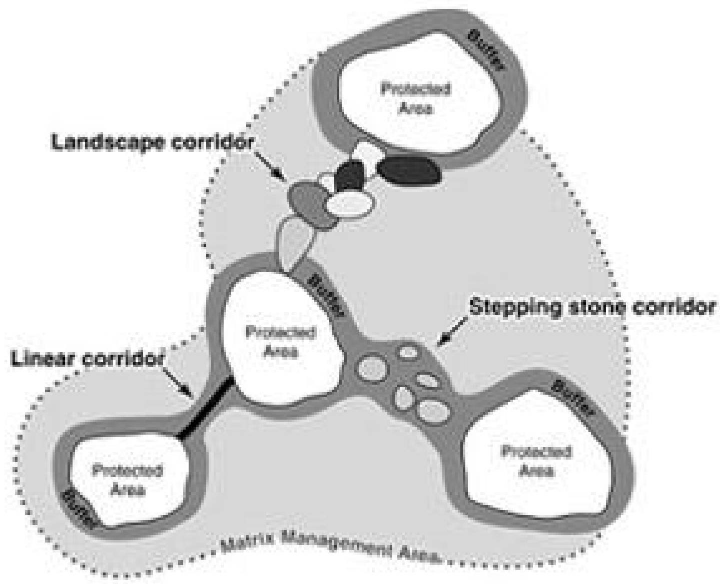


Figure 44 Various structural forms of fauna habitat corridors and their typical arrangement

The parameters required for successful biodiversity corridors have been studied in considerable depth over the last decade or so (Beier et al, 2008). Width of corridor, structure and composition of vegetation in the corridor, distance between larger reserve areas, and age of regrowth and so on all contribute to the effectiveness of the corridor (Hyder, 2008). More importantly, the requirements for different faunal groups, and sometimes closely related species, can be quite varied, so that the corridor structure that suits one species may not work for another.

Buffers form an integral component of the conservation landscape, both for reducing impacts on reserves and for improving the effectiveness of different types of corridors (**Error! Reference source not found.**; Ferrier et al, 2010).

PROS AND CONS OF VEGETATION BASED METHODS

Although widely used throughout Queensland, the Biodiversity Assessment and Mapping Methodology (BAMM; see APPENDIX 1: ASSESSING CONSERVATION VALUES) has a bias towards vegetation as the only relevant aspect of biological condition, particularly for determining the habitat quality of an area or reserve. There is also a bias – albeit understandable - towards native vegetation over introduced species which doesn't consider the capacity of weeds to provide feeding and roosting habitat resources, even on a temporary basis during a transition to a restored bushland ecosystem.

BAMM has a strong emphasis on reserve size, or unit size. Factors which lead to higher value include:

- presence of threatened species, or potential presence,
- ecosystem value which is based in part on reserve unit size, so that larger areas in poor condition are considered of greater value than smaller areas in good condition

- tract size, which is considered in a landscape context so that small units in highly degraded landscapes are worth more than larger units in less fragmented landscapes
- relative size, compared to other reserves of similar vegetation type
- condition, based on canopy extent
- ecosystem diversity, or number of ecosystems in the reserve unit
- context and connection, which includes the presence of key elements such as water and endangered ecosystems, and considers these based on the degree of shared boundaries with other reserve units

All of these factors give a reserve unit its basic value, which is then open to negotiated variation based on expert opinion and knowledge of local fauna species and threatening processes. Once again the actual presence of fauna is only a minor part of the calculated value, thus it relies very heavily on the principle that if you build a 'nice house' the right animals will move in, and doesn't really consider whether they are actually close enough and have the potential to access the 'nice house'. It is true that without sufficient habitat attributes, some species will struggle to survive, but the best potential habitat will fail to support that species if it simply is not present.

MODELLING FAUNA SPECIES DISTRIBUTION

Vegetation and habitat based ecosystem assessments are easier and more cost effective than most fauna based assessments. They can be readily conducted during much of the year, and generally one survey is sufficient to gather adequate information for a valid assessment. Fauna surveys, in contrast, may need to be conducted over a period of time, including different seasons when a given species may be more or less active in different parts of the ecosystem.

Species distribution models (SDMs) estimate the relationship between species records at sites and the environmental and/or spatial characteristics of those sites (Franklin, 2009). A major distinction among methods is the kind of species data they use. Where species data have been collected systematically – for instance, in formal biological surveys in which a set of sites are surveyed and the presence/absence or abundance of species at each site are recorded – regression methods are used. However, in many cases systematic biological survey data tend to be sparse and/or limited in coverage, and species records are available in the form of presence only data. In an effort to utilise existing species datasets (such as this project), an array of SDMs have been developed (Elith et al, 2011). One of these, MaxEnt, was selected for review as it has been recommended for use by Hills Shire Council in a project for fauna habitat modelling across their LGA. This review is provided in Appendix 1.

A key consideration for this type of modelling process is that environmental variables should affect the species' distribution at the relevant scale, determined by the geographic extent and grain of the modeling task (Pearson et al., 2004). For example, drawing from Mackey and Lindenmayer (2001), climatic variables such as temperature and precipitation are appropriate at global and meso-scales; topographic variables (e.g., elevation and aspect) likely affect species distributions at meso- and topo-scales; and land-cover variables like percent canopy cover influence species distributions at the micro-scale.

Some potential issues for the accuracy of presence only modelling include spatial autocorrelation from using samples collected in close proximity, or bias due to nearby presence of roads, rivers or other access conduits, differences in sampling methods and/or sampling intensity, poor geospatial records (particularly for archival data), and use of insufficient environmental parameters to adequately describe a species' environmental niche (Phillips et al, 2006).

A REVIEW OF SELECTED PROGRAMMES AND PROJECTS

LOCAL AREA BIOLINKS MAPPING (MACLAGAN/CEC, 2009)

The Cardinia Environment Coalition (CEC) aims are to protect and enhance the natural environment in the Cardinia Shire and adjoining areas, working across the Central Western Port and part of the Southern Yarra Ranges catchments. The CEC is the umbrella body of over 20 landcare and friends groups. It coordinates the Western Port Landcare Network that has large scale projects including salinity, biolinks and a Beef and Dairy project. The CEC aims to lead significant positive environmental change through community based awareness and action. They recognised the importance of creating biolinks across private property to fill the spaces between parks and reserves.

One of the CEC's major initiatives was the Biolinks Action Plan, which identified a series of environmental, economic, and social/cultural benefits. Maclagan/CEC (2009) described several types of linkage corridors, some of which are particularly applicable for privately owned urban land. The most easily recognised type of biolink is a continuous linear strip or corridor, although discontinuous stepping stones can also act as biolinks. Enlarged sections along corridors or nodes act as biodiversity supplements. Core areas are the patches to connect between (often public land parks or reserves).

The following sections draw from this project, and describe the principles for selecting biolink sites, landscape features that have greatest suitability for biolinking, some mechanisms for prioritising the development of biolinks, and some general recommendations for consideration when undertaking this type of project.

Principles Used to Select Biolinks

Biolinks have been selected according to their ability to satisfy at least one of the following three general requirements:

- Contains existing ecological assets (e.g. riparian habitat, remnant vegetation, Endangered Ecological Communities, records of threatened species, adjoins public land).
- Has high importance for restoration (e.g. to connect between public land, important habitat patches or between other biolinks, or to improve waterway health).
- Has significant private land restoration work already underway and has potential to act as a central backbone around which to focus more private land work.

Sometimes, although a potential biolink might satisfy one or more of these requirements, it may not be included due to one of the following factors:

- There is another biolink following roughly the same path.
- It is too short (ie, may only go through a single private property), or too long.
- It is outside the current area of interest for the PRCG or any of its member groups.
- It does not follow a conspicuous distinguishing feature (see below).

Features Used to Select Biolinks

A number of landform features inherently have many of the characteristics that indicate suitability for biolinks. Where possible, biolinks need to be spatially organised to link up with each other.

- **Waterways.** By their very nature, waterways are extremely important biolinks - they are inherently linear and continuous in shape, they perform vital ecosystem services and they offer resources and environmental conditions that are crucial for a wide range of biodiversity. Waterways should, therefore, be given high priority as biolinks.

- **Road, Rail and Recreation Trail Corridors.** These features often make suitable biolinks due to their linear and relatively continuous shape, as well as the fact that they often harbor remnant vegetation. Some LGAs have GIS mapping of additional reserves where vegetation is deemed to have significant conservation values. These sections may already have special management including signage and targeted weed control. Significant roadsides and other linear public land reserves should been given high priority as biolinks.

- **Private Land Work.** Areas where private land work is already well underway provide good opportunities to create networks of property-scale biolinks across property boundaries. Focusing on these areas will increase the likelihood that there will be a number of enthusiastic people who can speak from personal experience and promote biolinks to their neighbours and local community. Features (such as road or waterways) traversing aggregations of private land work have been given high priority as biolinks.

Prioritising Biolinks

The next step of a Biolinks Project will involve prioritising biolinks before beginning work on the most important ones. These steps may require input from local Bushcare and other groups. The following questions can help to prioritise biolinks:

- Which biolinks require the most urgent action using the principles of 'Protect, Enhance, Restore'?
- Which biolinks have the most community interest?
- Which biolinks will be the least difficult to implement?
- Which biolinks will produce the best returns on investment?
- Which biolinks will achieve multiple benefits?
- Which biolinks will attract funding?

BIOLINKS IN URBAN LANDSCAPES

Backyards for wildlife (Bathurst, Adelaide, and many others)

Adelaide City put together a comprehensive series of Backyards for Wildlife Fact Sheets that were specifically aimed at attracting wildlife to urban gardens. Topics include:

- Creating a habitat garden, which talks about the importance of offering food and safe havens for species such as a variety of birds, insects, bats, small animals, reptiles and maybe even frogs
- Landscape elements, which focuses on the availability of food, water and shelter as key fauna requirements in a native garden

- Establishing a native garden, which talks about using local native species to reduce the amount of water required, to drought-proof your garden, save water and attract local wildlife
- Encouraging birds, which mentions the different and specific habitat requirements for different groups of bird species
- Creating a home for lizards, including rocks and piles of timber to create habitat, with leaf litter to provide insects and snails as food resources
- Frog friendly gardens, which recommends the creation of frog ponds to reduce the impacts of urbanisation on wetlands and streams which may become highly modified
- Sharing the garden with possums, which describes the results of surveys to find out about how possums and people interact in the urban environment
- Bringing back butterflies, which describes the specific native plants required for the various stages of a butterfly lifecycle
- Supporting native fish, which recommends species of native fish for garden ponds and aquariums, and outlines some of the other conditions they require
- Bats in your backyard, describes the critical ecosystems roles filled by these species, particularly for insect control

In Bathurst NSW the council has built on the information developed for the Adelaide project and produced a booklet which describes the steps to create a habitat friendly garden from scratch for new developments, and how to improve the habitat quality of an existing garden, with a supporting list of flora species and their role(s) in providing food resources and various habitat roles.

Birds in Backyards (http://www.birdsinbackyards.net/about/Birds-Backyards)

Winner of the 2008 Alan Strom Eureka Prize for Environmental Education, the Birds in Backyards Program is a research, education and conservation program that is designed to address the loss of wild bird species, particularly small bird species that live where people live. From large cities to small townships, backyards, gardens, parks and streetscapes to schoolyards or domestic and utility areas on farms or industrial estates, Birds in Backyards, with the help of local communities, undertakes scientific research and disseminates the results directly back into the communities that need to know, providing accurate information and community education opportunities.

The program has three main objectives:

1. Research: To find out what influences bird diversity in gardens and yards, urban bush lands, parks and public areas
2. Education: To develop and increase community understanding and involvement with the current status of birds; to encourage a 'hands on' culture of planting for birds and of monitoring their presence and absence; to help people to learn how to love and live with birds
3. Conservation: By putting into practice the information learnt from research, open spaces in places where people live, will also become suitable for birds to inhabit. This should contribute to a greater diversity of birds living in these places.

Urban Wildlife Corridor Projects around Sydney

River2Rivers Project

The River2Rivers project was managed jointly by City of Ryde Council and Hunters Hill City Council, in conjunction with the Parramatta and Lane Cove River Trusts. The project grew from the recognition that the progressive urbanisation of Sydney has removed, fragmented and substantially modified habitat for native plants and animals. In inner zones such as Ryde-Hunters Hill these effects have been largely historical with the last phase of large-scale clearing of native vegetation occurring over 60 years ago.

This project has particular relevance as it targeted the recreation of bushland corridors through a range of land use areas in the two LGAs, with a large part of this area in the Parramatta River Catchment. Local residents, schools and community groups were all invited to be involved, and between them they planted over 13, 000 plants in the target corridor areas. As well, a number of workshops were staged for local residents, with topics such as the creation of habitat gardens for small birds and fauna, caring for wildlife, and understanding the local native small bird species. The project included hands on demonstrations of backyard restoration and planting for wildlife, and also encouraged residents to become involved in local Bushcare groups.

The considerable success of this project in the targeted habitat improvement and habitat creation along an urbanised wildlife corridor makes it an effective 'pilot' project for a similar project on a larger scale throughout the Parramatta River Catchment area.

Pittwater Council Wildlife Corridors and Backyard Bushcarers

Pittwater Council used a "whole of shire" approach, and mapped key corridors throughout their LGA. These included bushland on private property, road reserves and along creeks and sand dunes that provided corridor connection between large bushland reserves.

A number of key species were identified for the shire, including small and large birds, and mammals, and these form the basis of recommendations for local residents to improve the habitat value of their property. Rather than a targeted program, the aim is to provide general information about the values of and threats to wildlife corridors, with links to additional information and periodic workshops.

The whole process is supported by Backyard Bushcare, which is aimed at residents on properties adjoining bushland reserves. Backyard Bushcarers are encouraged to remove weeds in their bit of reserve as well as improve the habitat value of their own property, with the support and guidance of council.

Wadalba Wildlife Corridor, Wyong

Wyong Shire recognised the importance of their local wildlife, which included a number of threatened fauna species, and incorporated a wildlife corridor into the planning for a new residential land release. There are major advantages to retaining bushland over recreating bushland, not the least of which is the time required, and the financial investment up front as well as ongoing maintenance. A management plan was prepared to direct the long term management of the wildlife corridor, including identifying probably threats from the developing urban environment, and preparing strategies to reduce the likely impacts.

For this corridor, the design addressed the habitat requirements of a specific suite of fauna species. This differs from many other urban wildlife corridor programs, which aim for general “habitat improvement”. Unfortunately, the current project area already has a lengthy history of urbanisation, and there is very little opportunity to conserve existing whole corridor areas over and above those already in established reserves.

Western Sydney Parklands Trust

Western Sydney Parklands Trust is creating a 2000 hectare bushland corridor to maintain, reconnect and restore habitats and ecosystems in the heart of urban Western Sydney. Currently, the Trust is managing 1,000 hectares of bush in varying condition. Over the next 10 years, the goal is to double this to 2,000 hectares, with a financial investment of $10 million. The Trust has set a target of expanding the bushland by 33ha annually, which will create protective buffers for the core habitat and link remnant bushland. This program is called 'Bringing Back the Bush'.

The program is implemented through a combination of bush regeneration and revegetation conducted by professional teams, targeted corporate and community volunteer activities, school based revegetation along bushland edges, and work for the dole programs that also offer training and employment. Key advantages of this project are that a single organisation oversees all the work on public land that has been designated as part of the Western Sydney Parklands.

Figure 45 Edge planting in Western Sydney Parklands (http://www.westernsydneyparklands.com.au/environment/)

Sydney GreenWay: Cooks River to Iron Cove

One of the most relevant of urban biolinkage programs is the recent Greenway Sustainability project. The Cooks River to Iron Cove GreenWay is an urban green corridor in Sydney’s Inner West, connecting the Cooks River to Iron Cove. The community’s vision is for a “recognisable environmental, cultural and sustainable transport corridor linking to of Sydney’s most important waterways” (GreenWay MasterPlan & Coordination Strategy 2009). What began as a grass roots initiative in 2001 has become the focus of a key partnership between Ashfield, Leichhardt, Marrickville and Canterbury Councils from 2009-2012.

As part of this project a biodiversity strategy (AWC, 2011) was developed that provided a range of short, medium and long-term actions to support the development of an indigenous flora and fauna habitat and movement corridor. A key aspect of this project is the ongoing involvement of community members. A GreenWay Biodiversity Vision was developed in consultation with a community working group. An important aspect of this vision was that the GreenWay is that it is “supported by a community that feels connected to their local environment and has a sense of ownership of the GreenWay, actively protects the GreenWay and is educated about the importance of biodiversity”.

To facilitate this, the Biodiversity Strategy was structured according to six biodiversity objectives that were developed and agreed by community stakeholders:

1. Create a flora and fauna corridor which supports the original vegetation of the area, provides habitat, and facilitates movement and migration for a wide range of native plant and animal species throughout the GreenWay catchment;
2. Identify areas within and adjacent to the GreenWay catchment with high biodiversity values that require protection and improve the connectivity between these areas;
3. Protect and enhance the habitat and migration opportunities for locally significant or threatened native species, populations and communities (including the endangered population of Long-nosed Bandicoot), and allow for their continued evolution and survival in and beyond the GreenWay catchment;
4. Engage and educate residents and the broader community, including local businesses and visitors to the GreenWay, to encourage a sense of ownership and participation in protecting and restoring biodiversity in the GreenWay catchment;
5. Mitigate key threats to biodiversity to increase the survival and adaptive capacity of species, populations and ecological communities of plants and animals.
6. Provide strategic guidance to councils, private landowners and major stakeholders on how to coordinate biodiversity management across the four local government areas.

Figure 46 Location and extend of the GreenWay corridor (AWC, 2011)

The GreenWay project links two of Sydney's important waterways, one of which drains directly to the lower Parramatta River. As part of the Parramatta River Catchment, recommendations in this project have direct crossover with the current project.

SELECTION OF CORRIDORS

REMOTE SENSING

Preliminary identification of potential fauna corridors started with the use of aerial photography. By viewing the catchment at the landscape scale it enabled the identification of potential corridor linkages between existing core reserves and through existing linear reserves. A number of potential linkage corridors were selected based on the mapped distribution of fauna sightings, and with consideration of the spatial arrangement of parks, gardens and drainage lines.

Specific potential corridors were identified in each LGA within the project study area. The options for corridors were more limited in the highly urbanised eastern part of the catchment, such as Ashfield, Strathfield and Auburn LGAs. In direct contrast, Parramatta LGA has a good number of well-connected reserves that follow creeks and drainage lines, and these were able to form the backbone of a fauna corridor network. Further west, Blacktown LGA bears the legacy of ongoing urbanisation, and drainage corridors are often over-cleared or retain only very narrow strips of highly degraded vegetation. Ongoing clearing of weeds around drainage lines to facilitate streambank stabilisation works is a process that fails to take into account the role of non-native vegetation in fauna habitat resources (Figure 47). In the northeast part of the catchment, City of Ryde and Hunters Hill LGAs reflect the well established nature of urban development in these areas. While corridor opportunities are comparatively limited in the parts of these LGAs that fall into Parramatta River Catchment, there are clearly defined reserves with the original native vegetation retained, and often managed through established plans of management with regular works activities conducted by contractors and Bushcare volunteers.

Figure 47 Wholesale clearing for streambank stabilisation works at Troubador Park, Kings Langley

GROUND TRUTHING CORRIDORS

Once the potential corridors were identified they were investigated through a series of field surveys that established their current condition and fauna habitat potential, and identified a number of works based actions that would improve the overall connectivity and condition of corridors.

Unlike the previous phase of the project, which looked at the fauna diversity for council managed lands, the process of corridor assessment included areas that are outside the direct management control of councils. The following sections describe aspects of corridor condition that were recorded to assess the current condition of potential corridors.

Natural values

Many urban reserve plans of management focus predominantly on the existing vegetation and the need to conserve threatened flora or endangered ecological communities. There is considerable overlap between the floristics of a reserve and the fauna that it will support. Two of the key factors that contributes to the maintenance of both flora and fauna conservation are the size and shape of the reserve. Reserves under 50ha in size require considerable work to maintain the integrity of the vegetation, and generally are not capable of supporting a diverse suite of native fauna. For reserves over 50ha in size, the shape of the reserve is also important. Round reserves have a smaller edge to core ratio, meaning that the length of the perimeter of the reserve is smaller compared to the size of the reserve. This reduces the level of ongoing impacts for the reserve, and increases the amount of the reserve (the “core” of the reserve) that is away from the edge. This better quality core reserve area is generally protected or “buffered” by the area near the perimeter of the reserve. For long, narrow reserves the buffer width required inside the perimeter of the reserve remains the same, but the size of the core area at the centre is greatly reduced.

Table 12 Natural values and their condition assessment for the development of habitat corridors

NATURAL VALUES	CONDITION ASSESSMENT
Vegetation community	Assessed from existing mapping data (OEH, 2013)
Patch character	• **Core habitat** (large council managed bushland reserve in good condition) • **Linear reserve** (council managed narrow reserve, often following drainage lines or other corridors/easements) • **Landscape corridor** (smaller reserves and other open space public or private land, often in poor condition or with mixed use open space management) • **Stepping stones habitat** (generally applies to areas in private ownership with low to medium density urban development)
Vegetation condition	• **Good condition** – with low density weed infestation, and/or high diversity native flora species, good structural diversity of vegetation, range of habitat resources available, with existing high faunal diversity • **Moderate condition** – medium to high density weed infestation, some native flora diversity retained, good structural diversity of vegetation, range of habitat resources available, with existing medium to high faunal diversity • **Poor condition** – high density weed infestation, little or no native flora diversity retained, some structural diversity of vegetation, some habitat resources available, with existing

	low to medium faunal diversity
Connectivity	• **High** – connects directly (<30m separation) to adjoining reserves/corridor patches with similar or better condition corridor elements/fauna habitat • **Medium** – connects directly to adjoining reserves/patches with poorer condition corridor elements/fauna habitat; OR connects indirectly (>30m separation) to reserves/corridor patches with similar or better condition corridor elements/fauna habitat • **Low** – connects indirectly (>30m separation) to reserves/corridor patches with poorer condition corridor elements/fauna habitat; OR does not connect to other reserves/corridor patches
Habitat assets/values	• Presence of ponds, wetlands, creeks, river • Presence of mature trees, connected canopy • Presence of shrub understorey layer • Presence of native understorey flora, including native grasses and herbs • Presence of fallen timber, leaf litter, lichens and mosses • Presence of nesting and roosting resources such as tree hollows, nest boxes, culverts, tunnels, abandoned buildings • Presence of rocks, boulders, rock walls

Social aspects

For many of the existing council reserves there are mixed use targets that drive their management. There are potential conflicts between best practice management for fauna and the other uses for reserves, and these need to be taken into consideration during the assessment of potential habitat corridor routes. Some of these will constitute major barriers to movement of fauna, preventing them from accessing some areas of potential habitat.

Table 13 Social aspects and their condition assessment for the development of habitat corridors

SOCIAL ASPECTS	CONDITION ASSESSMENT
Barriers to connectivity	Includes features that may impede wildlife movement, such as • Major roads (busy two lane roads lacking roadside planting, busy roads with more than two lanes of traffic) • Railway lines • Highly urbanised areas including industrial factories, shopping malls, car parks, high density housing, all lacking any potential fauna habitat
Current land use(s)	• Open space bushland • Open space mixed use (eg. childrens' play areas with areas of planting) • Open space sporting facilities • Urban residential housing • Transport or other corridor (road/rail/utilities) • Privately owned/managed land (eg. Primary schools, high schools, day care centres, factories, motorways, rail and infrastructure lands

SOCIAL ASPECTS	CONDITION ASSESSMENT
Recreational uses	• Bushcare group present • Existing natural area open space management plan • Passive recreation uses (walking, sitting, painting, drawing, photography, etc) • Active recreation uses (ball games such as golf, football, soccer, basketball, cricket, etc) • Bicycle track or combined cycleway/footpath present

Threats to fauna

Threats to native flora and fauna include weed invasion, and impacts from feral fauna. In combination these threatening processes may have significant impacts on vegetation and habitat by competing for resources, such as light, water, nutrients, breeding and roosting habitat. A range of other threatening processes are typical of highly urbanised areas and include: disturbance from increased noise, light, human activity, mortality from vehicles, changed hydrology, and predation or harassment by domestic dogs and cats.

Destruction and fragmentation of habitat is the biggest threat to biodiversity, especially in urban environments where habitat opportunities are limited. This may occur through inappropriate zoning which can lead to clearing for development, or through inappropriate landscaping or weed management practices. Some native animals have adapted so well to urban environments it has allowed them to increase their abundance or to extend their range to new areas, which can be detrimental to other native species.

Table 14 Threats to fauna and their condition assessment for the development of habitat corridors

THREATS TO FAUNA	CONDITION ASSESSMENT
Weeds	High density weed infestations have lower value, although it is important to remember the role of weeds in providing food and habitat resources for some species
Presence of pest animals	Cats, dogs, foxes, rabbits, Common mynas and others
Competition between native fauna species	Some native species may need a reduction in numbers due to their aggressive and competitive behaviours, such as Noisy Miners and Bell Miners
Human disturbance	Dumping of rubbish, chemicals and other wastes, unauthorised clearing, unlawful vehicular access, arson, encroachment
Reduction in habitat extent	Clearing of existing vegetation for any reason
Reduction in habitat quality	Includes temporary reductions through removal of weeds prior to the establishment of native vegetation; consider supplementing habitat resources with nest boxes etc

POTENTIAL FOR CORRIDOR IMPROVEMENT

Each corridor option was further assessed for its potential for improvement. This was considered to be directly related to two main factors:

- the resilience of bushland reserves and patches along the proposed corridor route, and
- the level at which PRCG is able to control and direct management actions

The resilience of bushland reserves and patches is inferred directly from its existing condition and the level and type of impacts that affect the area. The level at which the PRCG councils are able to influence management actions dictates the capacity for PRCG (through its member councils) to improve corridor condition, and is:

- Greatest in direct ownership and management by councils
- Moderate opportunities for land in ownership/management by public organisations and entities (eg. Schools, utilities, transport corridors, other educational institutions, large factories etc)
- Reduced opportunities for land in private ownership, especially commercial properties, with generally more potential for improvements in residential areas

Corridor options were considered in the context of existing values, current level and type of threats, social values and issues, and the potential for improvement. Based on these factors, the potential corridors were ranked for prioritisation for improvement works.

PRIORITISATION OF CORRIDORS

The most important consideration when planning for fauna habitat corridors is to ensure that there are good opportunities for linkages between existing core habitat reserves. Without these core habitats, the corridor effectively goes nowhere, and instead it becomes a “sink” for fauna, exposing them to increased predation and ongoing high levels of perturbation. From MacLagan/CEC (2009), the following questions can help to prioritise fauna habitat corridors, or biolinks:

- Which biolinks require the most urgent action using the principles of ‘Protect, Enhance, Restore’?
- Which biolinks have the most community interest?
- Which biolinks will be the least difficult to implement?
- Which biolinks will produce the best returns on investment?
- Which biolinks will achieve multiple benefits?
- Which biolinks will attract funding?

The first step in the prioritisation process was to identify core habitat areas. These were deemed to be sites with a high species richness (fauna), and included SOPA, Rookwood Cemetery, Lake Parramatta, Duck River reserves, and Toongabbie Creek/Quarry Branch (Figure 10 Species richness based on records from fauna databases from 2000-2014).

The next step involved identifying existing corridors, which generally follow creek alignments (Figure 50). Many of these have areas of good habitat interspersed with areas of fair to poor habitat in their current condition. Potential corridor linkages exist along Parramatta foreshores, Ponds and Subiaco Creeks, Vineyard Creek, Upper Toongabbie Creek, and along some minor tributaries in Blacktown.

Potential corridors link the areas of existing corridors through more degraded section of streams, or through a mosaic of reserves with different management strategies and uses. Opportunities exist to link with core habitat areas and/or core corridors in adjoining LGAs. By taking a regional approach it means that the current project can link with similar fauna corridor strategies in adjoining LGAs, but outside the immediate catchment area. Existing strategies, neighbouring core reserves and routes for potential corridors are shown in Figure 51.

The resulting corridors were prioritised on the following basis:

1) Quality of core habitat reserves and existing corridors (linear reserves) – the aim is to improve these linkages, and link other reserves to them
2) Degree of connectivity – shorter links are easier to create and maintain or improve, and become sustainable more rapidly
3) Reserves with existing plans of management – aims to link these reserves with other good quality habitat, and value adds to the existing works plans
4) Links with regional or local initiatives – including River2Rivers (City of Ryde and Hunters Hill councils), Bankstown Biodiversity Strategy, Cooks River to Iron Cove GreenWay (Ashfield, with Marrickville, Leichhardt, City of Canterbury), and City of Canada Bay Fauna Corridors initiative; this also adds value to existing projects
5) Community support and involvement, such as Bushcare groups and contractor sites - community education and participation is fundamental in achieving effective conservation of biodiversity resources (DEWHA)

Figure 48 A large area of high quality core habitat is conserved at Lake Parramatta reserve

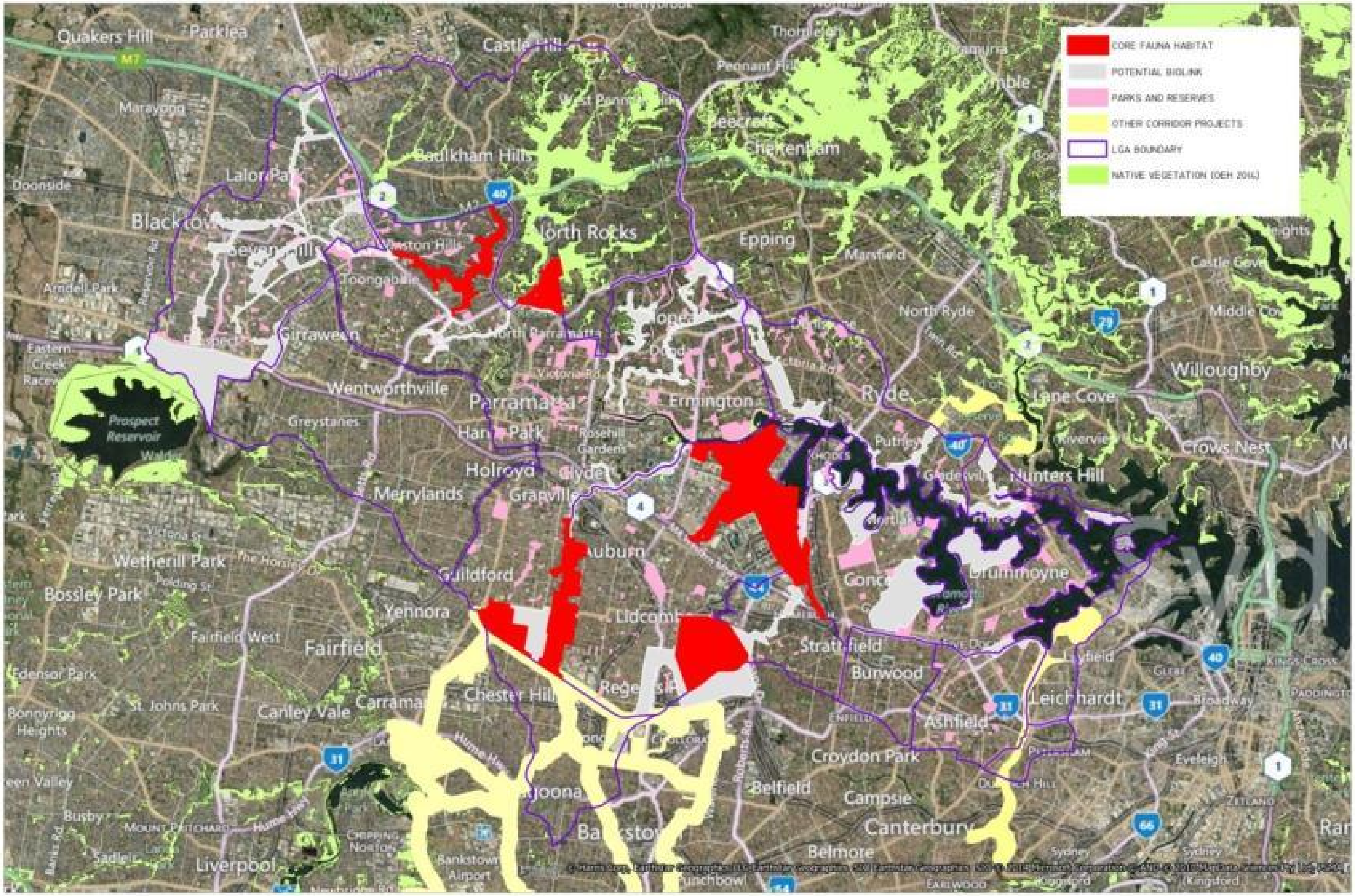


Figure 49 Core habitat areas for PRCG catchment, including SOPA, Rookwood Cemetery, Lake Parramatta, Duck River reserves, and Toongabbie Creek/Quarry Branch

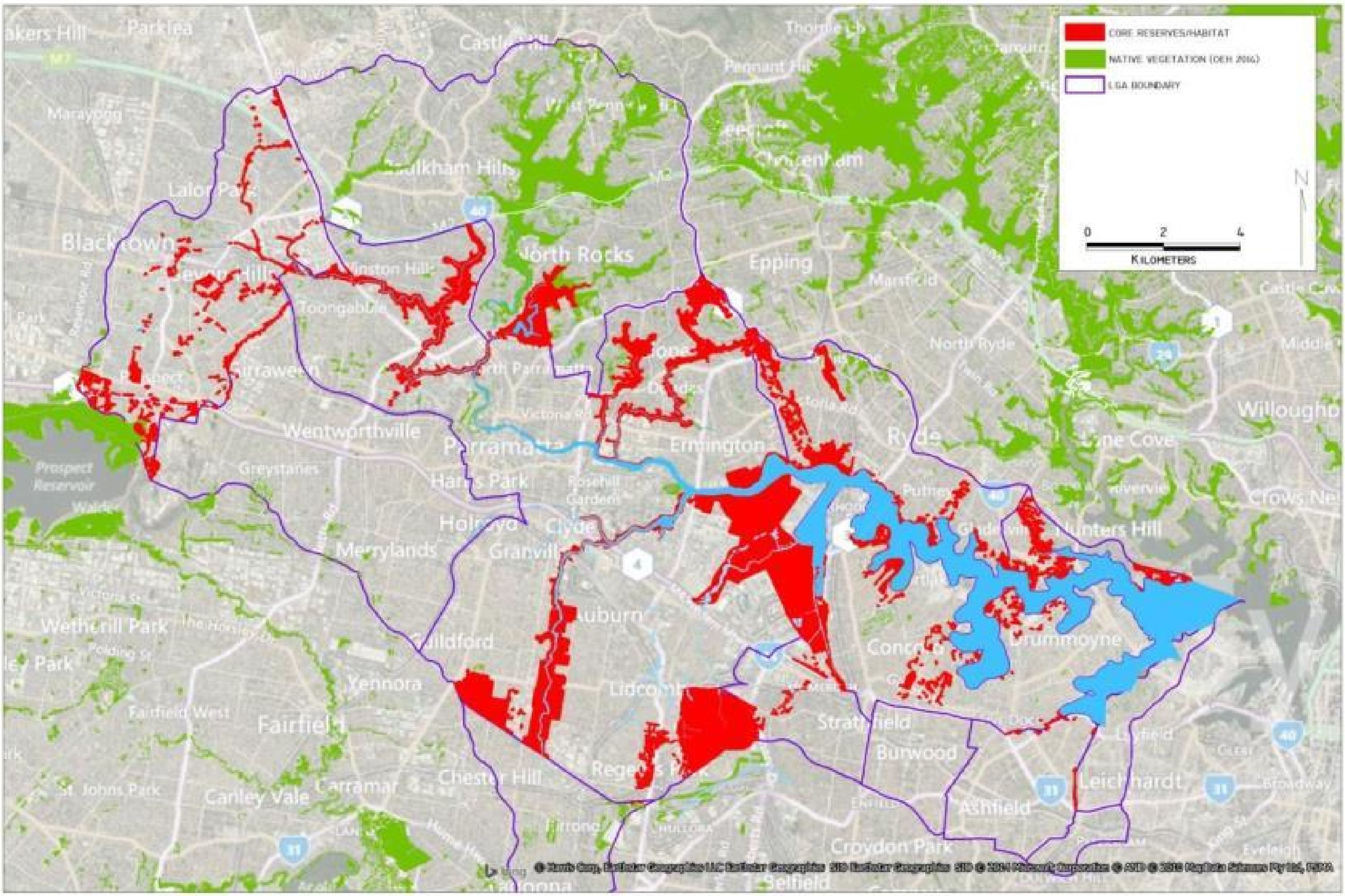


Figure 50 Core habitat and existing corridors throughout PRCG catchment typically follow drainage lines

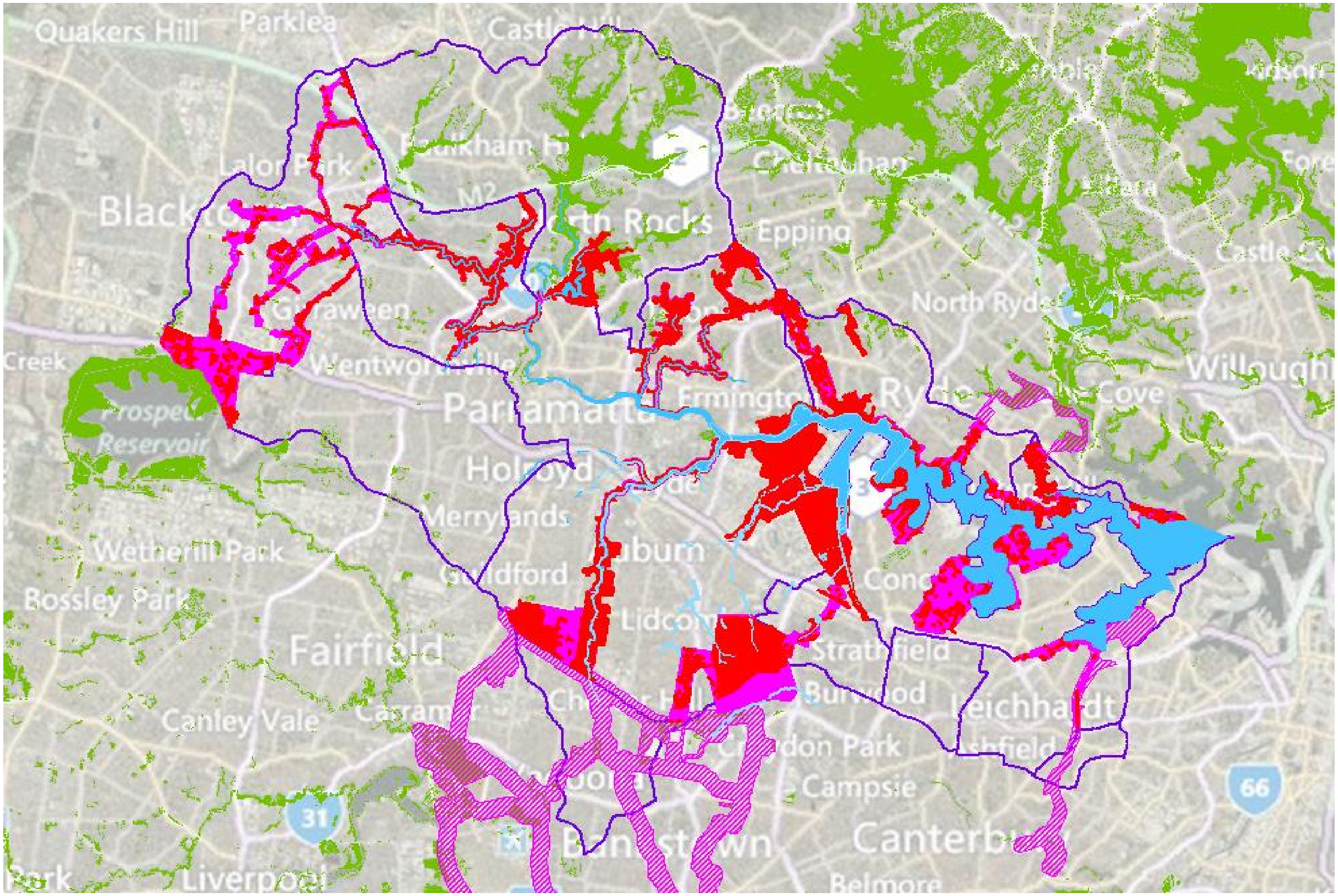


Figure 51 Potential corridors and fauna habitat corridor areas in LGAs outside Parramatta River catchment

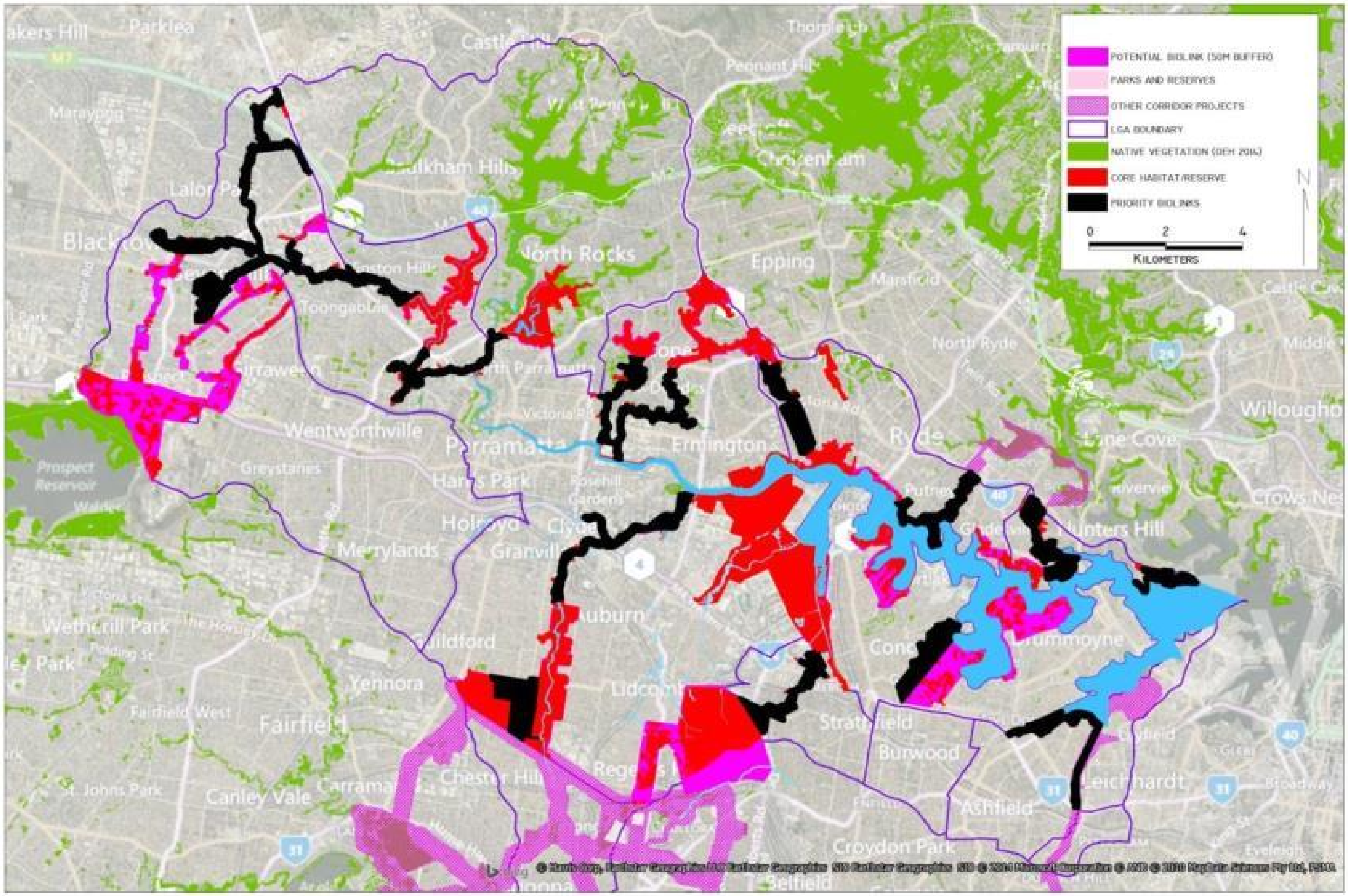


Figure 52 High priority fauna habitat corridors for Parramatta River catchment

A number of high priority fauna habitat corridors were identified in the Parramatta River catchment. Where practicable, one corridor was selected for each LGA (Figure 52). Exceptions included City of Ryde and Hunters Hill LGAs, where two high priority corridors were identified, including corridors that formed part of the River2Rivers corridor project routes. Parramatta LGA also had several corridors identified, primarily because of the extent and condition of bushland in this part of the catchment. Blacktown LGA was more problematic as land usages in the area are changing so quickly that aerial photography is inevitably lagging behind clearing for development, making this LGA quite difficult to manage holistically. Several potential corridors were identified for Blacktown LGA, mainly in the more established areas, and designed to link poor quality fauna habitat to some realistic habitat areas.

Current conditions for all potential corridors surveyed are presented in APPENDIX 2: OVERVIEW OF CORRIDORS IN THE CATCHMENT of this report. Concept works plans are provided for corridors in Auburn, Ashfield, Strathfield and Blacktown. Many of the other corridors have existing plans of management or corridor strategies that outline recommended works.

CORRIDORS AND THEIR PRIORITIES FOR EACH LGA

Several corridors were identified in each LGA. These were prioritised based on the characteristics described in the previous section. At least one high priority corridor was identified in each LGA (Figure 52). Some corridors have high priority sections and medium priority sections (Table 15).

Table 15 Fauna habitat corridors and their priority for works in each LGA of the Parramatta River catchment

LOCAL GOVERNMENT AREA	CORRIDOR (INCLUDING RESERVES)	PRIORITY
HUNTERS HILL	**Pulpit Point Reserve to Clarkes Point Reserve**, via Francis Street Reserve, Kellys Bush Reserve, Weil Park, Prince Edward Reserve, and Morts Reserve	High to medium
HUNTERS HILL	**Bedlam Bay to Tarban Creek Riparian Corridor**, including Looking Glass Bay Reserve, Banjo Paterson Park, Bedlam Bay Parramatta River Regional Park, Gladesville Park, Gladesville Reserve, Betts Park, Huntleys Point Reserve, Riverglade Reserve, Tarban Creek Reserve Part of River2Rivers Corridors	Medium to high
CITY OF RYDE	**Corridor 1: Brush Farm Park to Foreshore**, via Lambert Park, Maze Park, Ryde Parramatta Golf Course, and Meadowbank Park	High to medium
CITY OF RYDE	**Corridor 2: Foreshore to Tyagarah Park**, via Settlers Park, Bennelong Park, Kissing Point Reserve, Putney Park, Morrison Bay Park, Bremner Park, Tyagarah	Medium to high

LOCAL GOVERNMENT AREA	CORRIDOR (INCLUDING RESERVES)	PRIORITY
	Park, Mallee Reserve, Ryde Aquatic Centre Part of River2Rivers Corridor	
CITY OF RYDE	**Corridor 3: Looking Glass Bay to Glades Bay**, including Glades Bay Park, Darri Reserve, Boyla Reserve, Looking Glass Bay Park	Medium
ASHFIELD	**Corridor 1: Parramatta Rd to Iron Cove**, via Jegorow Reserve, Reg Coady Reserve, Robson Park and Dobroyd Parade Reserve Links with Corridor 2 via Dobroyd Parade Reserve	**High**
ASHFIELD	**Corridor 2: Hawthorne Canal**, including Cadigal Reserve, and Richard Murden Reserve Part of Cooks River to Iron Cove GreenWay	**High**
STRATHFIELD	**Corridor 1A-1B: Powells Creek to Homebush West**, via Bressington Park, Mason Park Wetlands, Mason Park, Wenthworth Reserve, and Bill Boyce Reserve	**High**
STRATHFIELD	**Corridor 1B alternate route**: via Bressington Park, Mason Park Wetlands, Mason Park, Ismay Reserve, Allen Street Reserve, Bill Boyce Reserve	**High**
STRATHFIELD	**Corridor 1C-1D: Homebush West to Rookwood**, via Airey Park, Melville Reserve, Hudson Park Golf Course, Frank Zions Reserve (then to Rookwood)	**High**
AUBURN	**Corridor 1: Rookwood Cemetery to Carnarvon Golf Course**, via Grandin Park, Eastlakes Reserve, Norman May Park and Coleman Park	Medium
AUBURN	**Corridor 2: Rookwood Cemetery to Potts Hill** WFP, via University of Sydney campus, Lidcombe Hospital, Central Park, Juniperina Juvenile Justice Centre, Dawes Reserve, Cutcliffe Reserve, Potts Hill Reserve	Medium
AUBURN	**Corridor 3: Upper Duck River**, including Princes Park, Peter Hislop Park, Auburn Golf Course, Progress Park, Auburn Community Picnic Area, Auburn Botanical Gardens, Webbs Avenue Playing Fields, Oriole Stadium, Mona Park and Bangor Park	**High**
BLACKTOWN	**Corridor 1: Refalo Reserve and Troubador Park to Twin Gums Reserve**, via Laing Reserve, Pearce Park, and Banks Reserve	**High**
BLACKTOWN	**Corridor 2: Toongabbie to McCoys Park and Station Rd**, via Seven Hills industrial area	High to medium
BLACKTOWN	**Corridor 3: Ashley Brown Reserve to Peace Park via Seven Hills**, including Fairfax Community Stadium,	**High**

LOCAL GOVERNMENT AREA	CORRIDOR (INCLUDING RESERVES)	PRIORITY
	and Blacktown War Memorial Park	
BLACKTOWN	**Corridor 4: Peace Park to Timbertop Reserve**, via Orana Park, St Martins Crescent, Muju Bijar Reserve, Mitchell Reserve, Leabon Walkway, and William Lawson Park	Medium
BLACKTOWN	**Corridor 5: Best Rd Reserve to Grantham Reserve and to Railway Ave Reserve**, via Soldiers Settlement Reserve, Duncan Park, Railway Reserve, Tonga Park, and high voltage power line easement	High to medium
BLACKTOWN	**Corridor 6: Grantham Reserve to Prospect Park, and Timbertop Reserve**, via Amazon Park, Prospect Park, Peter Winter Park, Oklahoma Park, Fox Hills Golf Course, and Warmuli Reserve (and to Prospect Reservoir)	Medium
PARRAMATTA	**Corridor 1: Toongabbie Creek & Quarry Branch**, including Hammers Rd Reserve, Otto Losco Reserve, Impeesa Reserve, Bundilla Forest, Backhousia Reserve, Third Settlement Reserve, Moxham Park, John Curtin Reserve, Model Farms Reserve, Oakes Reserve, Palestine Park, Reynolds Park, Sue Savage Park, and McCoy Park	High to medium
PARRAMATTA	**Corridor 2: Lake Parramatta to Parramatta River and Lower Toongabbie Creek**, including Lake Parramatta Reserve, Boundary Rd Reserve, Hospital Farm Reserve, Tartoola Reserve, Robin Hood Park, Hospital Farm Reserve, Redbank Rd Reserve, Milson Park, Currawong Park, Parabianga Reserve, Arrunga Gardens, and Armagh Park/Alice Watkins Park	**High**
PARRAMATTA	**Corridor 3: Ponds-Subiaco Creeks**, including Schaeffer Park, Jim Crowgey Reserve, The Ponds Reserve, Eccles Park, Upjohn Park, Sturt Reserve, The Ponds Walk, Rapanea Community Forest, Herbert Rumsey Reserve, Fitzgerald Forest, Cox Park, Galaringi Reserve, Dandarbong Reserve, Charles Fraser Park, Barayly Park, Allan Cunningham Reserve, Sir Thomas Mitchell Reserve, Dundas Park, Kilpack Park; and **to Vineyard Creek**, including Rydalmere railway corridor, Anderson Ave Reserve, Fred Robertson Reserve, Greens Ave Reserve, Mohamet Allum park, Vineyard Creek Reserve, Rock Farm Reserve, Walter Brown Park, Elizabeth Macarthur Park, Searle Park, Homelands Reserve, and Calangara Park	High to medium
PARRAMATTA	**Corridor 4: The Parramatta River**, including George Kendall Riverside Park, Eric Primrose Reserve,	Medium

LOCAL GOVERNMENT AREA	CORRIDOR (INCLUDING RESERVES)	PRIORITY
	Schaeffer Park, Baludarri Wetlands and Parramatta River foreshore	
PARRAMATTA & AUBURN	**Corridor 5: Lower Duck River**, including Granville Memorial Park, Camelia foreshore, Silverwater foreshore, Silverwater Park	Medium
PARRAMATTA	**Corridor 6: Upper Duck River**, including Wadangalli Woodland, Woodville Golf Course, Joseph Back Reserve, Campbell Hill Pioneer Reserve, Duck River Bushland Reserve, Ray Marshall Reserve, Clyde Road Reserve, Horlyck Reserve, and Duck River Reserve	**High**
CANADA BAY	**Corridor 1A: Parramatta Rd to Rodd Point**, via Croker Park, Timbrell Park, Five Dock Park, Roberts Reserve, Larkins Reserve, Nield Park, and Rodd Park	**High**
CANADA BAY	**Corridor 1B: Five Dock Bay to Nield Park**, via Russell Park, Lysaght Park, Campbell Park, and Alison Park	Medium
CANADA BAY	**Corridor 1C: Extension to Drummoyne Park**, via The Esplanade, and Taplin Park	Medium
CANADA BAY	**Corridor 1D: Hen and Chicken Bay to Abbotsford Bay**, via Russell Park, Chambers Park, Blackwall Point Reserve, Armitage Reserve, Figtree Bay Reserve, Wiremill Reserve, Abbotsford Cove Foreshore Park, Werrell Reserve, Battersea Park, Quarantine Reserve, and Henry Lawson Park	Medium
CANADA BAY	**Corridor 2A: Kings Bay to Canada Bay**, via Halliday Park, Friend Ave Reserve, Barnwell Park, Maple Reserve, Charles Heath Reserve, and Cintra Park	Medium
CANADA BAY	**Corridor 2B: Exile Bay and Massey Park Golf Course**, via Bayview Park, Durham St foreshore	Medium
CANADA BAY	**Corridor 2C: Kings Bay to Queen Elizabeth Park**, via Barnwell Park Golf Course, St Lukes Park, and Goddard Park	Medium
CANADA BAY	**Corridor 2D: Majors Bay to Massey Park Golf Course**, via Majors Bay Reserve, Concord Golf Course, Majors Bay Road Reserve, and Edwards Park	Medium
CANADA BAY	**Corridor 2E: Majors Bay to Bicentennial Park**, via Majors Bay Reserve, Arthur Walker Reserve, Yaralla Estate, Village Green, Eliza Park, Charlton Park, Loftus Park, and Powells Creek Reserve	Medium
CANADA BAY	**Corridor 2F: Rivendell Point to Porters Creek**, via Rhodes Park, Mill Park, Rhodes Foreshore Park, Rhodes Waterside Park	Medium

IMPROVING THE QUALITY OF FAUNA CORRIDORS/BIOLINKS

WHAT DO FAUNA NEED WHEN IT COMES TO CORRIDORS?

Much of the established habitat corridor theory relies quite heavily on the principle that if you build a 'nice house' the right animals will move in, and doesn't really consider whether they are actually close enough and have the potential to access the 'nice house'. It is true that without sufficient habitat attributes, some species will struggle to survive, but the best potential habitat will fail to support that species if that species is simply not present.

Another key issue affecting the long term sustainability of fauna corridors is the current trend of ongoing pro-development pressures, the lack of long term strategic planning at appropriate scales coupled with community perceptions of what "nature" looks like. Ultimately, whatever the objectives of management are, urban bushland remnants are not self-sustaining, and dealing with their management issues require a proactive mix of planning, science and on ground works to conserve or increase existing biodiversity values and maintain some ecological function. Urban reserves cannot simply be managed in isolation as community support for management actions and strategies is often critical to the success of conservation efforts.

Vascular plant richness along with remnant size are often the best predictors for overall species richness and abundance within a remnant (Margules and Pressey 2000, Brauniger et al. 2010), with proximity and connectivity to other patches also playing an important role (Drinnan 2005). It must be noted, however, that other local scale habitat characteristics, such as for example fallen logs, exfoliated rock, soft soils, and proportion of exotic plant species, may be more important than floristic diversity as a predictor of survivorship for some species (Garden *et al.* 2010, Jellinek *et al.* 2004).

Cultural perceptions of what "nature" should look like can become an issue for land managers in urban areas when this perception of "nature" is confused with ecological function. Any management strategy that involves increasing the structural complexity of a remnant, or restoring parklands to a more natural state, or restoration of parts of the matrix between remnants, will involve making the landscape more "messy" and efforts to do so will inevitably lead to public criticism by some parts of the community (McDonnell 2007). This is despite evidence that simple measures such as leaving drainage easements unmown can improve functional connectivity between remnants (FitzGibbon *et al.* 2007).

Without functional connectivity the long term viability of species confined to isolated remnants is questionable (Parker et al 2008). Many remnants rapidly lose species richness and abundance when certain patch size thresholds are reached (Drinnan 2005). Determining what these thresholds are and the different minimum spatial habitat requirements for various species often produces disparate results (Taylor 2008). And in the urban landscape the question is often moot as there simply aren't the resources to buy private lands of conservation value to form comprehensive and adequate corridors. In an urban area in southern Sydney Drinnan (2010) found that bird and frog species richness rapidly declined in remnants under 4 hectares in area and plant and fungal species richness declined rapidly in remnants under 2 hectares in area, whilst 50 hectares was another significant threshold for "forest interior" species vulnerable to edge effects.

Only considering the size of remnants is problematic as the shape of reserves will have a major influence on the ongoing management resources required. Much of the remnant bushland in the Parramatta River catchment is in long and linear form, tending to follow narrow riparian corridors of natural drainage lines, creeks and rivers (Taylor 2008). The linear shape exacerbates the pressure exerted by degrading edge effects with proportionally large perimeter length versus area. Longer edges increase the area of bushland impacted by the urban/bushland interface, including increased weed invasion, predation, rubbish dumping, stormwater runoff, soil compaction and light spill. Light spillage alone has the potential to reduce available habitat and induce behavioural changes in nocturnal species. Light spill may alter fauna behaviour, affecting their roosting sites, feeding and breeding behaviours and patterns (Baker & Richardson 2006, Miller 2006, Kempenaers 2010).

Without functional connectivity the opportunity for migration between remnants is limited to only the most mobile species. Even within highly mobile groups, such as birds, movement can be hindered by aggressive introduced species such as the Indian Myna (*Acridotheres tristis*) or native species such as the Noisy Miner (*Manorina melanocephala*). Control of Indian Mynas is highly desirable and has strong community support. They are a "strongly disliked" species amongst residents who have witnessed harassment of native species, particularly nesting species (Tidemann 2005), although the magnitude of their impact on native species in urban environments may be over-estimated (Lowe *et al.* 2011).

Control of unnaturally abundant native species in urban areas is more problematic. For example, Pied Currawongs (*Strepera graculina*) can have a major impact on the breeding success of other species through nest predation (Major 1996). Nest predation is natural among this type of species but it becomes an issue when the predatory species have unnaturally increased in abundance. This may be because of a trophic cascade in urban areas where the largest predators that typically controlled these mid-sized predators are no longer extant in urban areas (Ford *et al.* 2001).

Ford et al. (2001) considered the presence of Noisy Miners as one of the most significant determinants of avifauna diversity and abundance in fragmented habitats. Noisy Miners play a significant role in suppressing other species, particularly small specialist species of birds. In Western Sydney (and elsewhere within their range) the Noisy Miner is ubiquitous in fragmented habitats. They are large, sedentary, highly social honeyeaters that prefer open forest and woodlands with a low grassy or sparse understorey - a simplified version of this is created in many suburban backyards, along road reserves and in urban open spaces used for passive recreation, including golf courses, parklands, etc.

While the Noisy Miner has increased in abundance in urbanised areas, many other species have significantly declined in abundance or simply disappeared. The aggressive behaviour of Noisy Miners includes harassment, mobbing and bullying of other species. These behaviours are well documented and play a large part in limiting the variety and abundance of other bird species, particularly small species, by effectively excluding them from available habitat (Grey et al. 1997; Catterall et al. 2002; Piper & Catterall 2003). With an edge effect 200 m deep, a remnant 10 ha in size is likely to become entirely occupied by noisy miners. This is a size threshold that has been commonly reported in association with area-standardised avian diversity reductions (Piper & Catterall, 2003).

Exclusion of small insectivorous species can also allow proliferation of insects that are implicated in native vegetation dieback and generalised poor tree health (Clarke *et al.* 1995). Studies have demonstrated that with increasing understorey density and complexity, including long grasses, the abundance of Noisy Miners decreases (Piper & Catterall 2003, Grey & Clark 2011). One option is trapping and humane destruction of these over-abundant native species, but another is to manage the landscape to minimise the habitat features, and moderate residential community behaviours, such as feeding birds, which favour these overabundant species.

Introduced vertebrate pest species include the Red Fox (*Vulpes vulpes*), the domestic cat (*Felis catus*), the black rat (*Rattus rattus*) and to a lesser extent in urban areas, the domestic dog (*Canis familiaris*). These animals interact with native species in a variety of ways, including predation and competition for resources (May and Norton 1996). Many native prey species also react negatively to the scent of these predators, causing them to actively avoid the area. This has implications for the function of corridors in urban areas (Little *et al.* 2002).

Cats and foxes are blamed for catastrophic declines and numerous extinctions of small to medium sized mammals following the arrival of Europeans in Australia. Ongoing and current levels of impact from these species are complicated by habitat destruction, fragmentation and changed fire regimes (May and Norton 1996). The true extent of their ongoing impacts on native fauna is largely anecdotal and difficult to quantify (Saunders & McLeod 2007). There is no dispute is that Red Fox numbers in urban areas can be extremely high (Saunders and McLeod 2007) and both feral and owned cats actively hunt native species (Robertson 1998).

Land managers also need to consider that any suppression of foxes may inadvertently increase the abundance of cats (both feral and domestic) hunting in bushland areas. Foxes may suppress or hamper hunting by cats by directly reducing numbers through predation and by interfering with and harassing cats within their territories (Triggs et al. 1984, Read & Bowen 2001). Similarly, removal of these introduced predators may lead to increases in black rat abundance as they comprise an important part of the diets of foxes in urban remnants (Cox et al. 2000). Black rats have been implicated in the decline of bird species through nest predation, and for native *Rattus*, *Antechinus* and *Melomys* species through direct competition (Cox et al. 2000). When attempting to conserve any of these species, control of black rats may be necessary.

Land managers can create Wildlife Protection Areas under the statutes of the NSW Companion Animals Act 1998. This enables Councils to prohibit dogs and cats in public places, or part thereof, where they have been set aside for the protection of wildlife. Council can declare a Wildlife Protection Area in any "public place, which may include a pathway, road, bridge, jetty, wharf, road-ferry, reserve, park, beach, garden or any other area" declared by Council, where the declaration may protect wildlife. Wildlife Protection Areas can be declared as one of two categories:

- Category 1 lands prohibit both cats and dogs as per S.30 c.1(b) and S.14 c. 1(h) of the NSW Companion Animals Act 1998.
- Category 2 lands prohibit cats as per S.30 c.1(b) of the NSW Companion Animals Act 1998. Dogs that are on a leash will be permitted on formed tracks, pathways or roads in Category 2 lands.

Along with weed invasion and suppression, altered fire regimes have the greatest potential to change vegetation community composition through the alteration of natural disturbance regimes that trigger recruitment (Crosti et al. 2007) or support underlying ecological processes such as nitrogen cycling and stimulation of soil seed banks (Prober *et al.* 2005). Too frequent fires are listed as a key threatening process, but exclusion of fire from fire-adapted communities conserved in urban remnants is equally problematic. This process can contribute to the ongoing extinction debt since older fragments typically have fewer species than newly created fragments (Ross *et al.* 2002).

Exotic plant species displace native species and can reduce the occurrence of important habitat plants for some fauna species. The Sydney Metropolitan region contains the greatest richness of weed species in NSW (SMCMA 2007). Over 65 weed species in the region form a direct threat for 20 ecological communities, 39 vascular plants, 9 fungi species and 12 fauna species listed under the NSW Threatened Species Conservation Act 1995 and NSW Fisheries Management Act 1994 (Coults-Smith and Downey 2006).

A range of options are available that have shown potential for addressing some of these major issues outlined above. These are described in the following sections, with some typical treatment details provided to illustrate the potential outcomes of works.

GENERAL RECOMMENDATIONS FOR THIS PROJECT

The following are some general recommendations for the management of land included within biolinks, whether on private or public (based on Biolinks principles MacLagan/CEC, 2009):

- Avoid further clearing of native vegetation, especially large trees or vegetation along waterways.
- Protect and enhance existing native vegetation through exclusion of vehicles, weed control, allowing natural regeneration of understorey (or planting out if necessary), and leaving fallen timber on the ground to provide habitat.
- Revegetate cleared areas with local indigenous species. Focus in particular on filling key gaps to enhance the connectivity of the overall biolink network.
- Waterways in particular require the exclusion of vehicles, and the protection, enhancement and restoration of native vegetation.
- Bear in mind that any changes to the environment can cause flow-on effects which may be hard to predict. Monitor changes and be ready to tackle new issues as they arise, e.g. problems with foxes, rabbits, weeds, etc.
- Legal designation of land for conservation purposes can afford a greater degree of security and long-term protection for key biolinks or parts thereof. For private land, conservation covenants or similar agreements are commonly used tools. Public land can

be rezoned by the relevant authority for conservation purposes or re-designated as protected areas such as parks and reserves.

- Broader areas of land can be protected through appropriate changes to zonation under LEPs and DCPs.

The following specific corridor-based recommendations apply directly to the corridor plans developed for this project:

- Establishment of Category 1 and Category 2 Wildlife Protection Areas
- Cat “no go at night” areas adjoining designated fauna habitat corridors; cats trapped in breach of this requirement
- Fox baiting programs in reserves other than dog off-leash parks
- Use mapped vegetation type to select appropriate native species for revegetation activities
- For areas without existing vegetation use appropriate plant species for food and habitat plants based on the most likely vegetation community (from pre-1788 vegetation mapping)
- Conduct community education programs to encourage landholders to develop their backyards for wildlife
- Provide free tubestock to landholders, selecting appropriate native species based on extant vegetation nearby, or mapped vegetation pre-1788
- Designated fauna habitat corridors within minimum 50m of core habitat reserves and linear corridors and 100m of landscape and stepping stone corridor routes – target landholders in these areas to supplement existing gardens with native species

WORKS ACTIVITIES RECOMMENDED

Works plans are provided for potential corridors in the inner west LGAs (Ashfield, Strathfield and Auburn) in Appendix 2. These corridor plans include their existing condition and the potential for improvement, accompanied by a set of concept plans that describe the types of works recommended and the locations for these works. Each corridor plan is accompanied by a set of key outcomes and some general comments. The key outcomes identify primary goals for each corridor, with the aim being to improve their existing condition in an achievable and sustainable manner. The general comments identify specific works to be conducted towards these outcomes. Key outcomes and general works comments are summarised below.

Remember, it is important to start with what is already there, and be realistic about what is actually achievable. Often it is better to remove a barrier or threat to fauna before commencing habitat reconstruction or replacement works – sometimes this will be enough to start the process of re-establishment of native wildlife.

Key outcomes:

- Maintain high quality core habitat area
- Connect with adjoining corridors or corridor projects
- Consolidate and expand existing revegetation areas

- Urban linkage from core habitat via stepping stone, landscape and linear habitat corridors
- Liaise and link with neighbouring community to improve corridor outcomes
- Liaise with CityRail, particularly in areas where they have identified Significant Environmental Area alongside railway line
- Liaise with local primary and high schools, consider involvement with childcare facilities to provide landscape corridor or stepping stones habitat
- Liaise with Golf Course management groups, Rookwood Cemetery, TAFE South Western Sydney, Sydney University Cumberland Campus, M4 Motorway management, and others to improve corridor outcomes on other lands
- Improve urban corridor connectivity through community education and participation

General works comments:

- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night
- Public education about value of connectivity corridors along existing footpath/cycleway
- Consider installing fauna crossing points for canal
- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Targeted bat surveys to identify bat species using existing stone and brick tunnels and bridges, and other potential habitat elements
- Accommodate existing bat habitat usage in all works programs
- Encourage community involvement by planting native shrubs and food plants in urban gardens
- Supplement existing habitat values in urban reserves with clustered planting, eg adding shrubs and groundcover around existing canopy trees, establish no whip-no mow zones

Potential community participation strategies are:

- Habitat enhancement programs on private lands
- Developing active partnerships with local schools and tertiary institutions
- Developing active partnerships with local businesses and commercial enterprises
- Expanding Councils’ existing Bushcare programs.

What households do in their own backyards can have a marked effect on urban biodiversity. Planting local native trees, shrubs and ground covers, bringing pets in at night, creating permeable fences to allow animals to pass from one yard to another, keeping gardens chemical free are a few simple but effective things individuals can do.

BENEFITS FOR FAUNA

Introduction of simple habitat elements can give quite rapid improvements in the quality of habitat available. The following table summarises the benefits of key components of fauna habitat that can be included in a corridor design.

Table 16 Habitat components and their benefits for fauna (adapted from Backyards for Wildlife, Bathurst Regional Council, undated)

HABITAT COMPONENT	WHAT IT ATTRACTS	WHERE TO POSITION IT
Tall trees (canopy)	Larger birds, small canopy feeding birds, nesting opportunities for a range of species, bats and other aroboreal mammals, insects, spiders and lizards	As a continuous canopy, or scattered across an open space; avoid planting close to infrastructure and buildings Use caution when planting in urban gardens
Small trees and tall shrubs (midstorey)	Small and mid sized birds, including nectar feeders and insectivores, microbats, insects, spiders, some frogs, and small lizards	In clusters under canopy trees; avoid dense shrubs in grassy woodland areas Suitable for urban gardens
Small shrubs (understorey)	Smaller nectar and insect eating birds, insects, spiders, some frogs and small lizards	Plant in clusters under canopy trees, or scattered throughout grassy woodland area Can be used as a vegetative barrier fence, ideally suited to urban garden planting
Grasses and herbs (groundcovers)	Granivorous birds, frogs and lizards, as well as insectivorous birds, insects, spiders and so on	Plant in clusters under canopy trees, or throughout in forested areas Combine with no whip/no mow zones near trees and shrubs for best results Ideal for urban gardens
Leaf litter, lichen, fungi	Lizards, frogs and insects, small mammals and ground foraging birds (Lyre birds, Brush Turkeys etc)	Avoid “tidying” the bush and leave leaf litter etc in all forested areas May not be suitable for all gardens
Logs (flat and hollow) placed on the ground	Lizards, frogs, spiders, insects, small mammals	Place directly on the ground, some under bushes, some out in the open Suitable for urban gardens
Rocks and boulders, used as borders or in piles	Lizards, frogs, spiders, insects, small mammals	Place directly on the ground, some under bushes, some out in the open Suitable for urban gardens
Dams and large ponds	Frogs, turtles, aquatic lizards, ducks and water birds, snakes, mammals	Away from houses and high use urban reserves as they may attract snakes

Small ponds (for frogs)	Frogs, lizards, insects, birds	Place in areas that receive some light and some shade Protect with fringing vegetation (shrubs, reeds and sedges) Suitable for some urban gardens; may require fencing
Nest boxes (for birds)	Birds, possums and other arboreal marsupials	At appropriate height for target fauna, and near other vegetation Ensure regular access to check for feral species (especially bees and wasps)
Bat boxes and tubes	Microbats	At appropriate height for target fauna, and near other vegetation Ensure regular access to check for feral species (especially bees and wasps)
Roost or perch poles and nesting platforms	Owls, eagles, falcons, other birds of prey	In large open areas that lack trees, such as playing fields and large, grassed open space reserves

Figure 53 Like many large raptors, ospreys will use nesting platforms, and return year after year

BIO-LINK TYPICAL TREATMENTS

Street scape treatments (Powers Road Blacktown)

Creek Treatment (Upper Duck River Rosnay Golf Course)

Golf Course water body treatments (Fox Hill)

Park Clump Treatment (Five Dock Park)

Streetscape Improvement, Nottinghill Road Auburn

Streetscape Improvement, Henley Drive below Timbrell Park, Canada Bay

EXAMPLES OF EXISTING TREATMENTS

Figure 54 Timbrell Park, Canada Bay

HABITAT CREATION WORKS AT MITCHELL PARK BLACKTOWN

Figure 55 HABITAT CREATION WORKS AT MITCHELL PARK BLACKTOWN - During earth works at Mitchell Park (left) and prior to works (right)

Figure 56 Plant establishment

Figure 57 Habitat creation – Mitchell Park

Habitat enhancement works Timbertop Reserve, Prospect

Clumped planting under existing canopy trees- Ashfield

Greenway plantings - Ahfield

APPENDIX 1: ASSESSING CONSERVATION VALUES

Common Nature Conservation Classification System (Chenoweth et al, 2000)

This process formed the basis of the Biodiversity Assessment and Mapping Methodology (BAMM), which drew heavily on this system (Chenoweth et al, 2000). The authors have since revised their classification system in a manner that was informed by BAMM. The key difference is that this system claims to be a conservation classification system, while BAMM merely aspires to be a biodiversity assessment tool.

Biodiversity Assessment and Mapping Methodology (Qld EPA, 2002)

The Biodiversity Assessment and Mapping Methodology (BAMM) was prepared to provide a consistent approach for assessing biodiversity values at the landscape scale in Queensland using vegetation mapping data generated or approved by the Queensland Herbarium as a fundamental basis (QLD EPA, 2002).

The methodology has application for identifying areas with various levels of significance for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. However, natural resource values such as dryland salinity and soil erosion potential are not dealt with explicitly, nor are cultural heritage, scenic amenity or wilderness values. For this reason, the method is described as a biodiversity assessment tool, not a conservation assessment tool in its broadest sense.

Many factors contribute to the assessment of biodiversity values. The methodology focuses on a number of consistent and reliable criteria that are transparent, objective and scientifically defensible. The criteria are in two groups, which are applied one after the other. The first group is based on existing data, which are relatively uniform and reliable across a bioregion. These criteria are diagnostic in that they are used to filter available data and provide a “first-cut” or initial determination of significance. This initial assessment is then refined using a second group of Other Essential Criteria. These Criteria may rely more upon expert opinion than on quantitative data, which in many cases are not available uniformly across the bioregion.

The seven Diagnostic Criteria use reliable and uniformly available information that is usually accessible in database format, and which can be queried to automatically generate significance classes using consistent rules of combination (Table 17). While species data are included, it is acknowledged that fauna and flora surveys are often far from complete and that existing data therefore may not provide a uniform coverage across any region. The criteria were assessed for their suitability in the current project.

Table 17 Biodiversity Assessment and Mapping Methodology diagnostic criteria (EVR = endangered, vulnerable or rare)

Diagnostic Criteria For analysis of uniformly available data	Applicability	**Other Essential Criteria** Assessed by expert panel using non-uniform data	Applicability
A: Habitat for EVR Taxa	Useful	H: Essential and General Habitat for Priority Taxa	Useful
B: Ecosystem Value: at three	Useful at	I: Special Biodiversity Values	Useful

scales • B1: State; • B2: Regional; and • B3: Local	regional or local scale		
C: Tract Size	Modified	J: Corridors	Useful
D: Relative Size of Regional Ecosystem: at three scales • D1: State; • D2: Regional; and • D3: Local	Useful at regional or local scale	K: Threatening Process (Condition)	
E: Condition	Modified		
F: Ecosystem Diversity	Useful		
G: Context & Connection (relationship to water, endangered ecosystems and physical connection between contiguous Remnant Units)			

Criterion A: Habitat for EVR taxa

Criterion A relates species of interest to the landscape, focusing on existing fauna record locations, and assessing the potential habitat quality of immediate and adjoining surrounds (Figure 58).

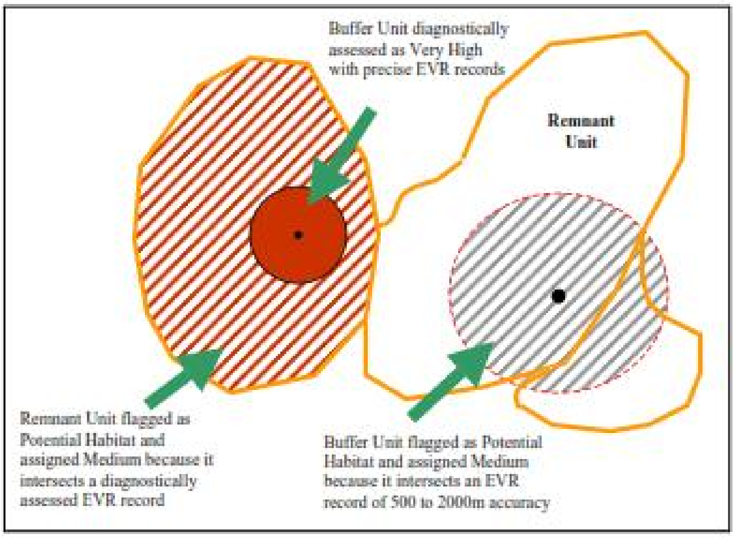


Figure 58 Endangered, vulnerable or rare species and potential habitat based on accuracy of records

Development of ratings for Buffer Units and the surrounding Remnant Units is based on extent and quality of native vegetation (Table 18).

Table 18 Indicators and ratings for Criterion A: Habitat for EVR taxa

Rating:	Low	Medium	High	Very High
Indicator:	The Remnant Unit* has no confirmed records or otherwise defined areas of Habitat for EVR taxa	The buffer area within the Remnant Unit* has relatively imprecise record/s (precision 500 to 2000m) for one or more EVR taxa OR The area within the Remnant Unit* falls outside the buffer area for precise record/s for EVR taxa OR The area within the Remnant Unit* represents Essential or General Habitat for an EVR taxon that is not sufficiently accurate to be considered Core Habitat	The area within the Remnant Unit* has precise record/s or core habitat for one Vulnerable taxon or one Rare taxon	The area within the Remnant Unit* has precise record/s (precision ≤ 500m) or core habitat for one or more Endangered taxa or two or more Vulnerable or Rare taxa

* Only remnant vegetation is identified in the first instance in this criterion on the grounds that neighbouring areas (for example, cultivated fields) may have lost all of their native vegetation. In the future, other native vegetation (modified) may be identified as having significant value for EVR taxa.

Criteria B: Ecosystem Value

At subregional and Local Government Area scales, the categories ‘Very High Conservation Value’, ‘High Conservation Value’, ‘Moderate Conservation Value’ and ‘Limited Conservation Value’ refer to Regional Ecosystems (REs) reduced to less than 10%, 10 to 30%, 30 to 50% and greater than 50% of their pre-clearing extent within a subregion or Local Government Area, respectively. In addition, REs with a pre-clearing extent of less than 300ha within subregions and LGAs are used to distinguish levels of Ecosystem Value.

Criteria B3: Local Ecosystem Value

Ecosystem Value applied at the LGA scale is particularly suitable for the current project. Poorly conserved ecosystems in good condition rate the highest (Table 19).

Table 19 Local Ecosystem Values for Regional Ecosystems assessed at LGA scale

Rating:	Low	Medium	High	Very High
Indicator:	"Limited Conservation Value" RE (>50% of the pre-clearing extent remains in the LGA)	"Moderate Conservation Value" RE (30-50% of the pre-clearing extent remains in the LGA) OR RE "Poorly Conserved" in the LGA	"High Conservation Value" RE (10-30% of the pre-clearing extent remains in the LGA) OR A wetland in SEQ designated as being of "Local Significance" in Chenoweth EPLA (2000b; after Dowling and Stephens 1998)	"Very High Conservation Value" RE (with a pre-clearing extent <300ha, or <10% of pre-clearing extent remains in the LGA)

Criteria C: Tract Size

This criterion is a measure of the relative size of a Tract. The size of any Tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger Tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller Tracts.

Fragmentation patterns vary, ranging from uncleared landscapes through to highly fragmented landscapes. This variability can be factored into considerations of the relative importance of tracts of the same size within different bioregions. That is, a small tract in a depleted landscape is assumed to have comparable importance to a larger tract in a less depleted landscape.

Criteria D: Relative Size of Regional Ecosystem

The relative size (expressed as a percentile) of the RE occurring within the Remnant Unit compared with all other occurrences of the same RE within other Remnant Units. Large examples of an RE are more significant than smaller examples of the same RE because they are:

(a) more representative of the biodiversity values particular to the RE; and
(b) more resilient to the effects of disturbance; and
(c) constitute a significant proportion of the total area of the RE.

Criteria D3: Local Relative Ecosystem Size

Local Relative Ecosystem Size Value is defined according to the analysis of Regional Ecosystems within Local Government Areas (LGAs). Indicators used to develop ratings at a local scale are based on the relative size of that ecosystem in the LGA (Table 20).

Table 20 Indicators used to develop ratings at a local scale

Rating:	Low (ha)	Medium (ha)	High (ha)	Very High (ha)
Indicator:	The RE within the Remnant Unit is > 25% the size of the largest example* of that RE in the LGA	The RE within the Remnant Unit is 25% to 50% the size of the largest example* of that RE in the LGA	The RE within the Remnant Unit is 50% to 75% the size of the largest example* of that RE in the LGA	The RE within the Remnant Unit is > 75% the size of the largest example* of that RE in the LGA

* The 'largest example' is calculated as the average of the largest three occurrences of that RE within the local government area.

Criteria E: Condition

The quality of Remnant Units is judged by the extent to which each resembles its natural condition, as indicated by the degree of anthropogenic disturbance.

Vegetation is mapped as remnant where the predominant canopy represents more than 50% of the undisturbed cover, averaging more than 70% of the undisturbed height and composed of species characteristic of the vegetation's undisturbed predominant canopy.

Criteria F: Ecosystem Diversity

The number and size of ecosystems and wetlands present in an area is an indication of habitat complexity. Ecosystem Diversity reflects the degree to which Regional Ecosystems are "packed" within an area, that is, an area with high Ecosystem Diversity will have relatively many Regional Ecosystems and ecotones.

Ecosystem Diversity is commonly classified using concepts of "richness" and "evenness". Richness refers to the number of different ecosystems, while evenness refers to their relative abundance. **Simpson's Diversity Index is a commonly used measure that incorporates both richness and evenness. The Index calculates a probability between 0 and 1, with high scores representing areas of high densities of Regional Ecosystems and ecotones**. Utilises a buffer in calculating richness. This process is utilised in the current project.

Criteria G: Context & Connection

Includes a buffer for calculations. Value is derived from the presence of:

- Water: The presence or inclusion of a wetland or waterway within or adjacent to remnant vegetation increases the vegetation's significance for contributing to ecological processes and protecting aquatic biodiversity. This criterion applies where waterways and wetlands have been mapped at an appropriate scale (currently, 1:250,000 for creeks, rivers and waterways and 1:100,000 or better for wetlands) and integrated with the RE coverage. Buffers for waterways and wetlands follow State policies for vegetation management on freehold and State lands.
- Endangered Ecosystems: Remnant Units bordering Endangered REs have additional importance as buffers.
- Physical Connection: The degree to which a Remnant Unit is connected to other vegetation. Connected Remnant Units are more representative of biodiversity, contribute more to a habitat network and have greater resilience to the effects of disturbance than small isolated Remnant Units.

Other Essential Criteria

At this point a series of filtering combinations are used to identify "First-Cut" Biodiversity Significance based on Diagnostic Criteria. These are then reviewed and refined based on knowledge of the region's biodiversity using Other Essential Criteria.

The application of these Criteria can either upgrade the "first-cut" significance of a Remnant Unit on the basis of additional information, or downgrade its significance if data is inaccurate or does not adequately take Condition into account, for example.

The expert panel/s should consider whether the "first-cut" of conservation significance should be upgraded, taking into account the potential for enhancement and maintenance through appropriate planning and management.

Criteria H: Core Habitat for Priority Taxa

Core Habitat defined by expert panels is treated as if the area had a spatially accurate, confirmed record for the taxon. Core Habitat replaces areas identified from point records and associated buffers in Criterion A.

Criteria I: Special Biodiversity Values

Areas with Special Biodiversity Values can include the following:

a) Centres of endemism – areas where concentrations of taxa are endemic to a bioregion or subregion are found.
b) Wildlife refugia, for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
c) Areas with concentrations of disjunct populations.
d) Areas with concentrations of taxa at the limits of their geographic ranges.
e) Areas with high species richness.
f) Areas with concentrations of relict populations (ancient and primitive taxa).
g) Areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
h) An artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
i) Areas with a high density of hollow-bearing trees that provide habitat for animals.
j) Breeding or roosting sites used by a significant number of individuals.

Criteria K: Threatening Process (Condition)

Consider the Condition or Habitat Quality of regrowth and remnant vegetation. Areas identified under this criterion may be used to upgrade or downgrade Biodiversity Significance arising from the "first-cut" analysis.

The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change. Available data sets and information about these and related processes should be compiled to assist in evaluating vegetation Condition.

BioCondition Assessment (Eyre et al, 2006)

BioCondition is an assessment framework that provides a measure of how well a terrestrial ecosystem is functioning for the maintenance of biodiversity values (Eyre et al. 2006). It is a site-based, quantitative and therefore repeatable assessment procedure that provides a numeric score that can be summarised as a condition rating of 1, 2, 3 or 4, or good through to poor condition.

There are 10 attributes in BioCondition that require benchmarks for the scoring system (Table 21).

Table 21 Attributes used in BioCondition assessment that require benchmarks for their scoring

Attribute	Measure
Native plant species richness	number
Tree canopy cover	percentage
Tree canopy height	median
Shrub layer cover	percentage
Native perennial grass cover	percentage
Native perennial forb and non-grass cover	percentage
Native annual grass, forb and non-grass cover	percentage
Large trees	number
Fallen woody material	number
Litter cover	percentage

The BioCondition score is based on a comparison between measurements of specific sitebased attributes and a benchmark value for each of those attributes, specific to a particular Regional Ecosystem (RE). A benchmark value is based on an average or median value obtained from mature and long undisturbed sites, or from Best on Offer (BOO) sites, given few ecosystems are totally free of impacts of threatening impacts (Landsberg and Crowley, 2004). These BOO sites are termed "reference sites".

MaxEnt

Phillips et al (2004) discussed some of the problems associated with modelling species geographic distributions, and the importance of this for conservation biology. They proposed the use of maximum-entropy (MaxEnt) techniques, specifically sequential update algorithms that can handle large datasets with a very large number of features. The goal is to predict which areas within the region satisfy the requirements of the species' ecological niche, and thus form part of the species' potential distribution (Anderson & Mart´ınez-Meyer, 2004). The potential distribution describes where conditions are suitable for survival of the species, and is thus of great importance for conservation.

The idea of MaxEnt is to estimate the target distribution by finding the distribution of maximum entropy (i.e., that is closest to uniform), so that the expected value of each feature under this estimated distribution matches its empirical average (Phillips et al, 2004). This turns out to be equivalent to finding the maximum likelihood Gibbs distribution (i.e., distribution that is exponential in a linear combination of the features). For species distribution modelling, the occurrence localities of the species serve as the sample points, the geographical region of interest is the space on which this distribution is defined, and the features are the environmental variables.

The result is a sophisticated statistical approach to predicting species distributions that has been tested on a number of datasets, including breeding bird data (Phillips et al, 2004). Input data is derived through empirical field surveys, and this forms the basis of "training" the development of the iterative algorithm so that it can understand the conditions that are suitable for a species. Output from the analysis gives a range that encompasses most suitable to least suitable conditions for the species.

One of the big issues for modelling fauna distribution is that all data is typically presence only, and absence data is not recorded. As an analytical process, MaxEnt benefited from the development of more sophisticated computing capacity, and the availability of detailed environmental data. For many species the realised niche may be smaller than its fundamental niche, due to human influence, biotic interactions (e.g., inter-specific competition, predation), or geographic barriers that have hindered dispersal and colonization; such factors may prevent the species from inhabiting (or even encountering) conditions encompassing its full ecological potential (Anderson & Mart´ınez-Meyer, 2004).

MaxEnt and similar processes assume that occurrence localities are drawn from source habitat, rather than sink habitat, which may contain a given species without having the conditions necessary to maintain the population without immigration (Phillips et al, 2006). Although a niche-based model describes suitability in ecological space, it is typically projected into geographic space, yielding a geographic area of predicted presence for the species. Areas that satisfy the conditions of a species' fundamental niche represent its potential distribution, whereas the geographic areas it actually inhabits constitute its realized distribution. Whether or not a model captures a species' full niche requirements, areas of predicted presence will typically be larger than the species' realized distribution. In reality, few species occupy all areas that satisfy their niche requirements.

APPENDIX 2: OVERVIEW OF CORRIDORS IN THE CATCHMENT

PREFERRED CORRIDORS FOR ASHFIELD LGA

Ashfield 1a

Key outcomes:

- Connect with Ashfield 2 corridor
- Consolidate and expand existing revegetation areas
- Liaise and link with neighbouring community to improve corridor outcomes

General comments:

- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night

Ashfield 1b

Key outcomes:

- Consolidate and expand existing revegetation areas
- Liaise and link with neighbouring council across Iron Cove Canal to improve corridor outcomes

General comments:

- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night
- Consider installing fauna crossing points for canal

Ashfield 1c

Key outcomes:

- Consolidate and expand existing revegetation areas
- Liaise and link with neighbouring council across Iron Cove Canal to improve corridor outcomes

General comments:

- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night
- Consider installing fauna crossing points for canal

ASHFIELD CORRIDOR 1: EXISTING CONDITION

KEY MAP


ASHFIELD IC
ASHFIELD IB
ASHFIELD IA
N
LGA BOUNDARY
PARK/RESERVE BOUNDARY
FAUNA RECORD (DISPERSED)
0 100 200
METERS
PRCG HABITAT PROJECT
appliedecology

ASHFIELD 1A CORRIDOR IMPROVEMENT WORKS

ASHFIELD 1B CORRIDOR IMPROVEMENT WORKS

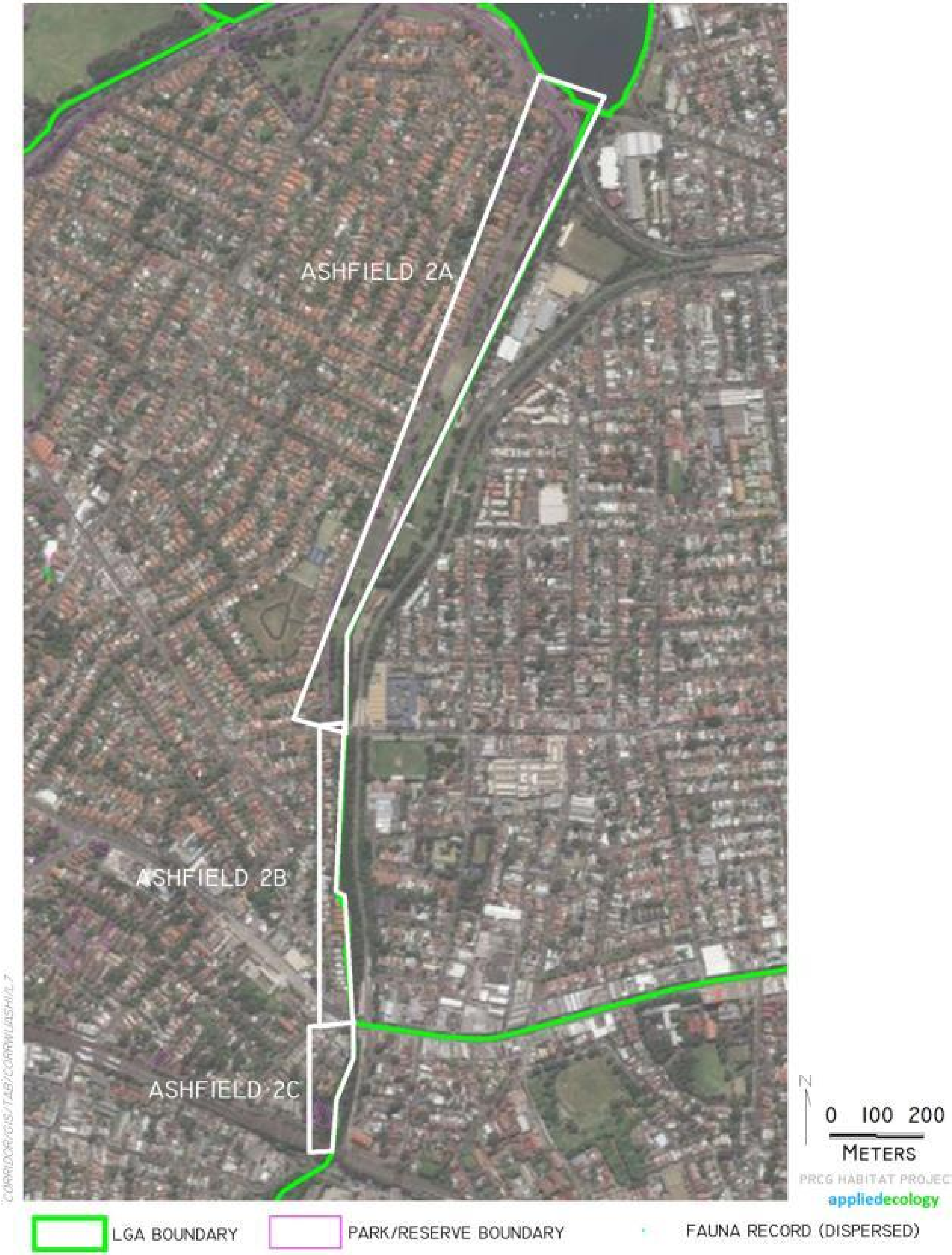
ASHFIELD 1C CORRIDOR IMPROVEMENT WORKS

Figure 59 Dobroyd Parade Reserve

Figure 60 Robson Park

ASHFIELD CORRIDORS 2: EXISTING CONDITION

KEY MAP


ASHFIELD 2A
ASHFIELD 2B
ASHFIELD 2C
N
0 100 200
METERS
PRCG HABITAT PROJECT
appliedecology
CORRIDOR/GIS/TAB/CORRWASHI/L7
LGA BOUNDARY
PARK/RESERVE BOUNDARY
FAUNA RECORD (DISPERSED)

PREFERRED CORRIDOR

Ashfield 2a

Key outcomes:

- Continue to consolidate and expand existing revegetation areas
- Link with Greenway Corridor plan
- Liaise and link with neighbouring council across Hawthorne Canal to improve corridor outcomes

General comments:

- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night
- Consider installing fauna crossing points for canal

Figure 61 existing Greenway revegetation projects illustrate that plantings that provide fauna habitat through structural and species diversity can also be visually pleasing.

Ashfield 2b

Key outcomes:

- Improve urban corridor connectivity through community education and participation

- Link with Greenway Corridor plan

General comments

- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Raise community awareness to keep cats indoors especially at night

Ashfield 2c

Key outcomes:

- Continue to consolidate and expand existing revegetation areas
- Link with Greenway Corridor plan
- Liaise and link with neighbouring council across Hawthorne Canal to improve corridor outcomes

General comments:

- Add nest boxes to create nesting and roosting habitat for birds
- Targeted bat surveys to identify bat species using existing stone and brick tunnels and bridges
- Accommodate existing bat habitat usage in all works programs in Cadigal Reserve
- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night
- Consider installing fauna crossing points for canal

Figure 62 Disused tunnels provide habitat for microbats near Cadigal Reserve

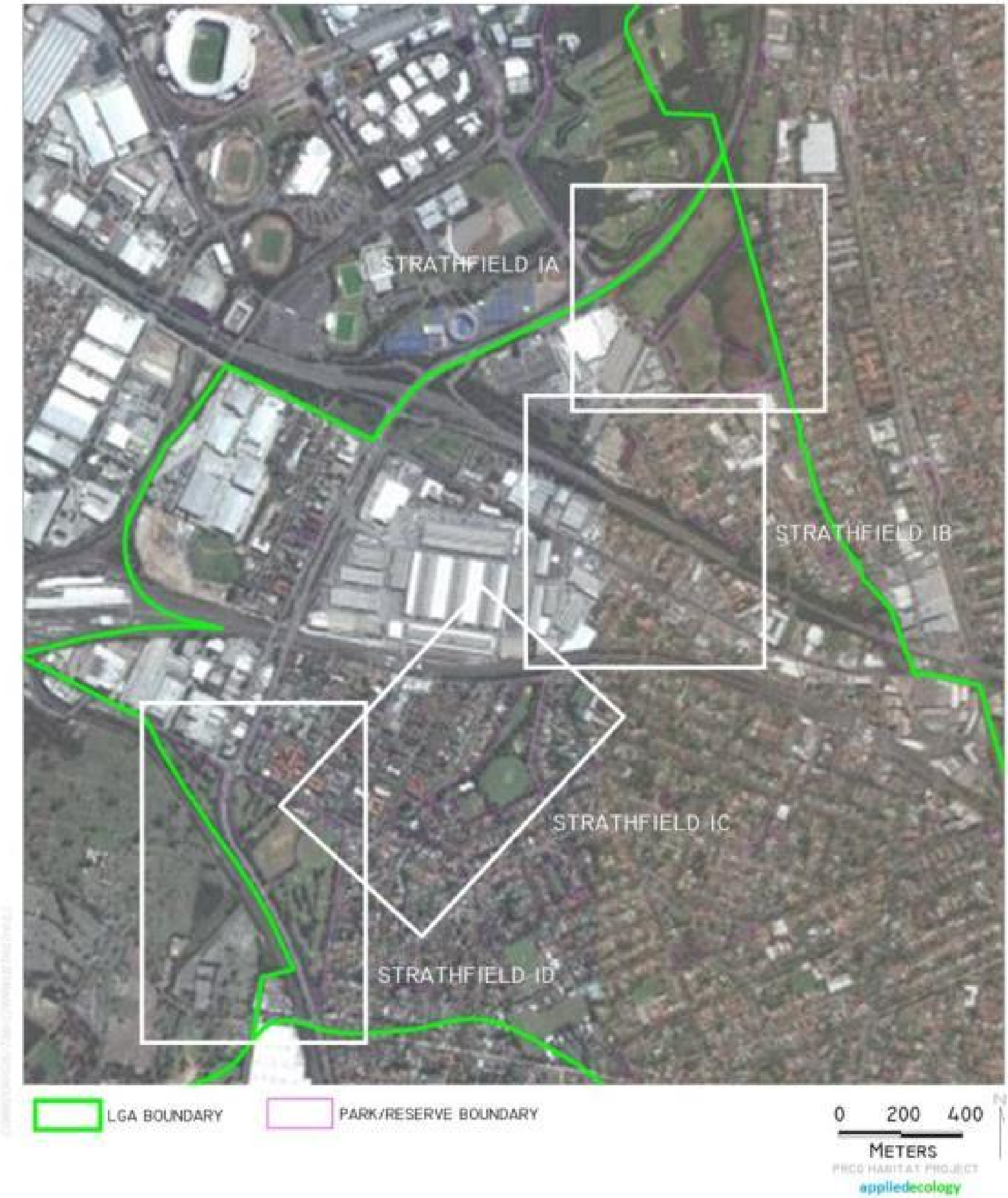
ASHFIELD 2A CORRIDOR IMPROVEMENT WORKS

ASHFIELD 2A CORRIDOR IMPROVEMENT WORKS

STRATHFIELD CORRIDORS

STRATHFIELD 1 CURRENT CORRIDOR CONDITION

KEY MAP



PREFERRED CORRIDOR

Strathfield 1a

Key outcomes:

- Maintain high quality core habitat area
- Consolidate and expand existing revegetation areas
- Liaise and link with neighbouring community to improve corridor outcomes
- Liaise and link with neighbouring council across Powells Creek Canal to improve corridor outcomes

General comments:

- Consider installing fauna crossing points for canals
- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Public education about value of connectivity corridors along existing footpath/cycleway
- Raise community awareness to keep cats indoors especially at night

Figure 63 Mason Park Wetlands form an area of core habitat in Strathfield LGA

Strathfield 1b

Key outcomes

- Urban linkage from core habitat via stepping stone, landscape and linear habitat corridors
- Liaise and link with neighbouring community to improve corridor outcomes
- Liaise with M4 Motorway management to improve linkage options and quality

General comments

- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Raise community awareness to keep cats indoors especially at night
- Consider Noisy Miner control program
- Add nest boxes to create nesting and roosting habitat for birds in Bill Boyce Reserve

- Establish fauna crossing points for M4 and Parramatta Rd, eg overhead crossing lines

Alternate routes

- Consider alternate routes to reduce reliance on urban and streetscape participation
- Possible alternate route via Ismay Reserve and Allen Street Reserve, and under M4 motorway

Figure 64 Opportunities exist for habitat improvements along motorways such as the M4

Strathfield 1c

Notes

- CityRail has identified Significant Environmental Area alongside railway line

Key outcomes

- Urban linkage via stepping stone and linear habitat corridors to landscape habitat
- Liaise and link with neighbouring community to improve corridor outcomes

General comments

- Liaise with CityRail to include linear corridors
- Liaise with Homebush High School to provide landscape corridor
- Target street planting of native feed trees and shrubs

- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Raise community awareness to keep cats indoors especially at night
- Encourage community involvement by planting native shrubs and food plants in urban gardens
- Consider Noisy Miner control program
- Supplement existing habitat values in Airey Park and Melville Reserve with clustered planting, eg adding shrubs and groundcover around existing canopy trees, establish no whip-no mow zones
- Add nest boxes to create nesting and roosting habitat for birds in Airey Park and Melville Reserve

Figure 65 Mixed use reserves such as Airey Park need to meet a number of needs, but provide opportunities for community education

Strathfield 1d

Key outcomes

- Urban linkage via stepping stone and linear habitat corridors to landscape habitat
- Liaise and link with neighbouring community to improve corridor outcomes
- Liaise with golf course management to improve corridor habitat potential

General comments

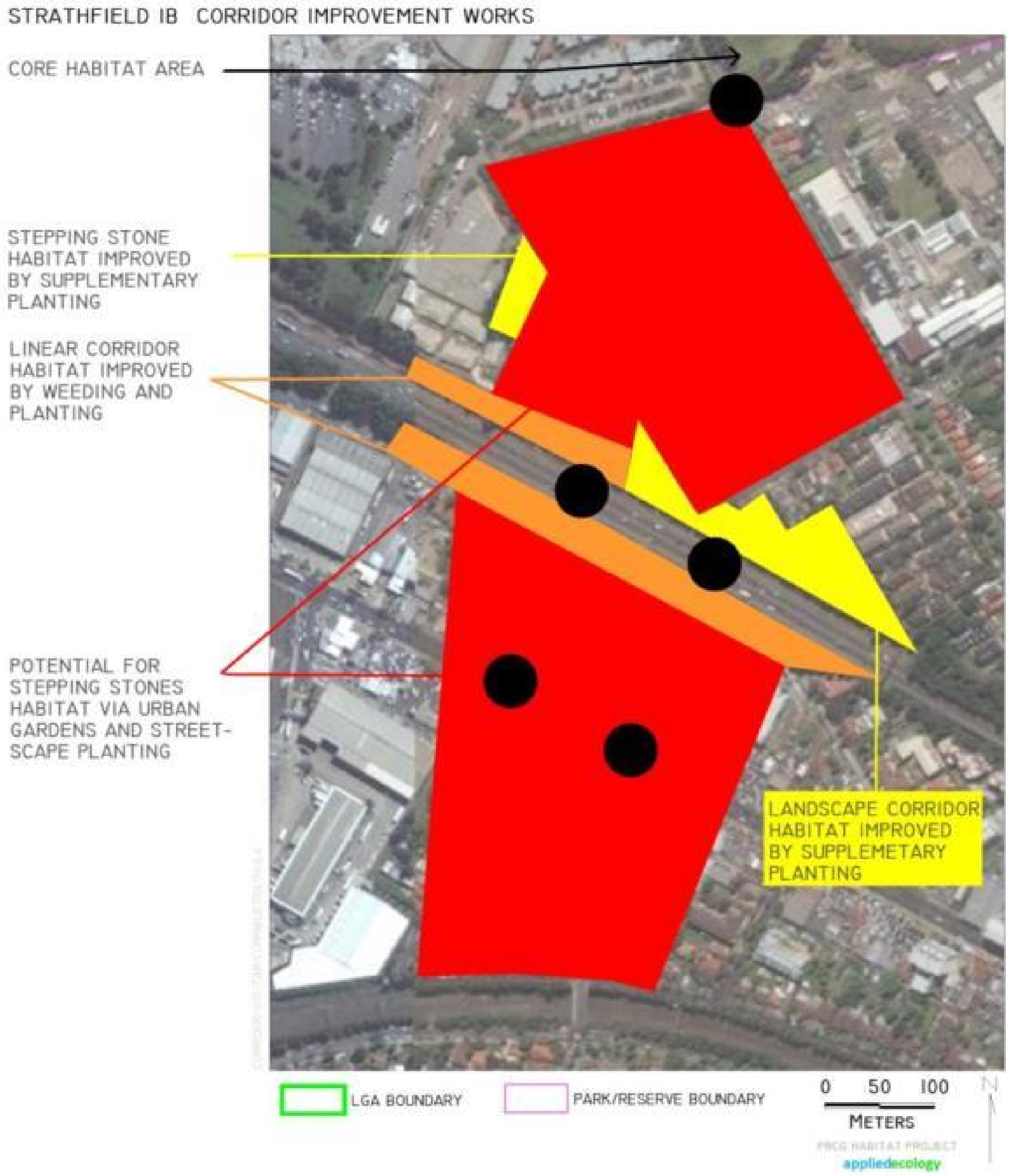
- Target street planting of native feed trees and shrubs

- Encourage community involvement by planting native shrubs and food plants in urban gardens
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Raise community awareness to keep cats indoors especially at night
- Consider Noisy Miner control program
- Supplement existing habitat values around the edges of Hudson Park Golf Course with clustered planting, eg adding shrubs and groundcover around existing canopy trees, establish no whip-no mow zones
- Add nest boxes to create nesting and roosting habitat for birds around the edges of Hudson Park Golf Course

Figure 66 Hudson Park provides a perfect opportunity for perching poles and nesting platforms

STRATHFIELD 1A CORRIDOR IMPROVEMENT WORKS

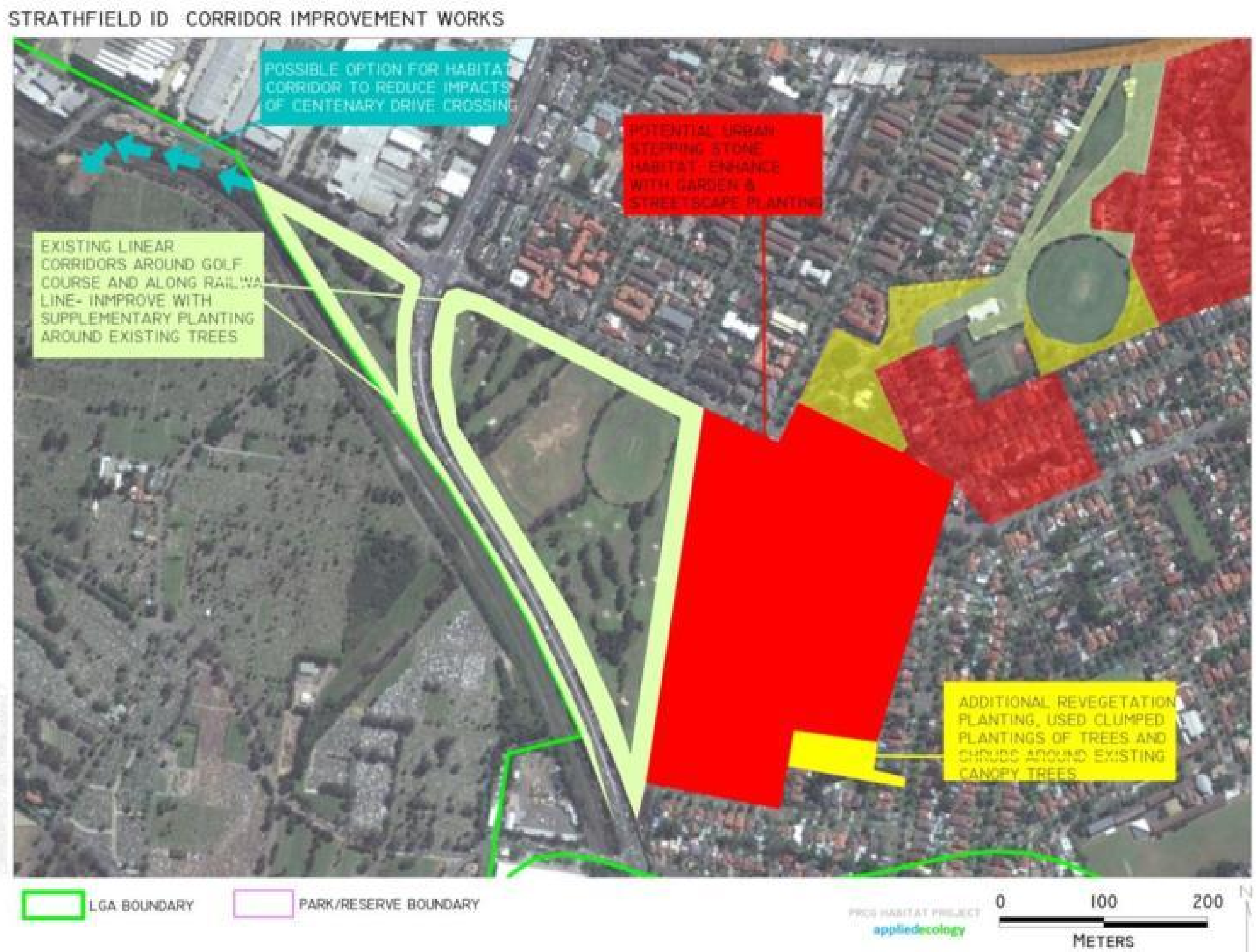
STRATHFIELD 1B CORRIDOR IMPROVEMENT WORKS



STRATHFIELD 1B CORRIDOR IMPROVEMENT WORKS – ALTERNATE ROUTE

STRATHFIELD 1C CORRIDOR IMPROVEMENT WORKS

STRATHFIELD 1D CORRIDOR IMPROVEMENT WORKS



AUBURN CORRIDORS

AUBURN 1 CURRENT CONDITION

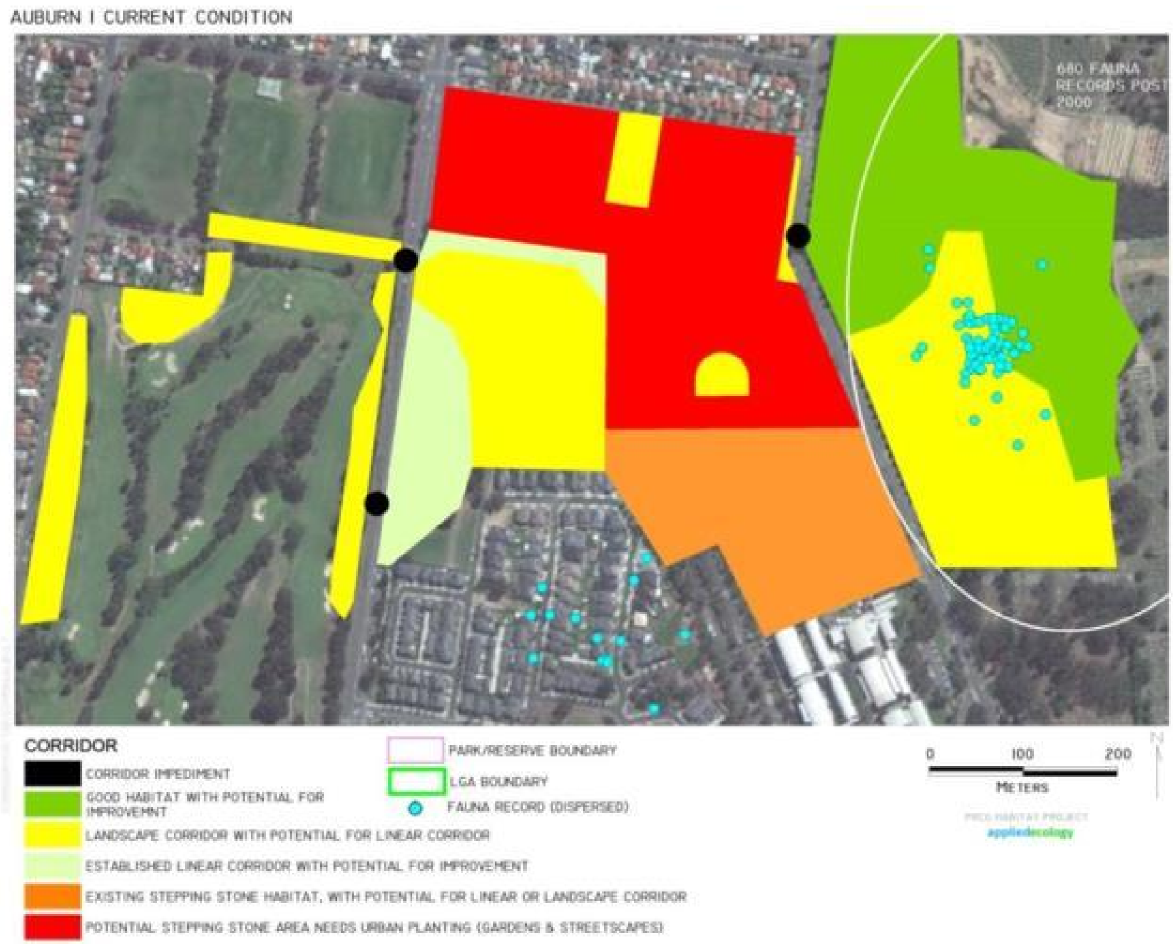


Figure 67 & 3 (above) Habitat Rookwood Cemetery

KEY MAP


LGA BOUNDARY
PARK/RESERVE BOUNDARY
FAUNA RECORD (DISPERSED)
0 50 100
METERS
appliedecology

PREFERRED CORRIDOR

Auburn 1

Key outcomes

- Urban linkage via stepping stone and linear habitat corridors to landscape habitat
- Liaise and link with neighbouring community to improve corridor outcomes
- Liaise with Carnarvon Golf Course management to improve corridor habitat potential
- Liaise with Rookwood Cemetery management to improve corridor/core habitat potential
- Liaise with Studdy Centre for MS to improve corridor/core habitat potential
- Liaise with TAFE South Western Sydney Institute Lidcombe College to improve corridor habitat potential
- Liaise with Sydney University Cumberland Campus to improve corridor habitat potential

General comments

- Target street planting of native feed trees and shrubs
- Encourage community involvement by planting native shrubs and food plants in urban gardens
- Encourage involvement of major landholders (TAFE, Sydney University, Rookwood Cemetery, Studdy Centre)
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Raise community awareness to keep cats indoors especially at night
- Consider Noisy Miner control program
- Supplement existing habitat values around the edges of Carnarvon Golf Course with clustered planting, eg adding shrubs and groundcover around existing canopy trees, establish no whip-no mow zones
- Add nest boxes to create nesting and roosting habitat for birds around the edges of Carnarvon Golf Course

Figure 69 Good habitat opportunities exist on private land, including the MS Studdy Centre at Lidcombe

AUBURN 1 CORRIDOR IMPROVEMENT WORKS

AUBURN 2 CURRENT CONDITION

Figure 70 Cutcliffe Park –introducing species and layer complexity around existing canopy trees through supplementary planting would greatly improve habitat quality.

KEY MAP

PREFERRED CORRIDOR

Auburn 2

Key outcomes

- Urban linkage via stepping stone and linear habitat corridors to landscape habitat
- Liaise and link with neighbouring community to improve corridor outcomes
- Liaise with Carnarvon Golf Course management to improve corridor habitat potential
- Liaise with Rookwood Cemetery management to improve corridor/core habitat potential
- Liaise with Juniperina Juvenile Justice Centre to improve corridor/core habitat potential
- Liaise with TAFE South Western Sydney Institute Lidcombe College to improve corridor habitat potential
- Liaise with Sydney University Cumberland Campus to improve corridor habitat potential

General comments

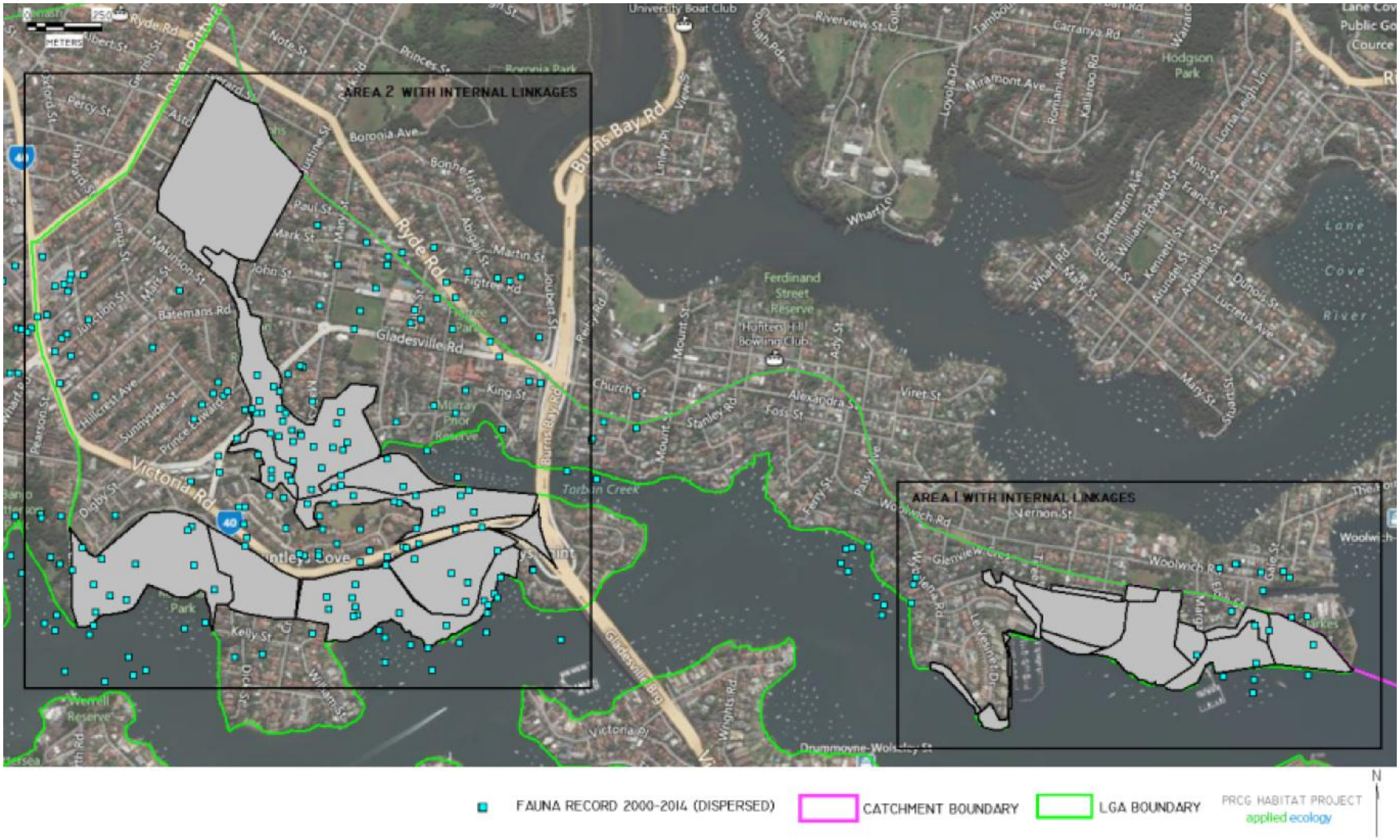
- Target street planting of native feed trees and shrubs
- Encourage community involvement by planting native shrubs and food plants in urban gardens
- Encourage involvement of major landholders (TAFE, Sydney University, Rookwood Cemetery, Juvenile Justice)

- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Raise community awareness to keep cats indoors especially at night
- Consider Noisy Miner control program
- Supplement existing habitat values around the edges of Carnarvon Golf Course with clustered planting, eg adding shrubs and groundcover around existing canopy trees, establish no whip-no mow zones
- Add nest boxes to create nesting and roosting habitat for birds around the edges of Carnarvon Golf Course

AUBURN 2 CORRIDOR IMPROVEMENT WORKS

HUNTERS HILL CORRIDORS

KEY MAP



AREA 1: PULPIT POINT RESERVE TO CLARKES POINT RESERVE

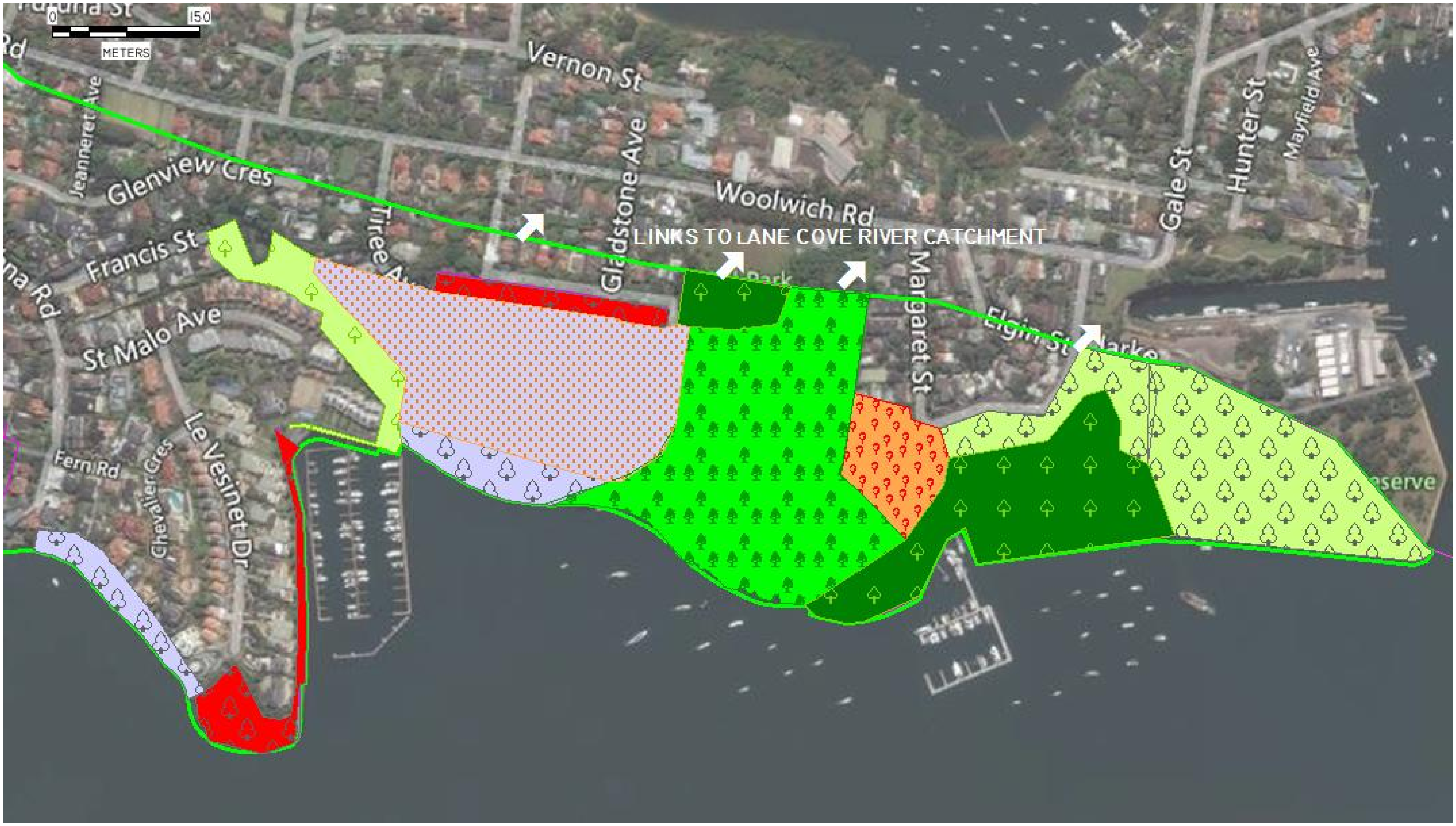


Figure 71 Kellys Bush combines habitat opportunities with passive recreation uses

Figure 72 Woolwich dock walkway

AREA 2: BEDLAM BAY TO TARBAN CREEK RIPARIAN CORRIDOR

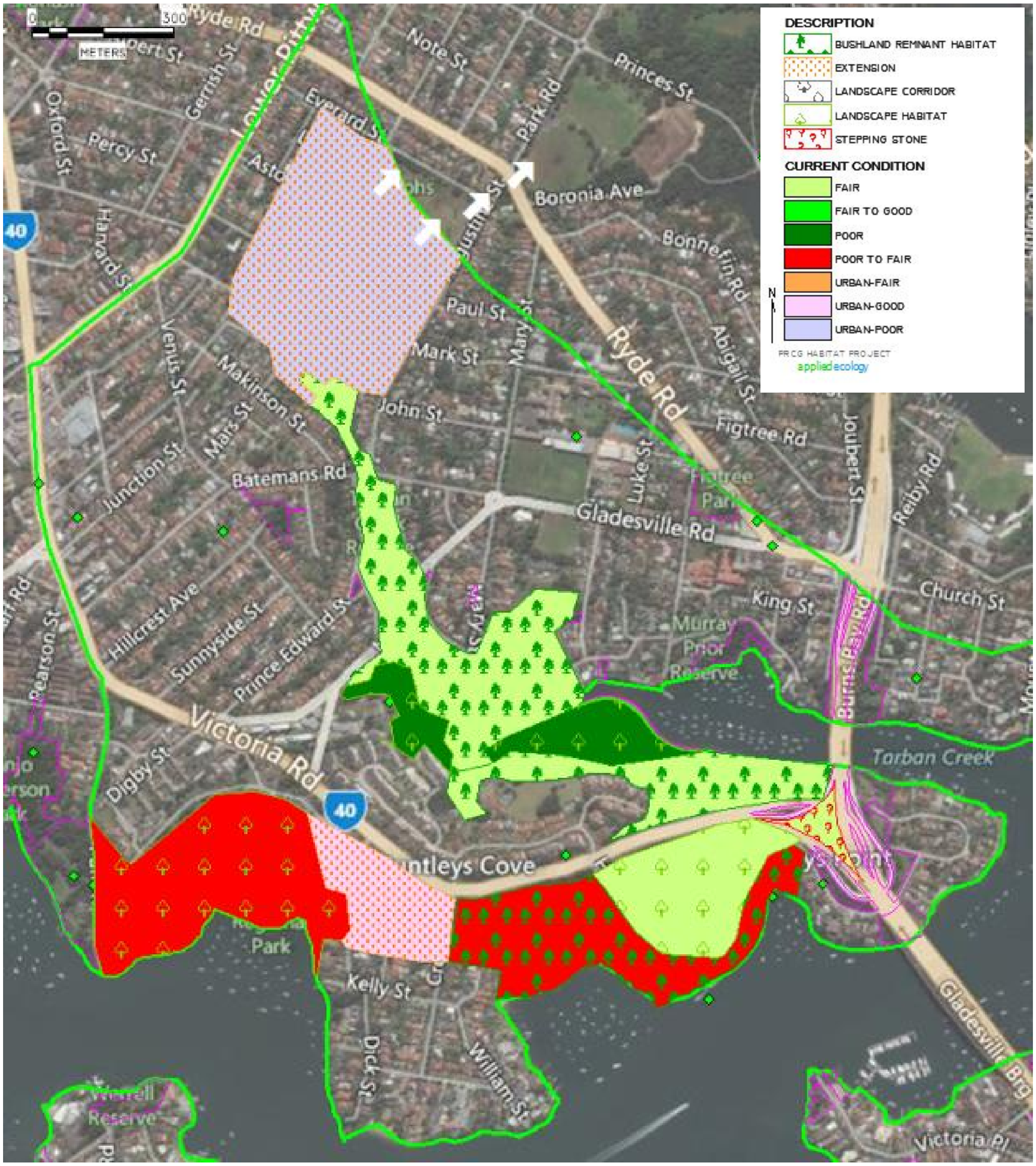
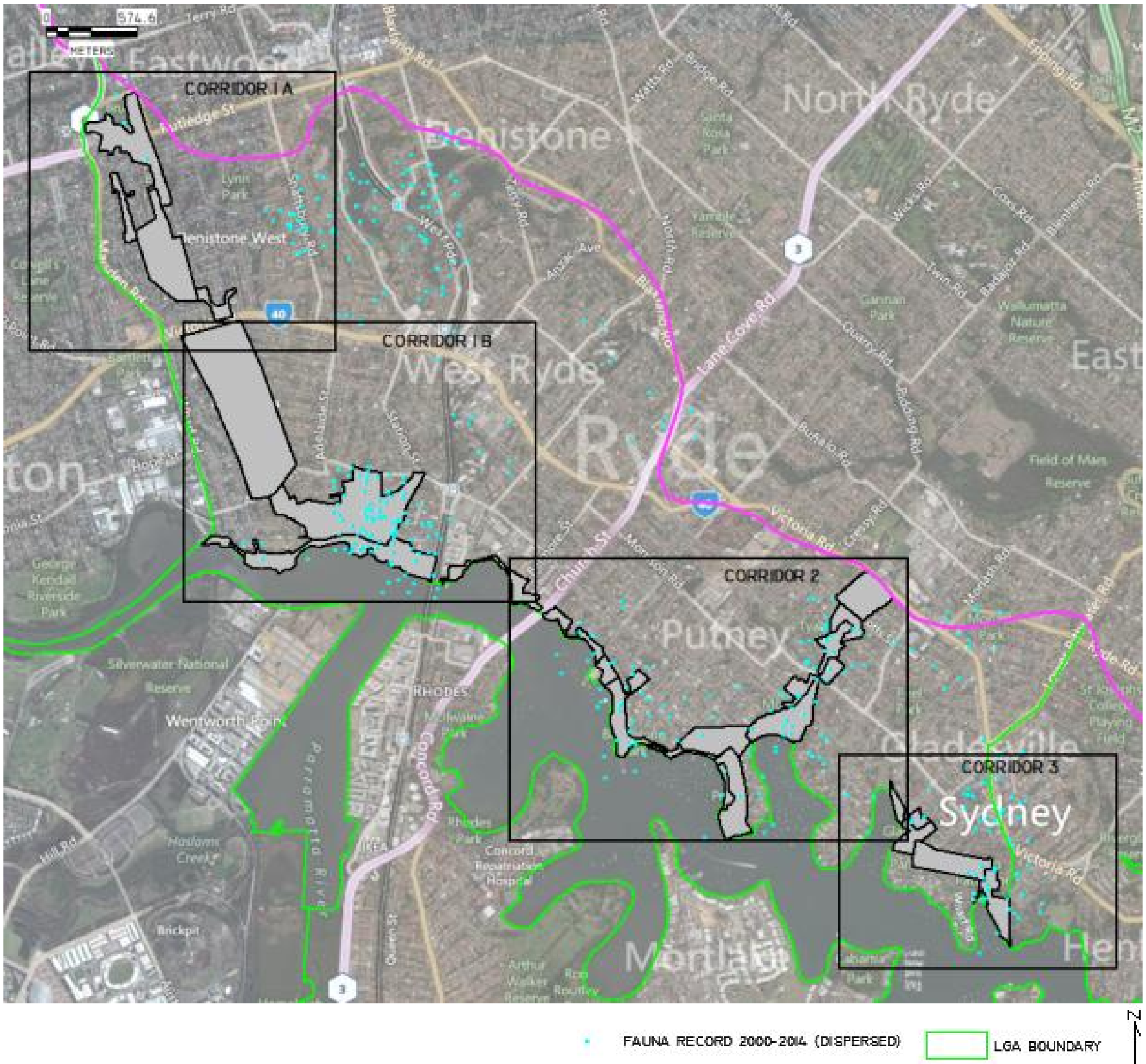


Figure 73 Grey headed Flying Foxes have a resident camp in Glades Reserve

Figure 74 Small areas of bushland are retained in Tarban Reserve

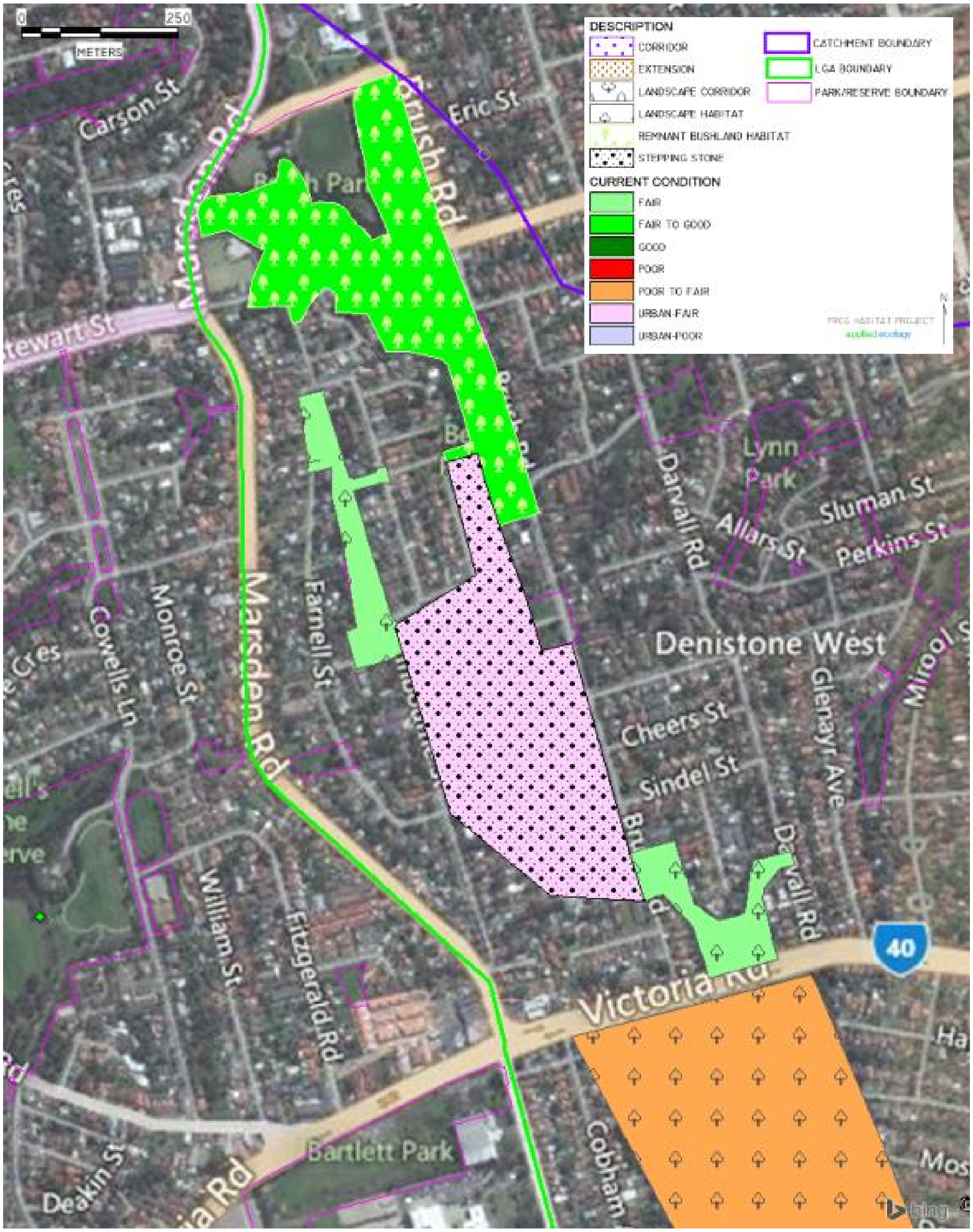
CITY OF RYDE CORRIDORS

KEY MAP



CORRIDOR 1: BRUSH PARK TO FORESHORE

A: BRUSH PARK TO VICTORIA ROAD



B: VICTORIA ROAD TO MEMORIAL PARK

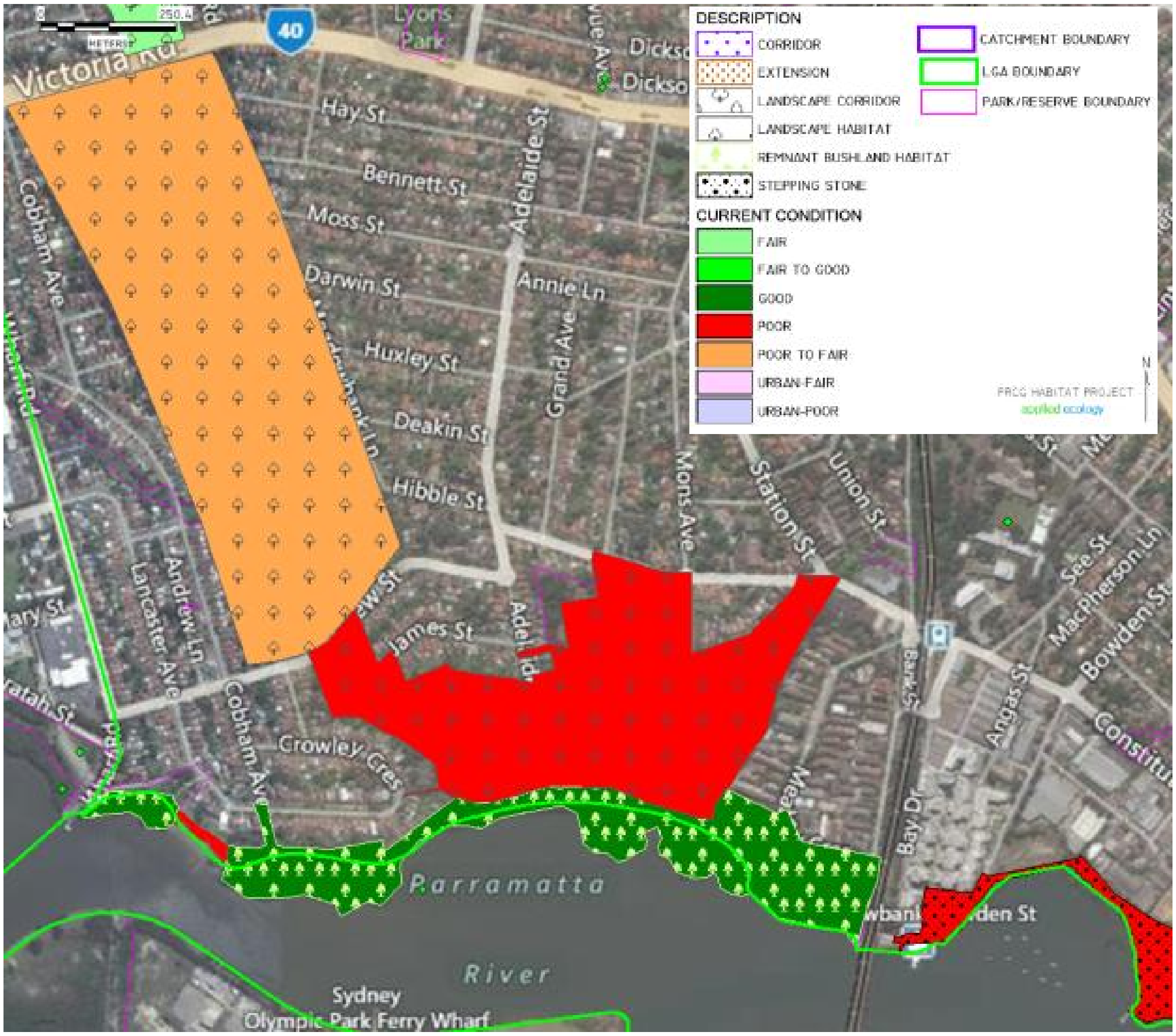


Figure 75 (left) Brush Farm Park, and (right) Maze Park, located on Archers Creek, part of the River2Rivers corridor

CORRIDOR 2: FORESHORE TO TYAGARAH PARK

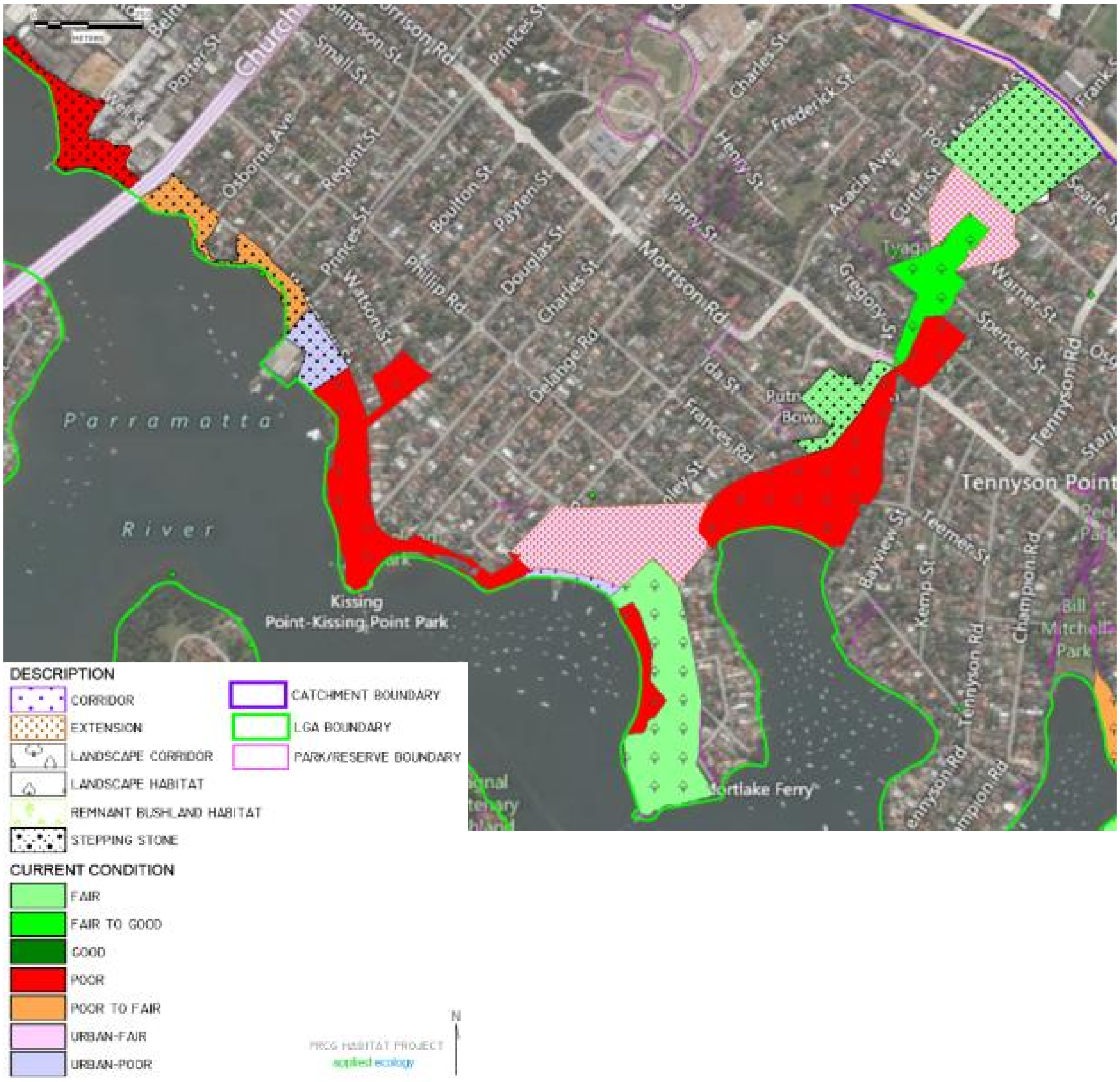
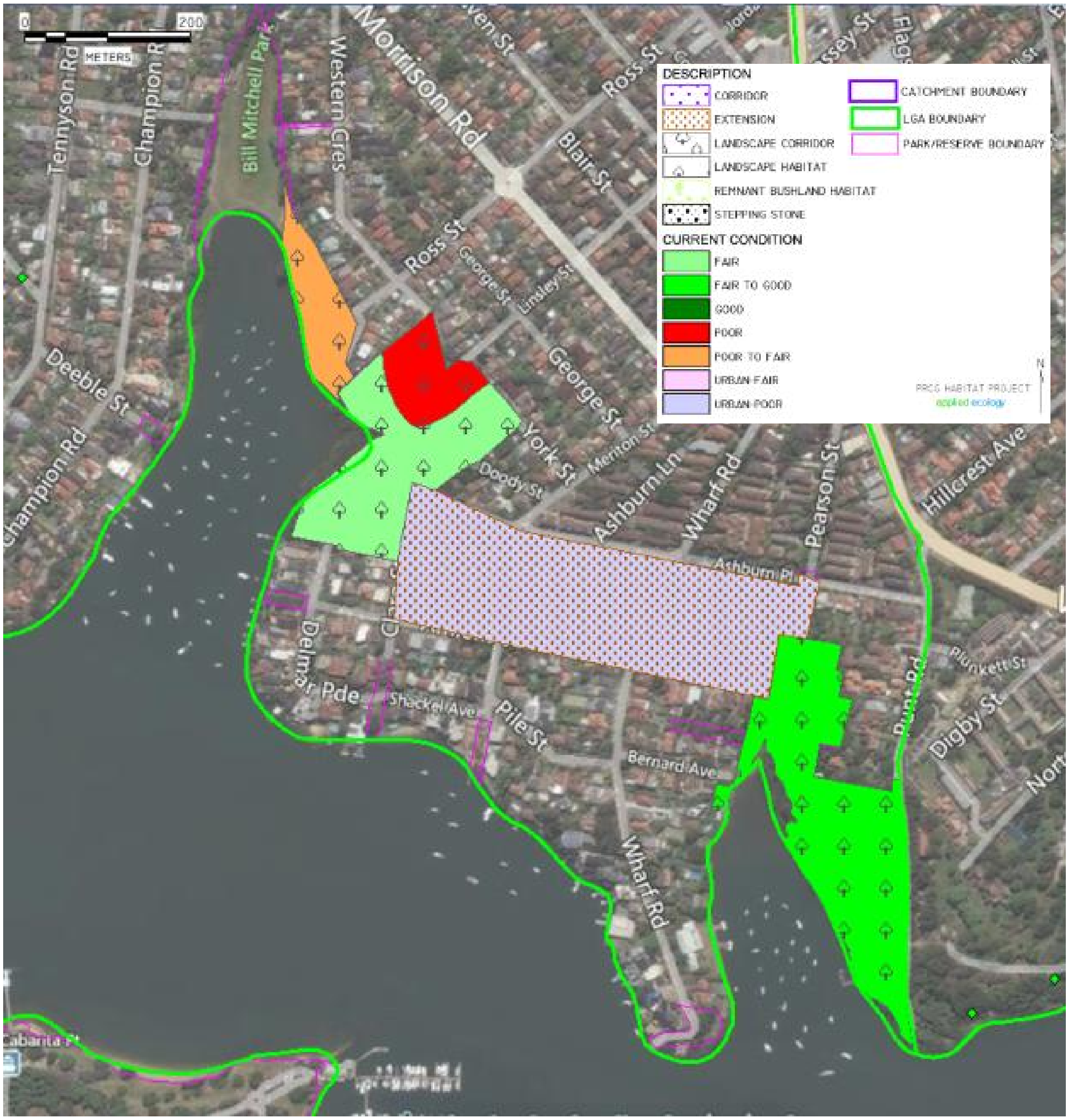


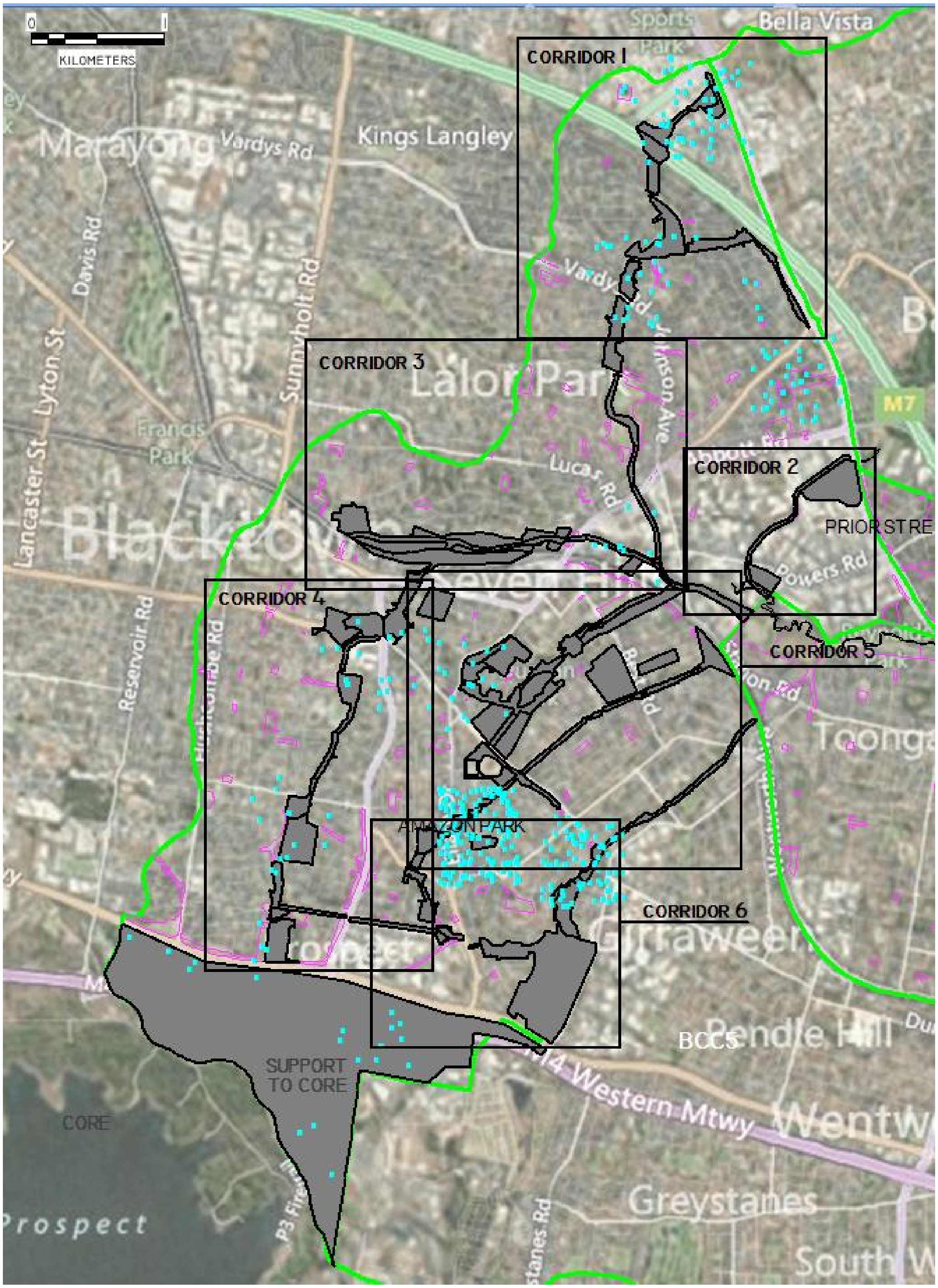
Figure 76 Putney Park combines remnant bushland with passive recreation

CORRIDOR 3: LOOKING GLASS BAY TO GLADES BAY



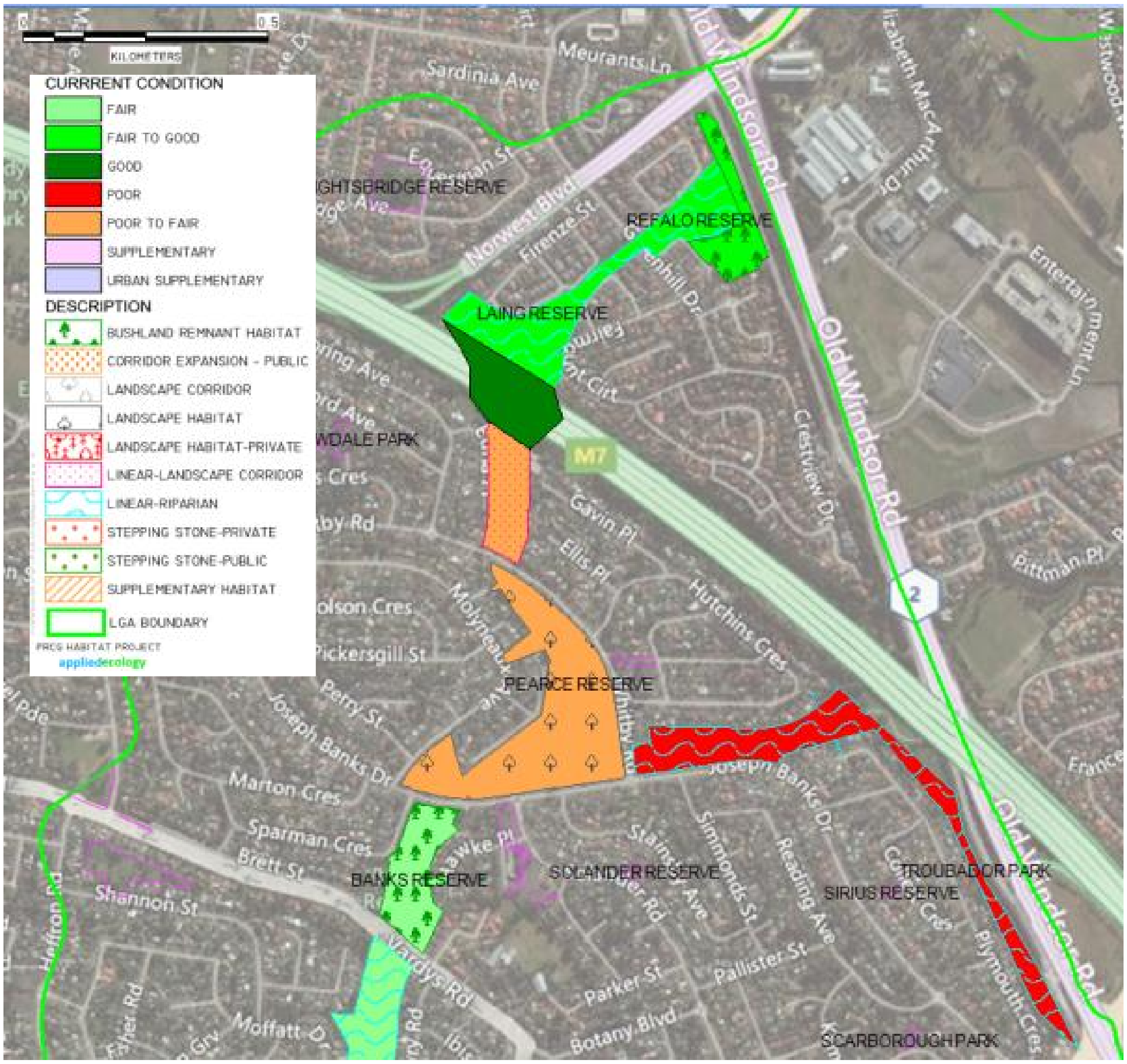
BLACKTOWN CORRIDORS

KEY MAP

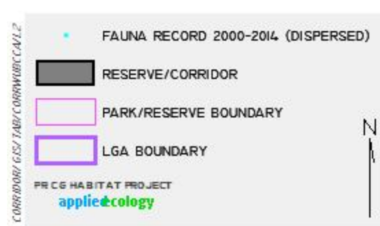


CORRIDOR 1: REFALO RESERVE TO JOSEPH BANKS PARK

REFALO RESERVE & TROUBADOR PARK TO TWIN GUMS RESERVE



Key outcomes:



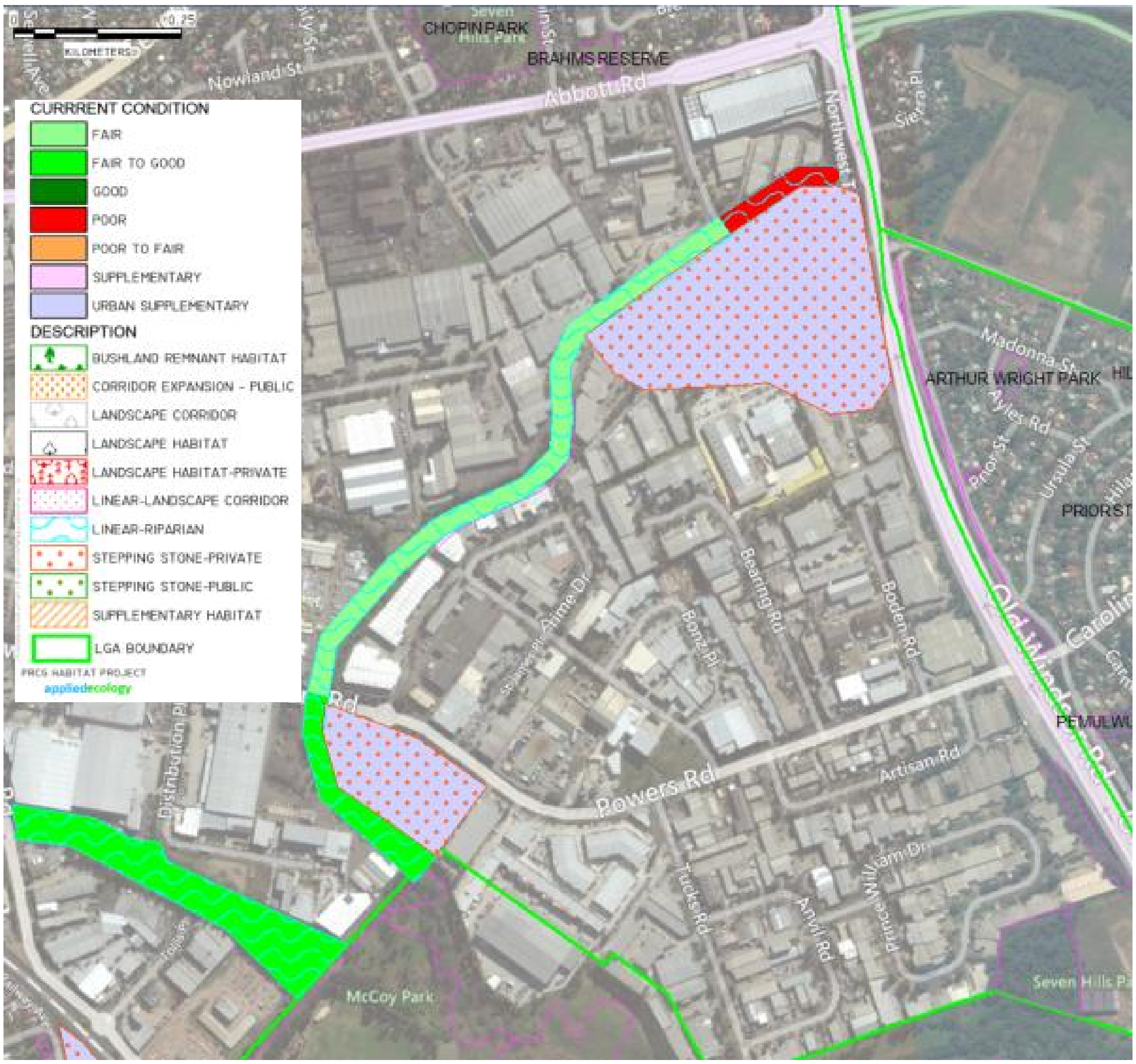
- Connect with other corridors
- Consolidate and expand existing revegetation areas
- Liaise and link with neighbouring community to improve corridor outcomes
- Link riparian habitat areas
- Urban linkage via stepping stone, landscape and linear habitat corridors

General comments:

- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program

- Raise community awareness to keep cats indoors especially at night
- Encourage community involvement to plant native shrubs and food plants in urban gardens
- Supplement existing habitat values in urban parks and reserves with clustered planting, eg shrubs and groundcover around existing canopy trees, establish no whip-no mow zones
- Encourage involvement of major landholders (TAFE, University, M2, M4 and M7 motorways, private companies with factories, CityRail, etc)

CORRIDOR 2: TOONGABBIE TO MCCOYS PARK & MCCOYS TO STATION ROAD



Key outcomes

- Link riparian habitat areas to core habitat reserves
- Urban linkage from core habitat via stepping stone, landscape and linear habitat corridors
- Liaise and link with neighbouring community to improve corridor outcomes

General comments

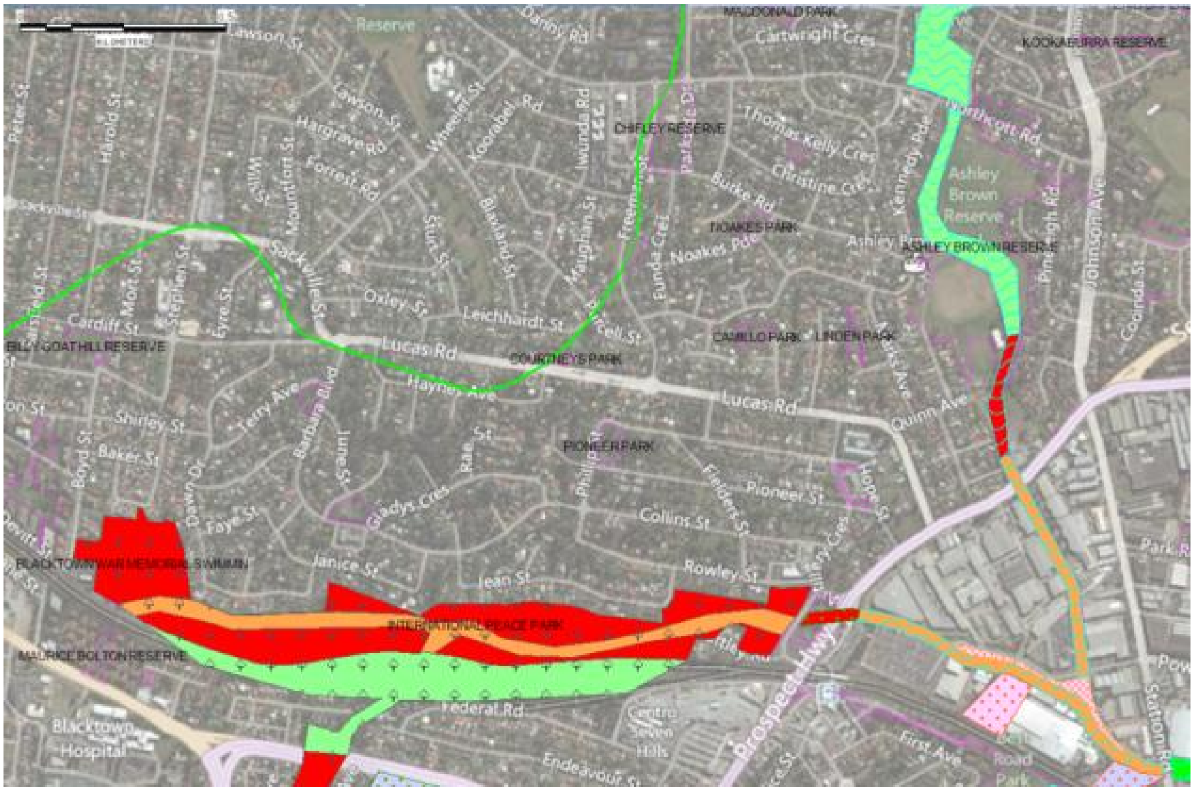
- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program

Figure 77 Corridor from Foundry Road

Figure 78 Riparian Linear Corridor from Powers Road

Figure 79 example streetscape treatment Powers Road

CORRIDOR 3: ASHLEY BROWN RESERVE TO PEACE PARK & STATION ROAD TO SEVEN HILLS (PEACE PARK)



Key outcomes:

- Consolidate and expand existing revegetation areas
- Liaise and link with neighbouring community to improve corridor outcomes
- Urban linkage via stepping stone, landscape and linear habitat corridors

General comments:

- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Encourage involvement of major landholders

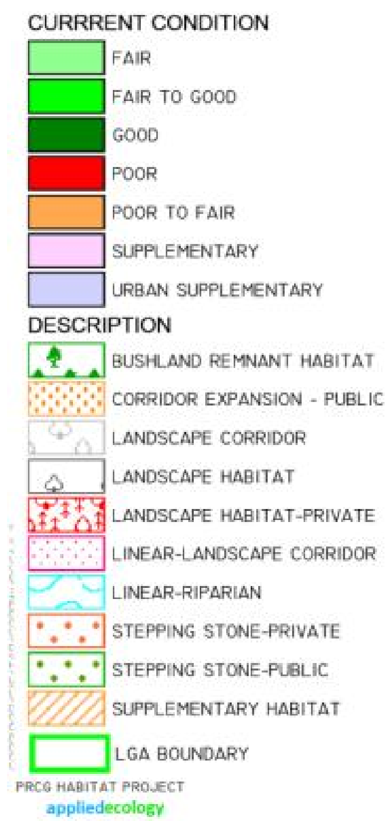
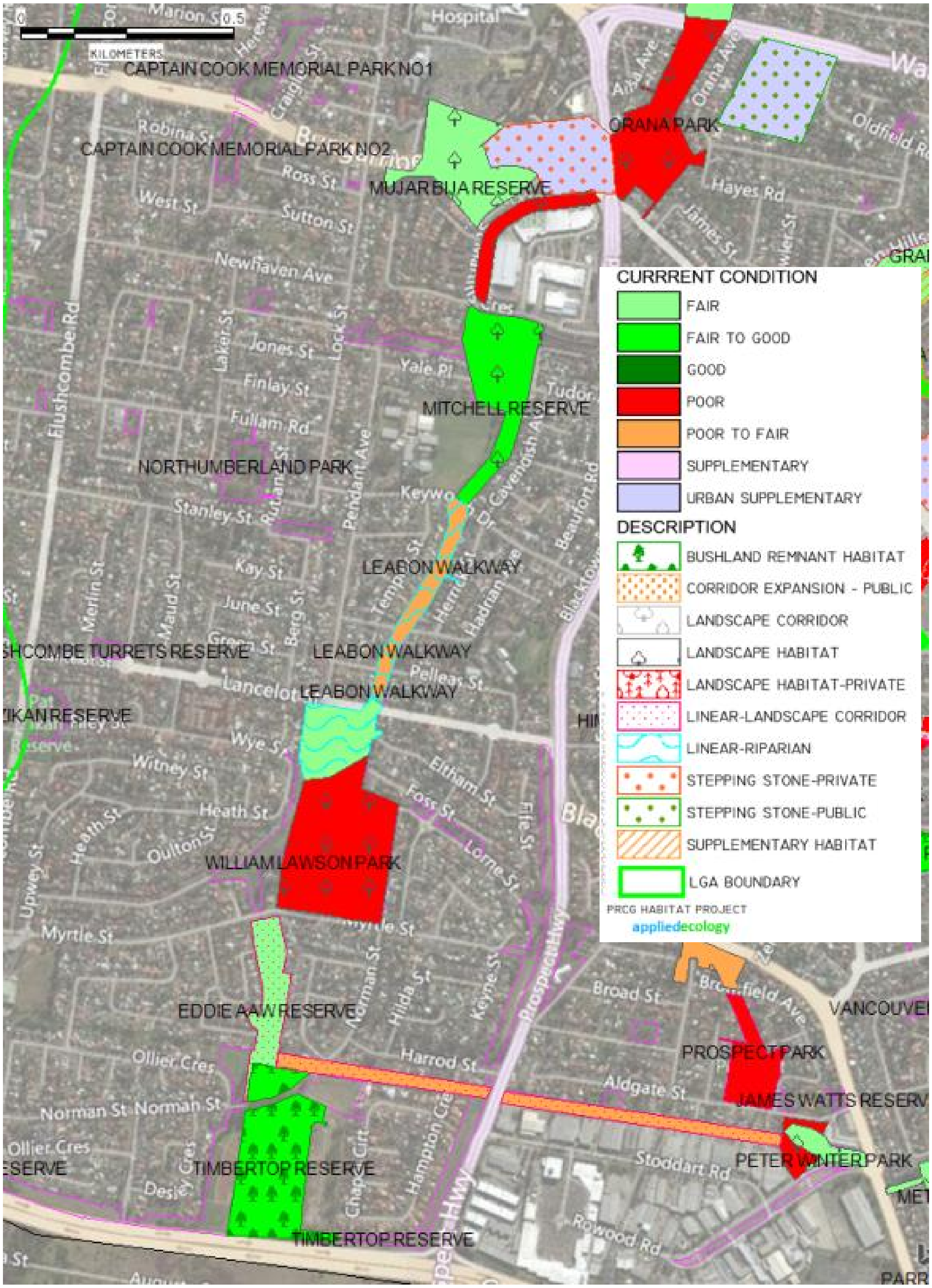


Figure 80 Streetscape improvement – example Powers Road.

CORRIDOR 4: PEACE PARK TO TIMBERTOP RESERVE



Key outcomes:

- Maintain high quality core habitat area
- Link riparian habitat areas
- Consolidate and expand existing revegetation areas

- Urban linkage from core habitat via stepping stone, landscape and linear habitat corridors
- Liaise and link with neighbouring community to improve corridor outcomes

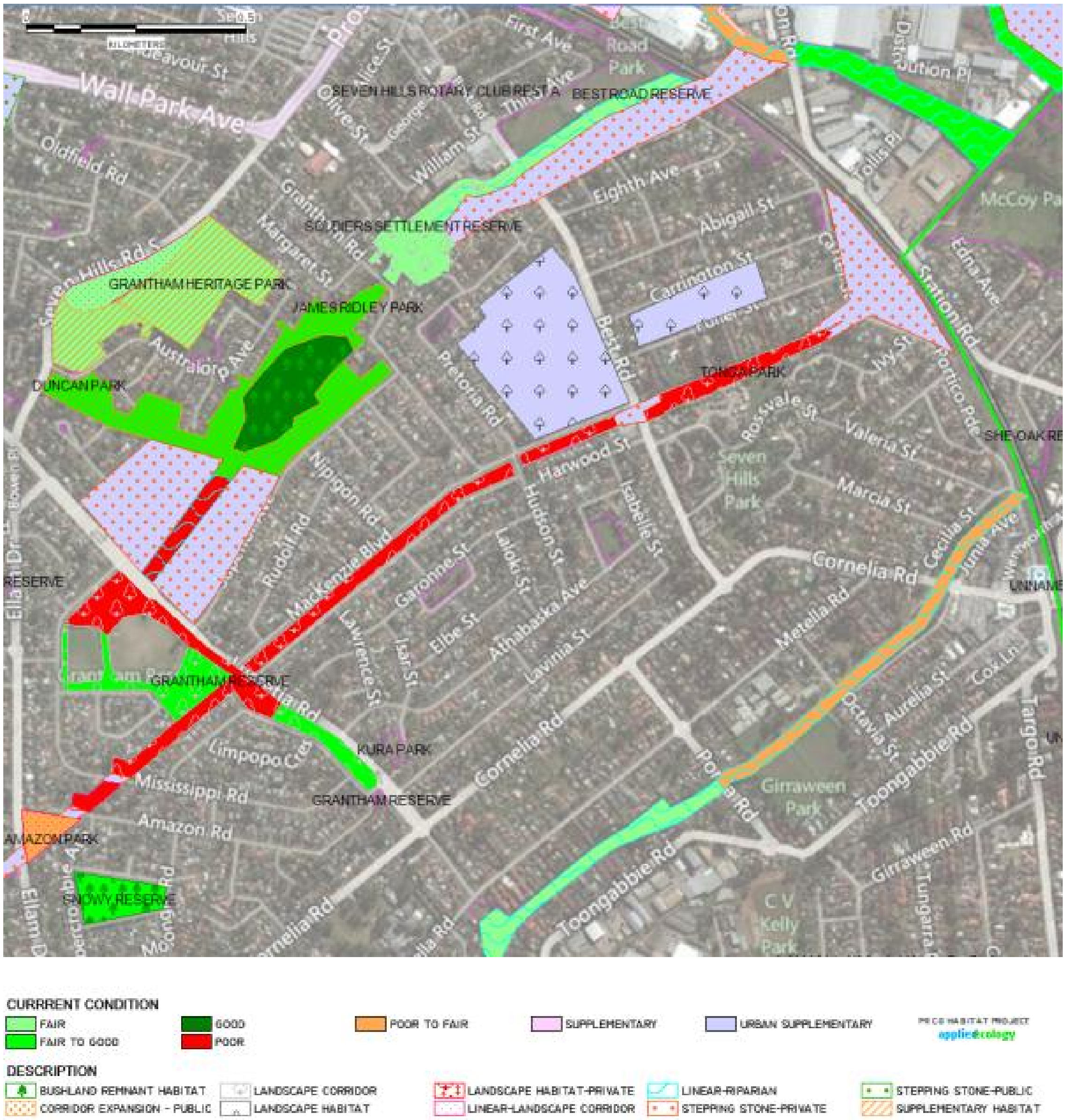
General comments:

- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night
- Accommodate existing bat habitat usage in all works programs
- Public education about value of connectivity corridors along existing footpath/cycleway
- Liaise with local high schools and primary schools to provide landscape corridor
- Encourage community to plant native shrubs and food plants in urban gardens
- Supplement existing habitat values in urban parks and reserves with clustered planting, eg shrubs and groundcover around existing canopy trees, establish no whip-no mow zones

Figure 81 PEACE PARK


Figure 82 ORANA PARK

CORRIDOR 5: BEST RD RESERVE TO GRANTHAM RESERVE & RAILWAY AVE RESERVE TO GRANTHAM RESERVE



Key outcomes

- Maintain high quality core habitat area
- Link riparian habitat areas
- Connect with other corridors
- Consolidate and expand existing vegetation areas
- Urban linkage from core habitat via stepping stone, landscape and linear habitat corridors
- Liaise and link with neighbouring community to improve corridor outcomes

General comments

- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs

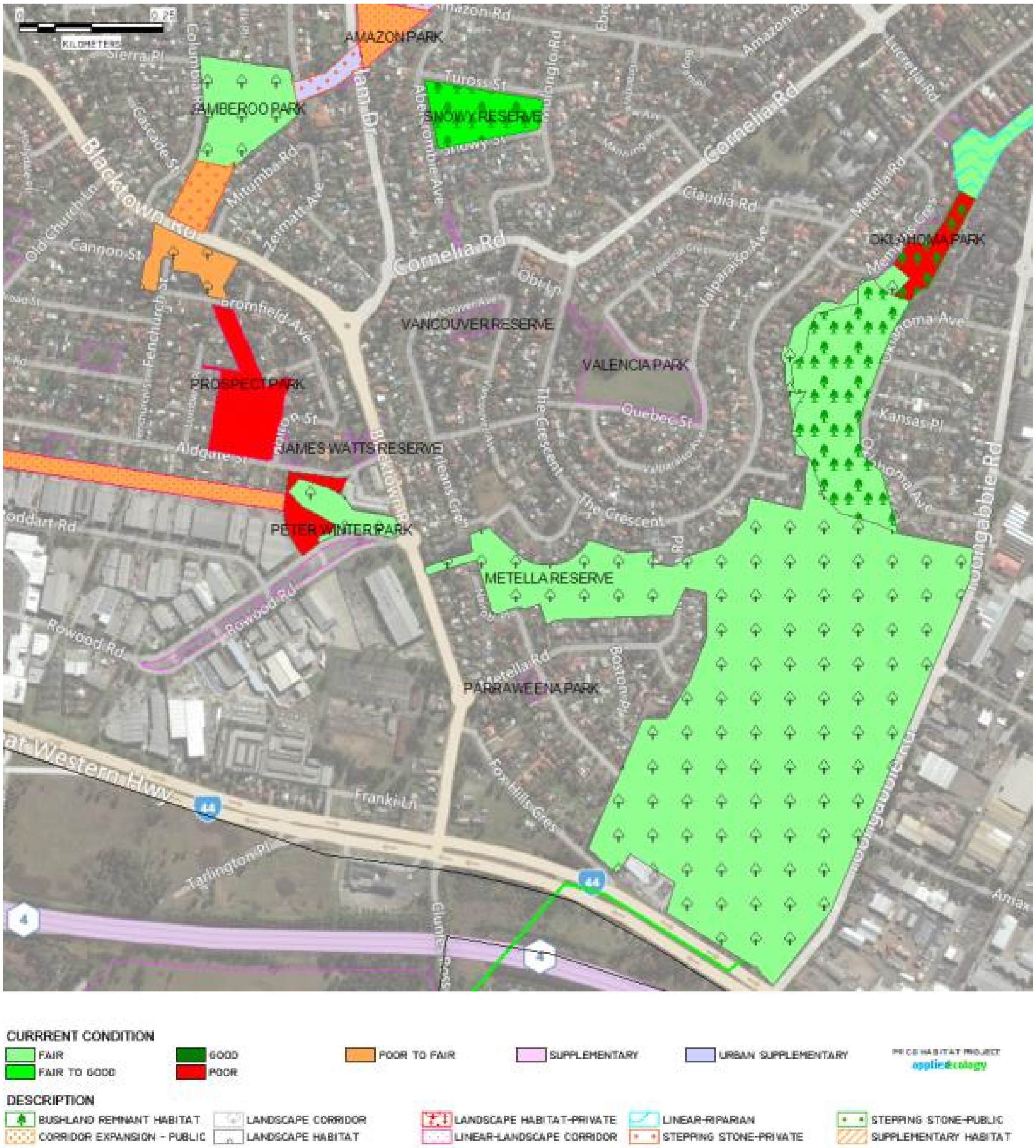
- Add nest boxes to create nesting and roosting habitat for birds
- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night
- Public education about value of connectivity corridors along existing footpath/cycleway
- Encourage community involvement by planting native shrubs and food plants in urban gardens
- Supplement existing habitat values in urban parks and reserves with clustered planting, eg adding shrubs and groundcover around existing canopy trees, establish no whip-no mow zones

Figure 83 DUNCAN PARK- CORE HABITAT AREA

Figure 84 BEST ROAD PARK LINEAR CORRIDOR

Figure 85 EEC PROVIDES GOOD HABITAT AT SNOWY RESERVE

CORRIDOR 6: (GRANTHAM RESERVE) AMAZON PARK TO PROSPECT PARK TO GREAT WESTERN HIGHWAY & TIMBERTOP.



Key outcomes

- Urban linkage via stepping stone, landscape and linear habitat corridors
- Liaise and link with neighbouring community to improve corridor outcomes
- Connect with other habitat corridors

General comments

- Target street planting of native feed trees and shrubs
- Use clustered plantings, eg with a feed tree surrounded by smaller shrubs
- Add nest boxes to create nesting and roosting habitat for birds

- Consider Noisy Miner control program
- Raise community awareness to keep cats indoors especially at night
- Encourage community involvement by planting native shrubs and food plants in urban gardens
- Supplement existing habitat values in urban parks and reserves with clustered planting, eg adding shrubs and groundcover around existing canopy trees, establish no whip-no mow zones

Figure 86 FOX HILL GOLF COURSE- EXAMPLE HABITAT ENHANCEMENT

Figure 87 GIRRAWEEN CREEK RIPARIAN CORRIDOR

Figure 88 METELLA RESERVE

CITY OF CANADA BAY COUNCIL

KEY MAP

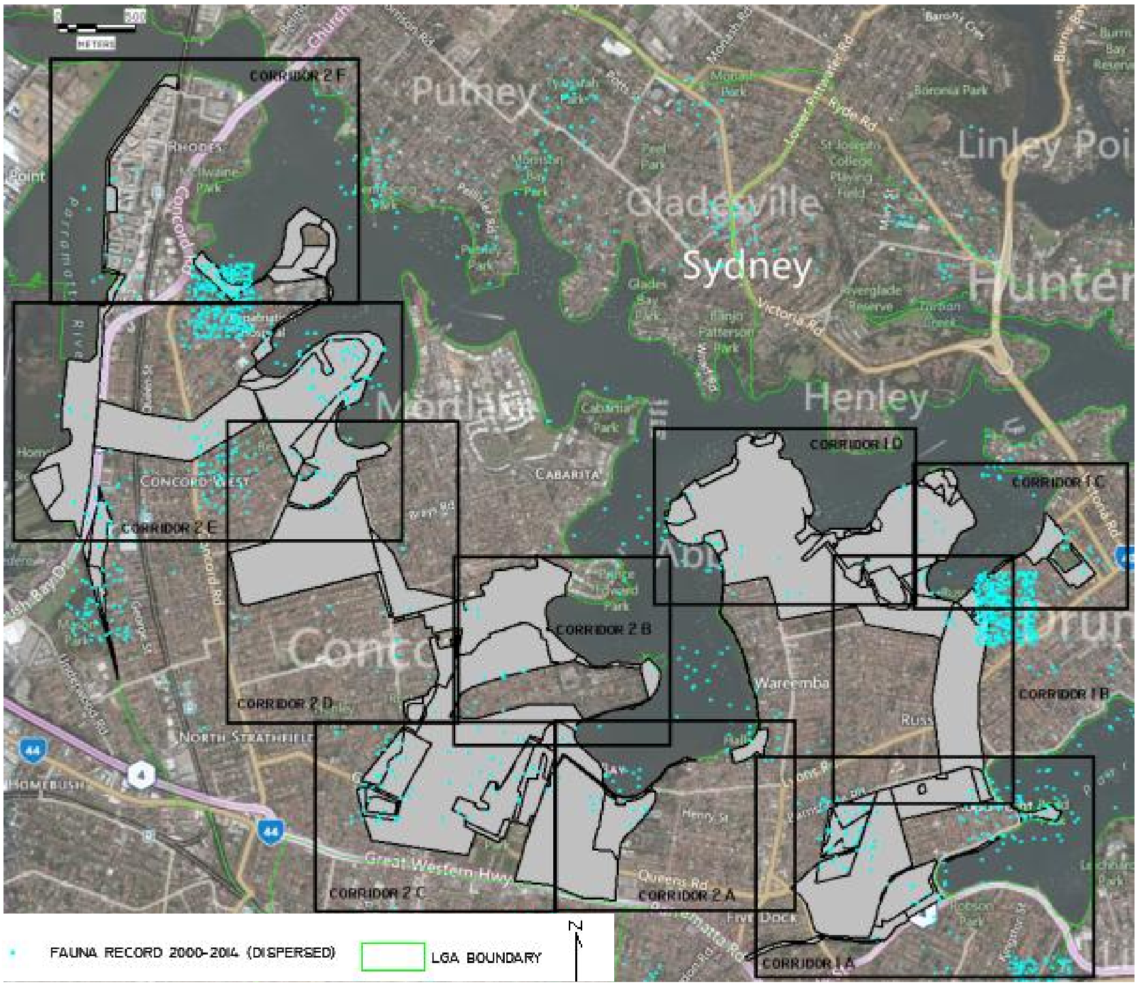


Figure 89 Rivendell unit has areas of bushland along the foreshore

CORRIDOR 1: IRONCOVE TO HEN AND CHICKEN BAY

A: PARRAMATTA RD TO RODD POINT/ NEILD PARK VIA FIVE DOCK PARK

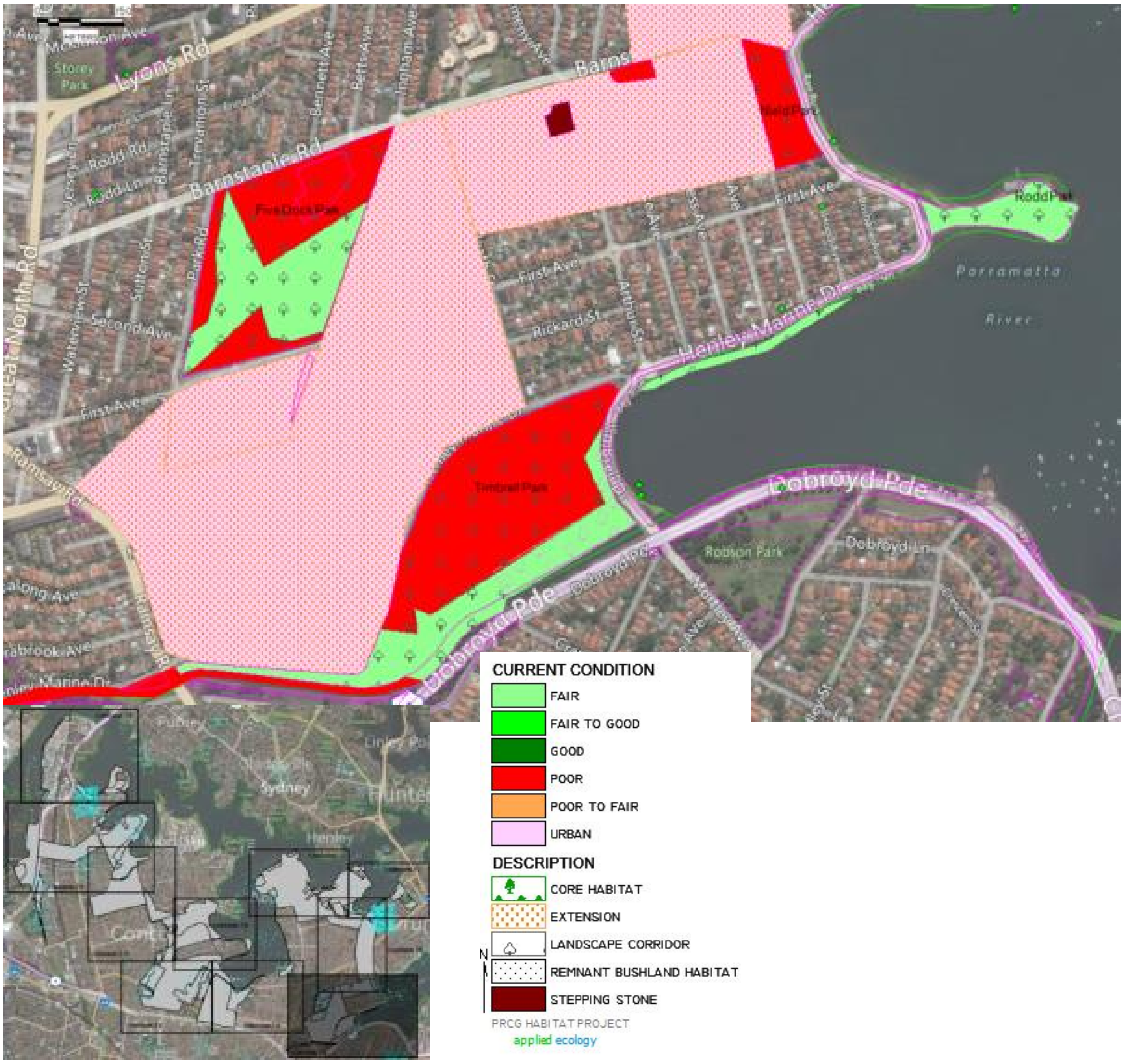


Figure 90 (left) Timbrell Park, and (right) Rodd Park

B: FIVE DOCK BAY TO NIELD PARK

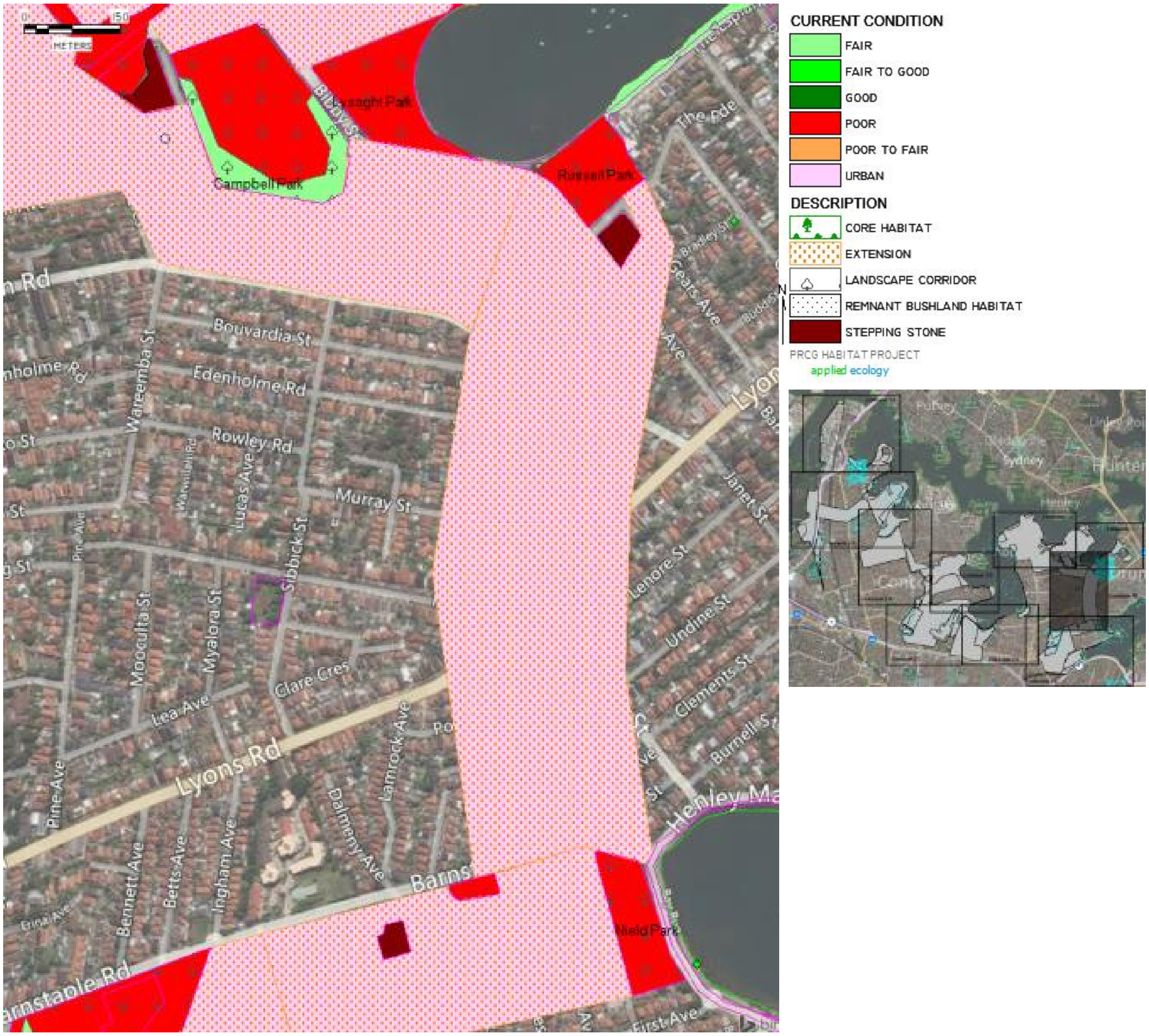
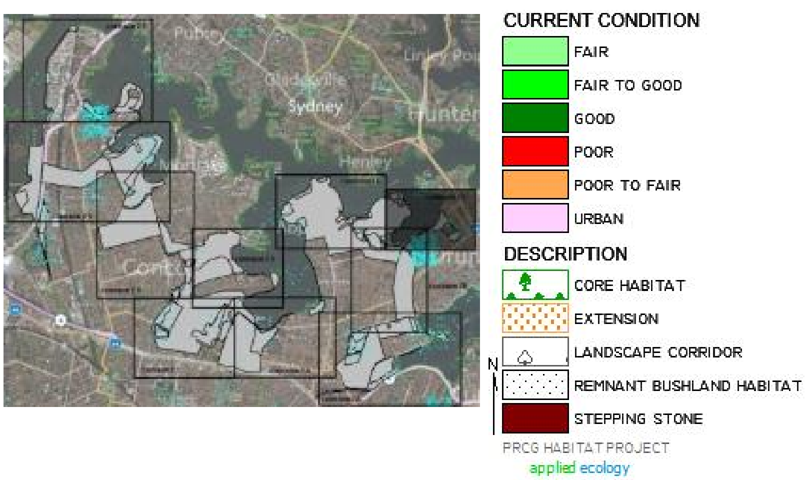


Figure 91 (left) Russell Lea Infants School, and (right) Masked Lapwings at Lysaght Park

C: CORRIDOR1 EXTENSION: TAPLIN PARK AND THE ESPLANADE



D: HEN AND CHICKEN TO ABBOTSFORD BAY

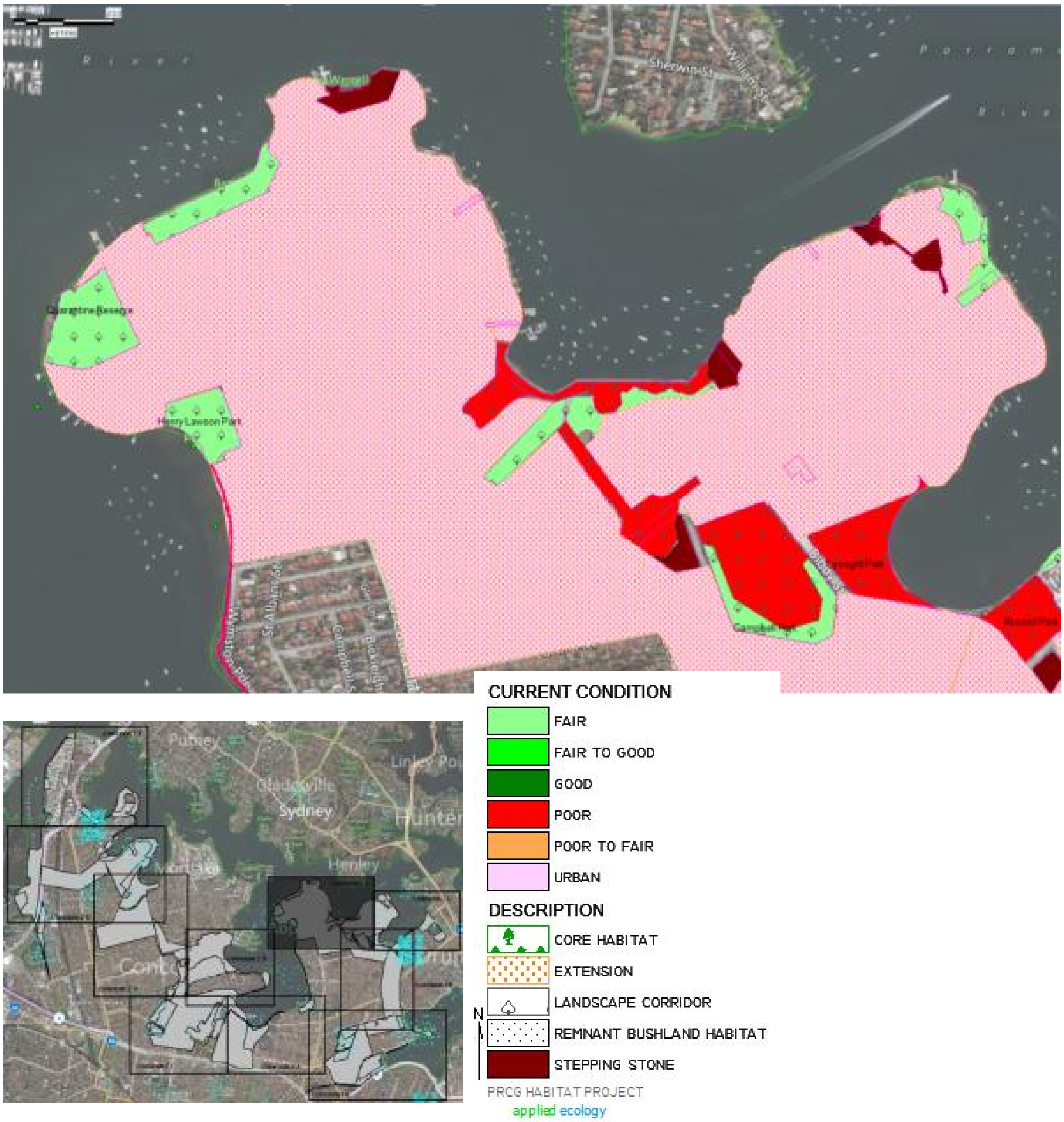


Figure 92 (left) Quarantine Reserve, and (right) Henry Lawson Park

CORRIDOR 2: KINGS BAY TO POWELLS CREEK

A: KINGS BAY TO CANADA BAY

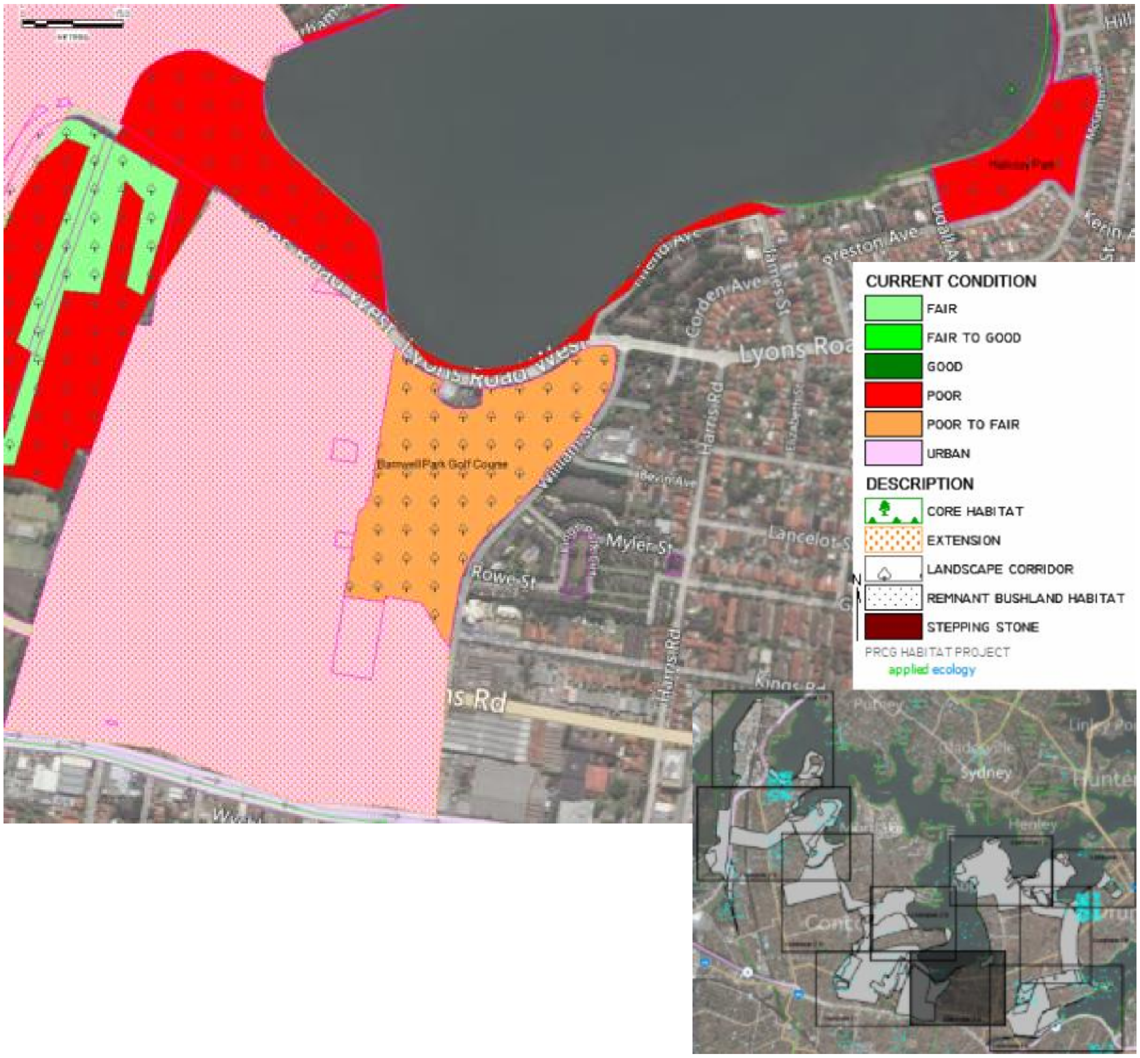
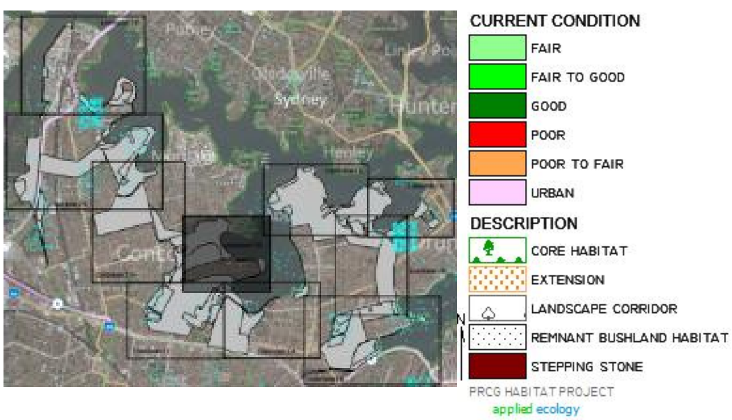


Figure 93 (left) St Lukes Park, and (right) Bramwell Park Golf Course

B: EXILE BAY & MASSEY PARK GOLF COURSE



C: KINGS BAY TO QUEEN ELIZABETH PARK

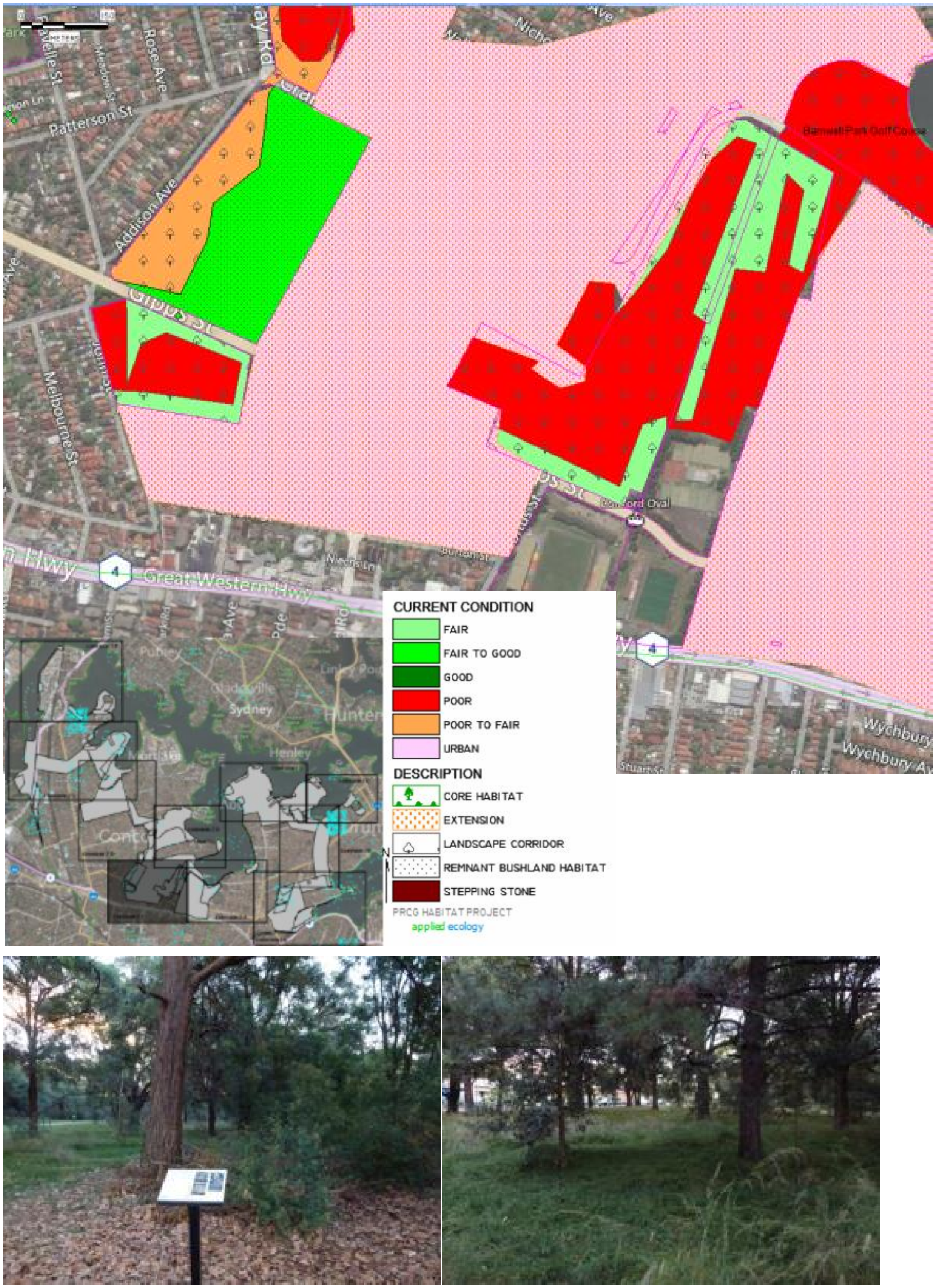
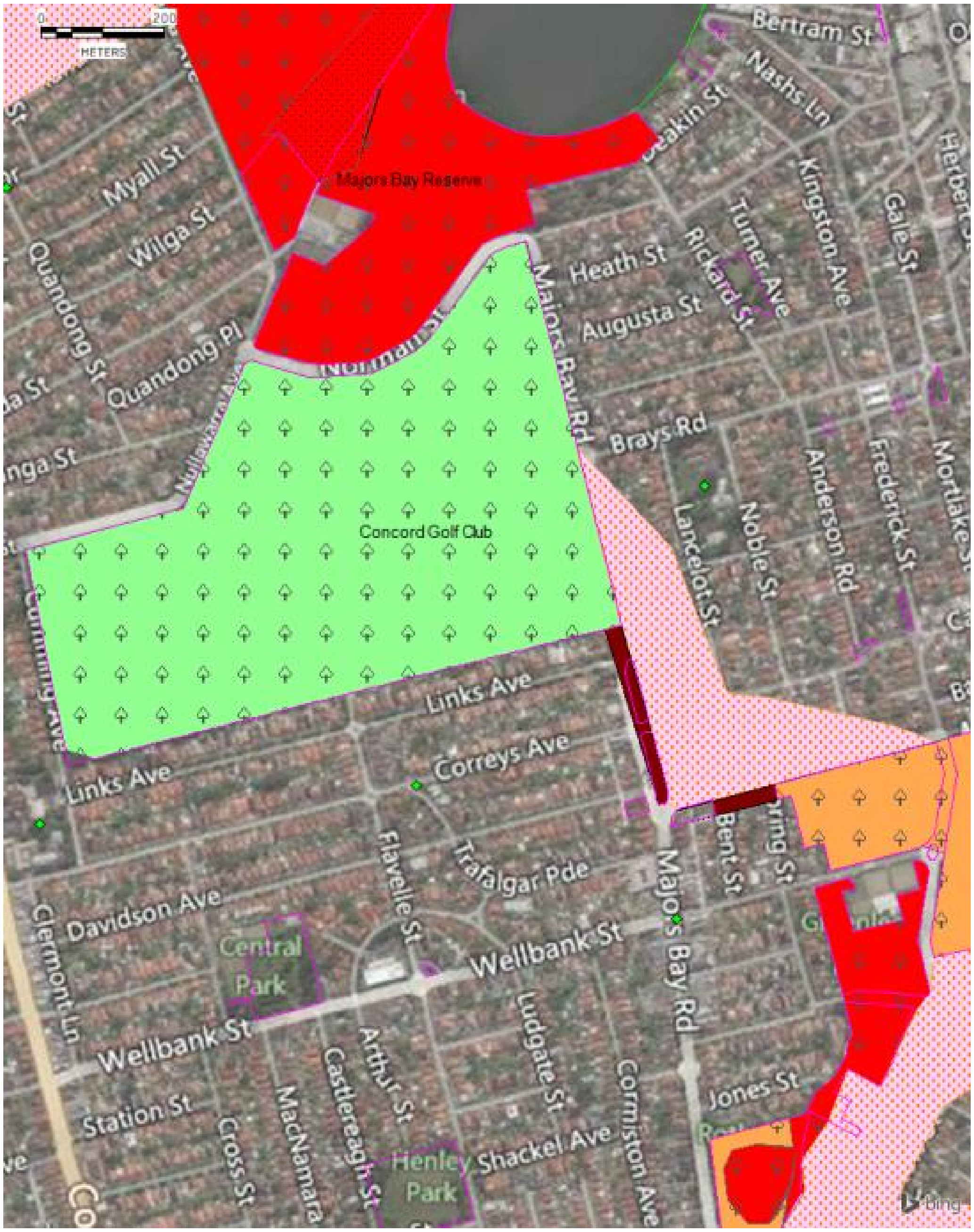
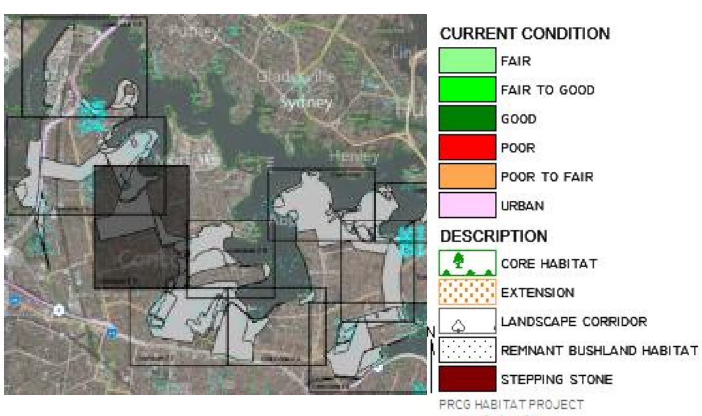


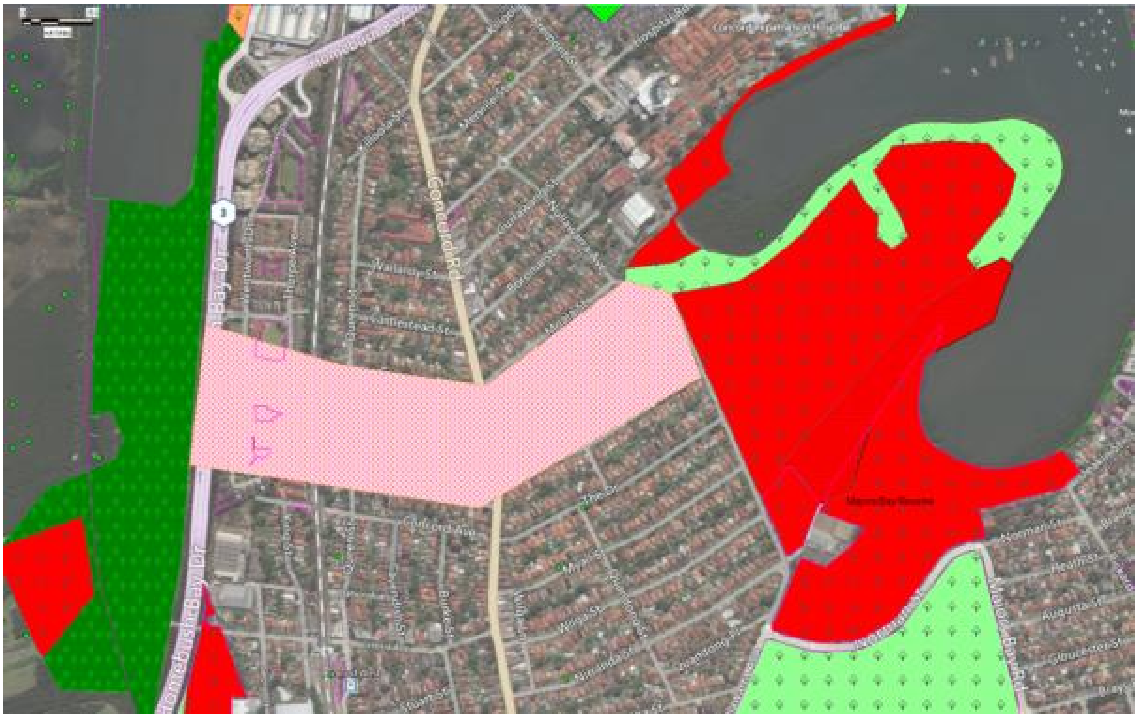
Figure 94 Queen Elizabeth Park – Sydney Turpentine Ironbark Forest

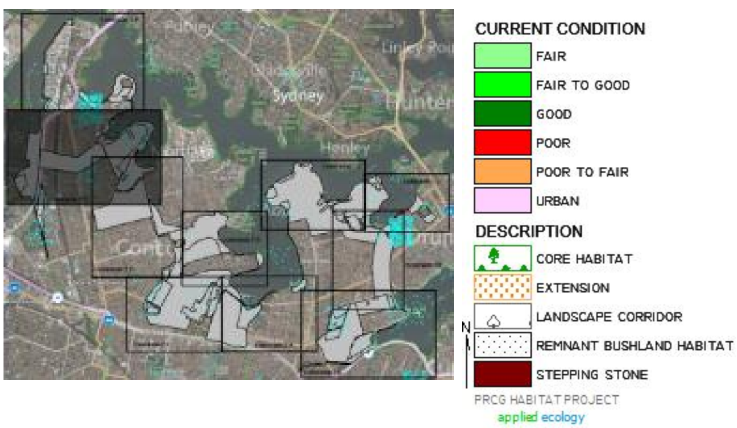
D: MAJORS BAY TO MASSEY PARK GOLF COURSE



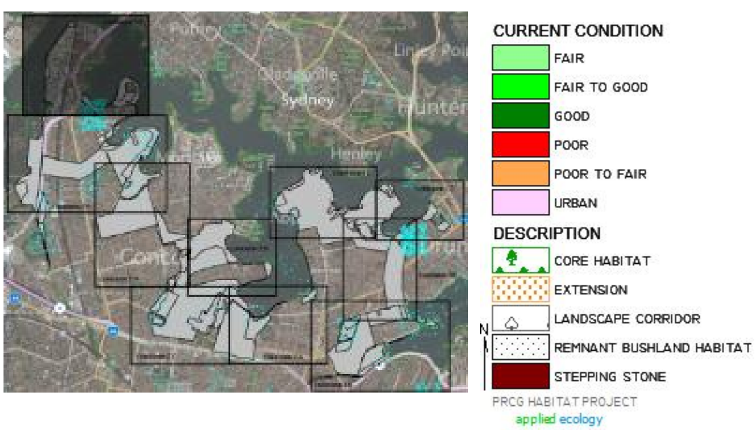


E: MAJORS BAY TO BICENNTENNIAL PARK





E: RHODES PARK TO PORTERS CREEK



PARRAMATTA CORRIDORS

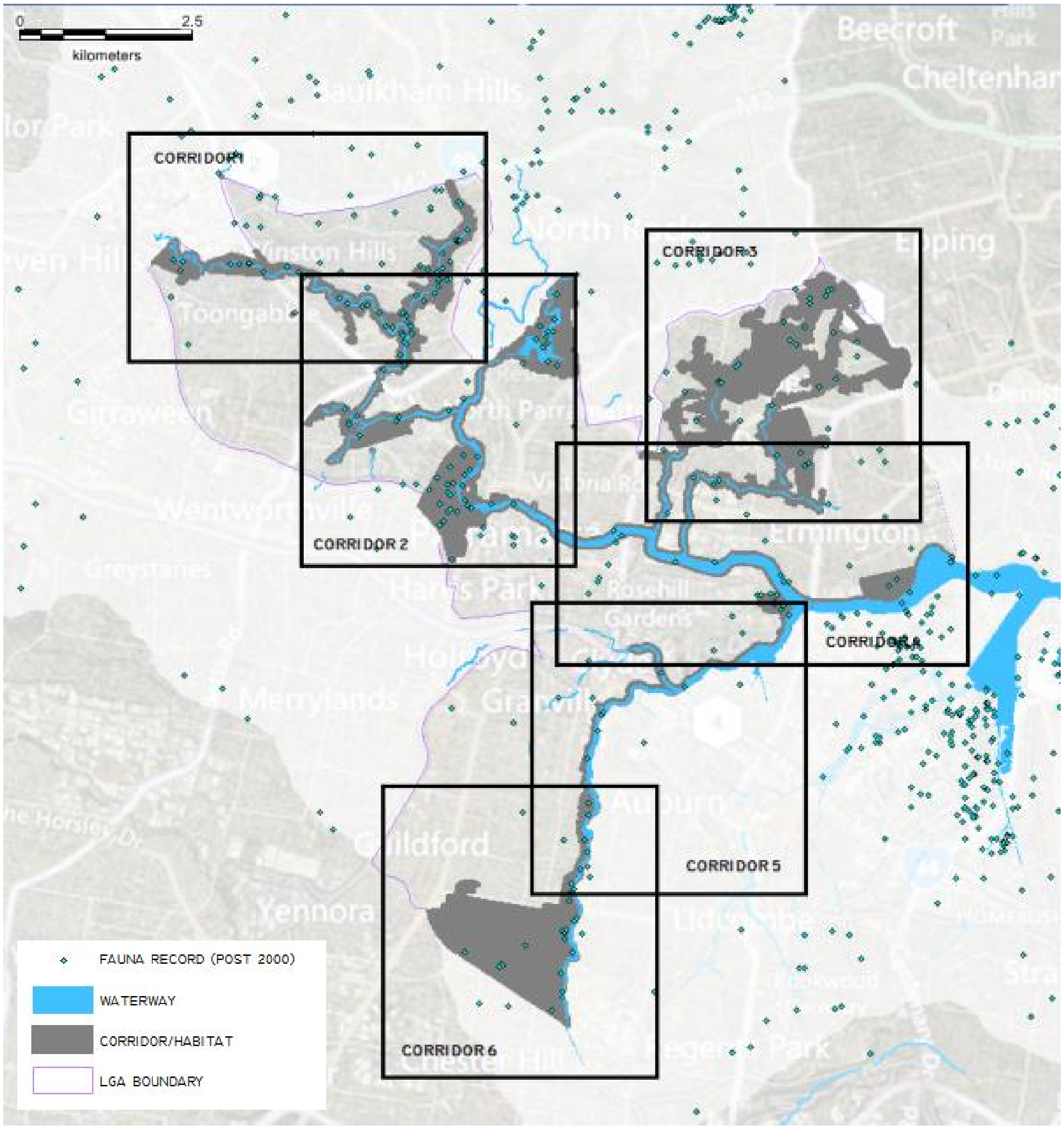


Figure 95 KEY MAP

CORRIDOR 1: TOONGABBIE CREEK –QUARRY BRANCH

McCoy Park to Bundilla forest and Model Farms Reserve – Toongabbie Creek – Quarry Branch

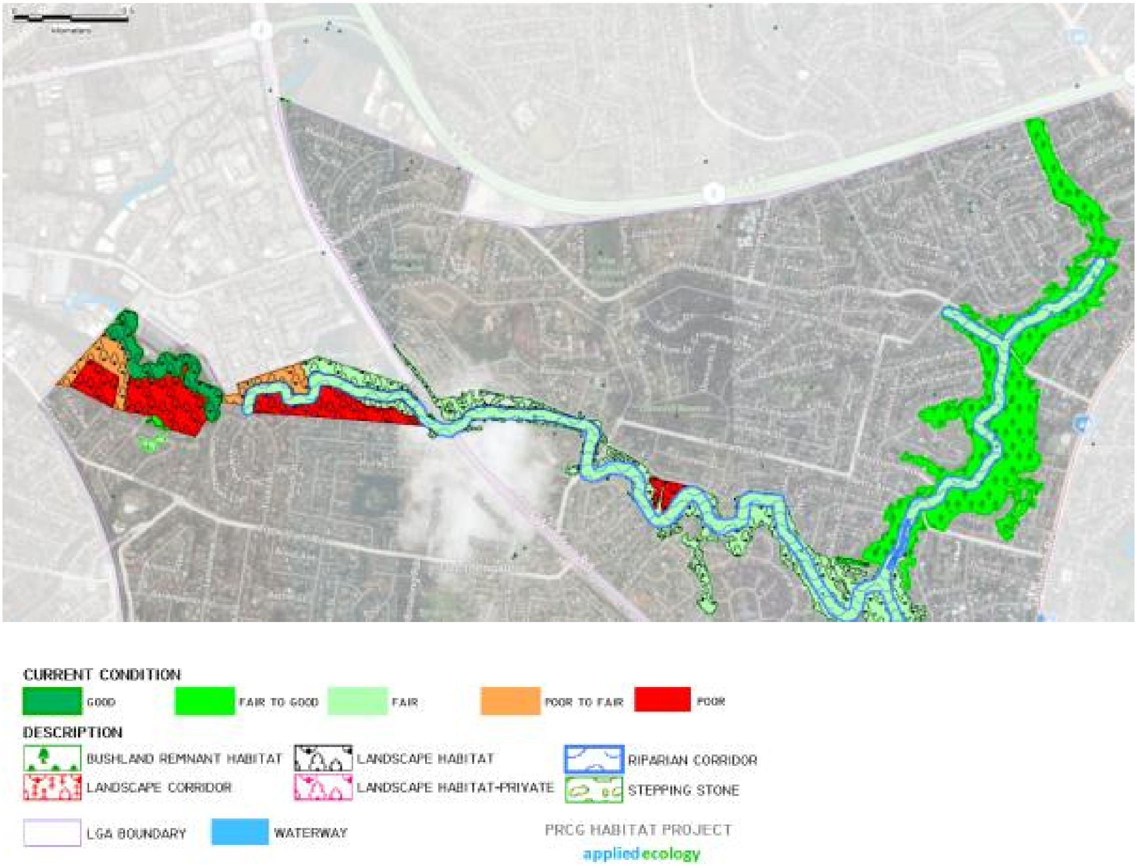


Figure 96 Toongabbie Creek – Quarry Branch

Figure 97 (left) Backhousia Reserve, and (right) Hammer Rd Reserve

CORRIDOR 2: TOONGABBIE CREEK TO PARRAMATTA RIVER

Robin Hood Park to Lake Parramatta Reserve And Parramatta Park

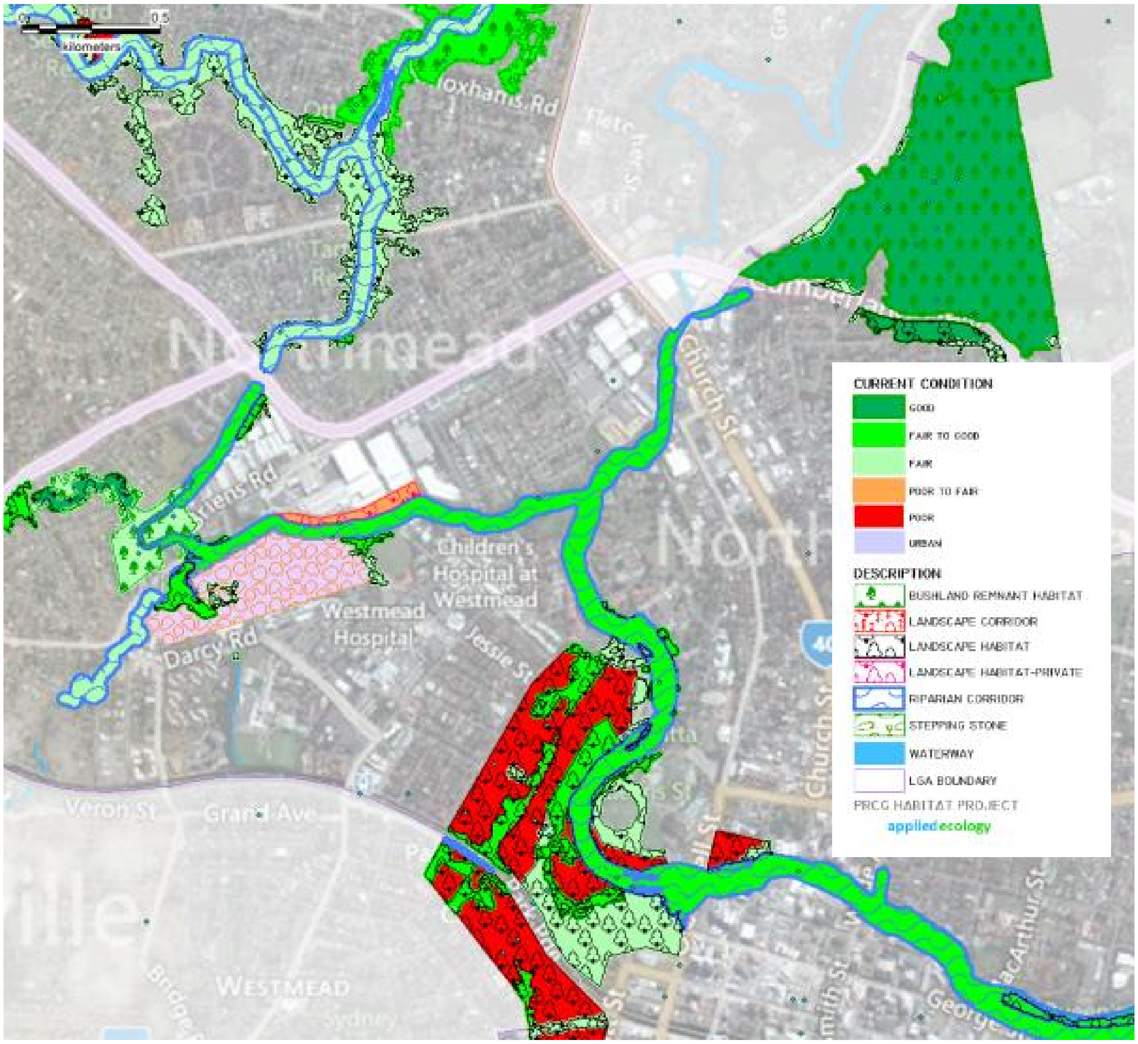


Figure 98 TOONGABBIE CREEK TO THE PARRAMATTA RIVER

Figure 99 (left) Hospital Farm Reserve, and (right) installing arboreal hair tubes at Lake Parramatta

CORRIDOR 3: THE PONDS CREEK TO VINEYARD CREEK – LINKS TO BRUSH PARK (CITY OF RYDE)

Galaringi and Eric Mobbs Memorial Park, Vineyard Creek Reserve to Ponds/Subiaco Creek Reserve

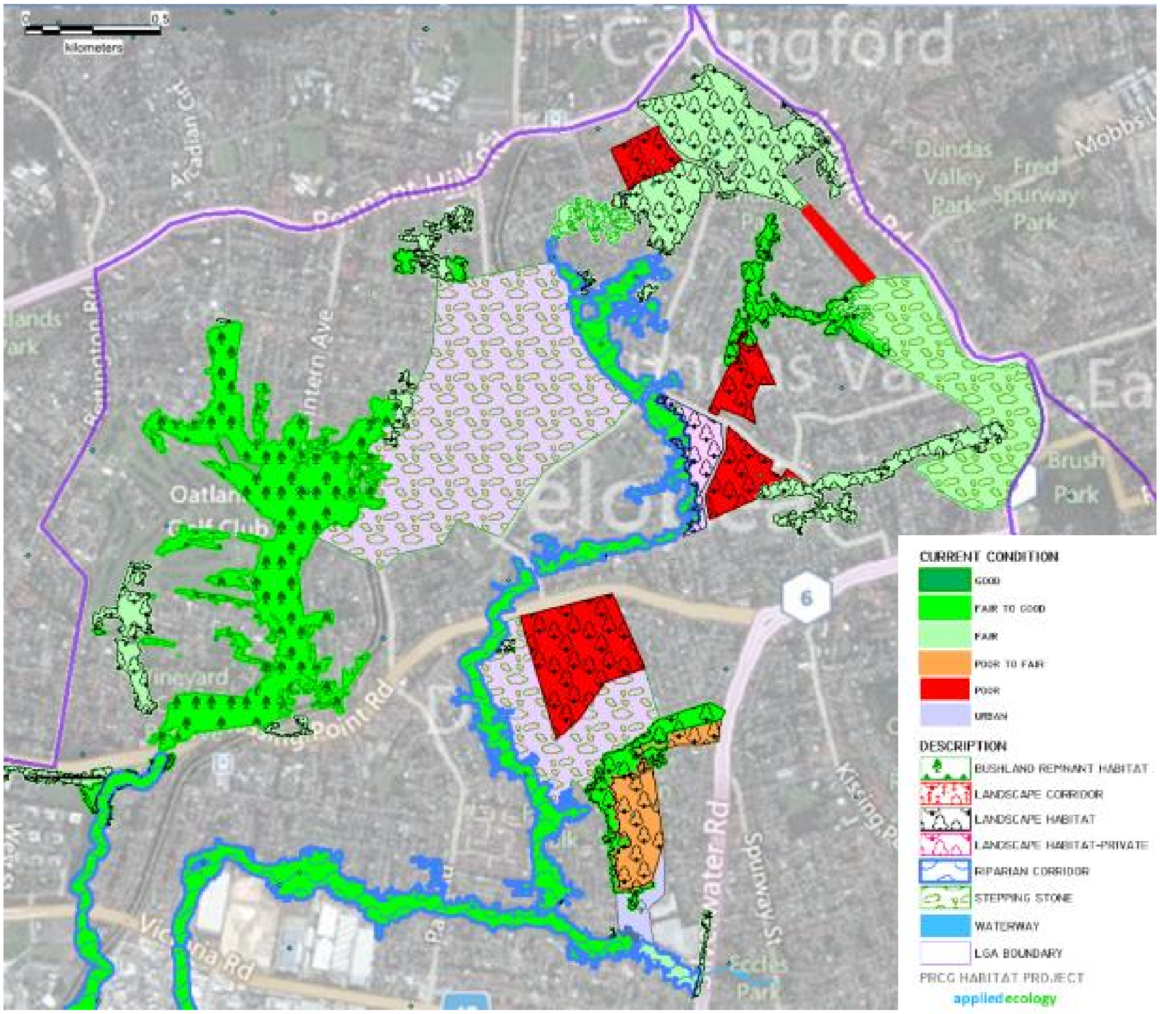


Figure 100 THE PONDS CREEK TO VINEYARD CREEK

Figure 101 (left) Vineyard Creek Reserve, and (right) Galaringi/Eric Mobbs Reserve

CORRIDOR 4: THE PARRAMATTA RIVER

Parramatta River Foreshore, George Kendall Riverside Park, Eric Primrose Reserve

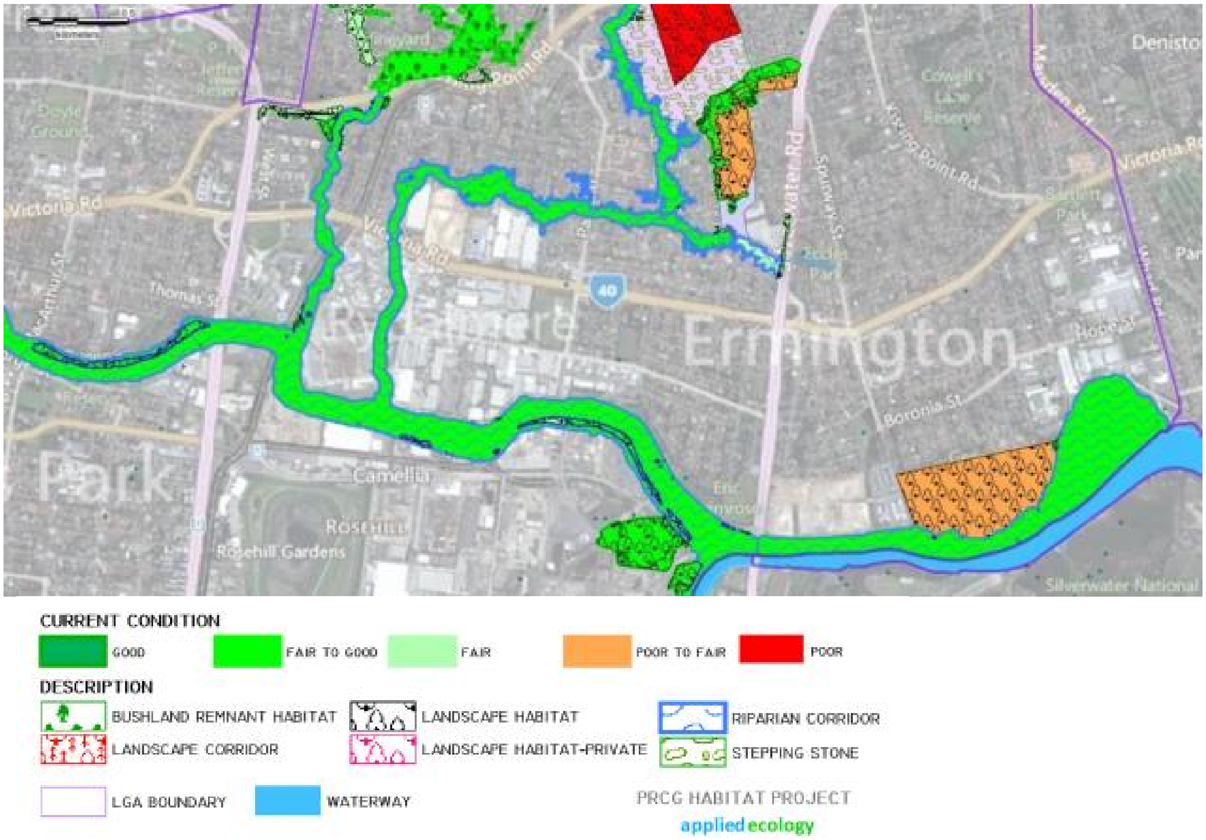


Figure 102 THE PARRAMATTA RIVER

Figure 103 (left) George Kendall Reserve, and (right) Eric Primrose Park

CORRIDOR 5: DUCK RIVER

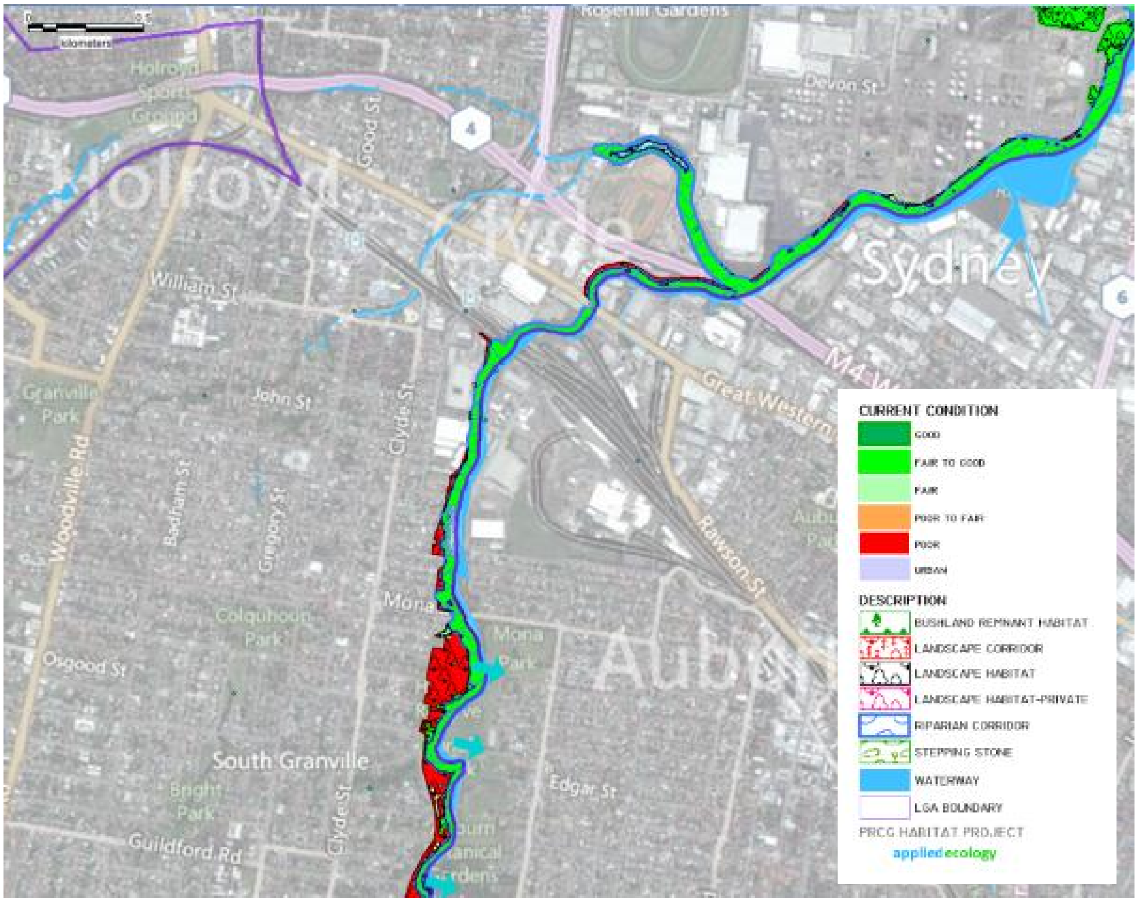


Figure 104 DUCK RIVER

Figure 105 Ray Marshall Reserve

CORRIDOR 6: UPPER DUCK RIVER

Woodville Golf Course, Campbell Hill Pioneer Reserve, Norford Park, Everley Park, Duck River Bushland Reserve

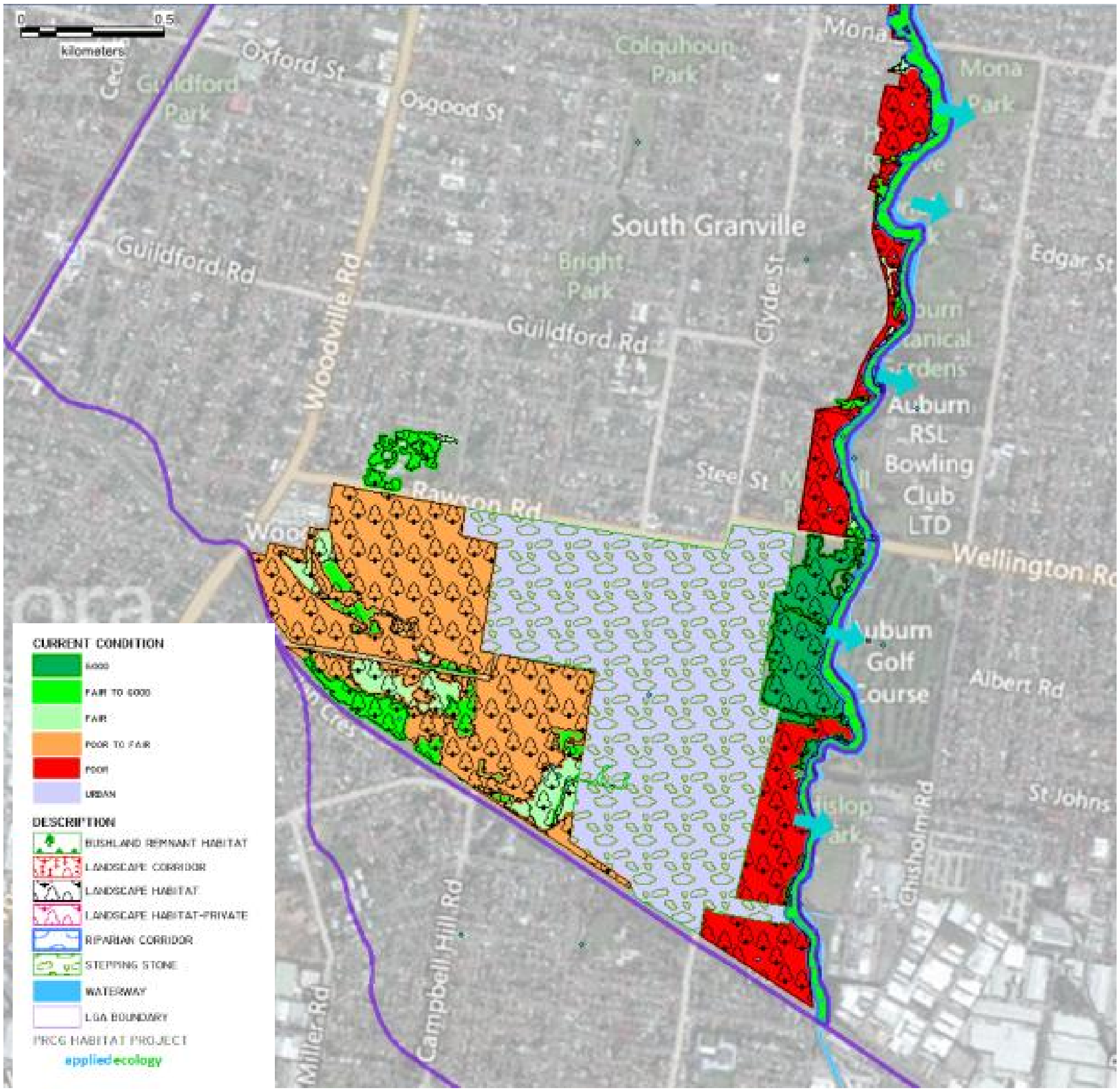


Figure 106 UPPER DUCK RIVER

Figure 107 Everly Park

Figure 108 Acacia pubescens at Duck River Bushland Reserve

APPENDIX 3: VEGETATION MANAGEMENT

LOCAL PROVENANCE AND SPECIES FOR REVEGETATION

WHEN TO REVEGETATE

Reestablishment of native vegetation serves a number of specific purposes. These include:

- Increased floristic diversity, leading to increased habitat opportunities and potential increases in fauna diversity
- Preservation of Endangered Ecological Communities, and retention of non endangered vegetation communities
- Stabilisation of soils in potential and actual erosion areas

Not all sites need revegetation, but it should be incorporated into projects where vegetation is cleared as part of streambank or channel bed stabilisation works, and areas where more than 50% of groundcover is removed as part of weed control activities, or where the floristic diversity is low following intensive or repeated disturbance.

For bushland sites, revegetation measures should be considered when:

- the regeneration potential of a site has been wholly or severely depleted
- attempts to trigger regeneration of soil-stored seed by a range of techniques have failed
- key species that are missing can not be naturally recruited to an area

In revegetation programs the aim is to use the minimum intervention necessary to re-establish natural regeneration processes. This is a sound philosophy from both a resource and ecological perspective. In relation to the vegetation communities in urban bushland it means that there is a need to be aware of the potential to oversimplify ecosystems through revegetation. It is easy, often unintentionally, to distort the natural community by introducing non-local plant material as part of revegetation projects. As a result, the valuable genetic resources of an area can be irrevocably lost.

SPECIES SELECTION AND SEED COLLECTION

'Best practice' in species selection has changed markedly over the past few decades from the simple use of Australian native species, through using only locally indigenous species, to propagating material from the particular bushland area to be planted. The use of indigenous species grown from local seed is essential for revegetation projects. These local species are adapted to the local climate and soil conditions and provide natural resources for the local wildlife.

The aim of restoration projects should be to repair and enhance. They should not impair the site's ecological values in order to simplify the restoration process. The increasing use of propagated and planted material, the pressure for quick results and the pressure for increased planting variety at the local level raise questions about maintaining genetic integrity in restoration programs.

It is generally the more easily obtained, collected and propagated species that tend to be used in revegetation projects, and these are typically canopy trees such as eucalypts and certain pioneer shrubs (often species of the family Fabaceae such as peas and wattles). Groundcovers, particularly in any quantity or diversity, are less often used.

Material for propagation is best found on-site or close to it. This is known as 'local provenance'. The use of site-adapted local seed for propagation is best for restoring pre-existing plant communities and conserving local biodiversity. It is also more likely to lead to a successful self-perpetuating plant community, as local provenant seed is adapted to local soils, climatic conditions and ecological processes.

In the manual "Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland" (DEC, 2005), the following guidelines on seed collection ranges have been developed for the Cumberland Plain bushland communities, and are based on estimated dispersal distances for various plant categories. Several of these communities are found in Berger Rd Reserve, and the following table (Table 22) provides a useful tool for estimating local provenance.

Table 22 Guidelines for seed collection ranges (with keys for range sizes, life span and population densities; DEC, 2005)

Plant categories	Collection range	Pollination by	Seed dispersal	Life span	Population density
Forbs and herbs	1	Wind Insects	Birds Insects Mammals Gravity	Short	Low-high
Wattles	1	Insects Birds Mammals	Insects Gravity	Short-medium	Low-high
Peas	1	Self Birds Insects	Insects Gravity	Short-medium	Low-high
Orchids and lilies	1	Insects	Wind	Short-medium	Low-medium
Ferns and allies*	1	Spores: no pollination	Wind	Short-long	Low-medium
Heaths and understorey shrubs	2	Insects Wind Birds Possibly self	Insects Gravity	Short	Low-high
Daisies	2	Insects	Wind	Short-medium	Low-high
Grasses	2	Wind	Wind	Short	High
Fleshy fruit plants (not trees), e.g. *Dianella*, *Exocarpus*	2	Birds Bats Other mammals Insects	Birds Bats Other mammals	Medium	Low-high
Banksias	2	Birds Mammals Insects	Wind Gravity	Medium-long	Low-medium
Casuarinas and conifers	2	Wind	Wind Birds Gravity	Long	Low-high
Eucalyptus, Angophora, Syncarpia, Callistemon	2	Birds Bats Other mammals Insects	Wind Gravity	Medium-long	Low-high
Trees with fleshy fruits	3	Birds Bats Other mammals Insects	Birds Bats Other mammals	Long	Low-medium

* Ferns and allies are a special case because of their reproductive physiology. You may need to check how each species interchanges genetic material.

Collection ranges	Guideline for seed collection
1	Crucial to collect as locally as possible from remnant or adjacent (same vegetation and microclimate).
2	Collect locally but can extend to nearby remnants that were formerly contiguous. For small plant populations, use general principles.
3	Can collect widely, but preferably not beyond subivisions of the state.

Life span		Population densities
Short (Years, including annuals)	Low	< 10 plants per/ha
Medium (Decades)	Medium	10–50 plants per/ha
Long Centuries)	High	> 50 plants per/ha

Source: Hawkesbury-Nepean Catchment Management Trust Draft Provenance Protocols

Under the Threatened Species Conservation Act 1995, a licence is required when undertaking an action that is likely to 'harm' an endangered ecological community. This definition includes collecting seed from such a community, and licensing provides a mechanism for addressing the dangers of over-collection. A useful checklist for seed collection includes (adapted from DEC, 2005):

- A self-perpetuating plant community is promoted by the use of site-adapted endemic propagation material.
- Seed collection should be carried out within the framework of a formal seed collection policy or code of practice. The Model Code of Practice for Community Based Collectors and Suppliers of Native Plant Seed (1999) by FloraBank is the most recent and can be found on the FloraBank website at www.florabank.org.au
- Collectors need to meet requirements under the Threatened Species Conservation Act 1995 including a section 91 licence from DEC when seed is collected from a plant community that is listed under the Act. Many plant communities in the Sutherland Shire have been listed.
- Seed should be collected on a project-by-project basis with the amounts collected based on the requirements of that project. Do not aim to stockpile seed.
- The proportion of seed taken from any one site should only be 10 per cent of a species' total annual seed crop from that site.
- Collectors require a clear understanding of the provenance range and vegetation communities involved.
- Collectors need to be aware that some species are protected under Schedule 13 of the National Parks and Wildlife Act 1974 and that it is an offence to pick these plants.

REVEGETATION TECHNIQUES

The success of any revegetation program depends largely on selection of the appropriate plant species and the appropriate techniques. Natural regeneration, direct seeding and planting of seedlings are the three main techniques used in revegetation. Each technique has advantages and factors to consider when deciding whether it is suitable. Some techniques are specialised for specific environments and purposes while others have broader uses. Often, a range of techniques are applied to the one site, so that site conditions and project size are matched with the most suitable technique(s).

This section provides a guide to the selection of appropriate techniques for revegetation, based on site and project requirements. These techniques fall broadly into the following groups (Table 23):

1. Natural regeneration: Germination of seedlings from seed fall from existing or nearby vegetation, from the soil seedbank or from seeds brought in by birds and animals.
2. Direct seeding: Sowing seeds directly onto the site on which you wish to establish them by mechanical or hand methods.
3. Planting: Planting nursery-grown seedlings such as cell or tube-grown plants by mechanical or hand methods.

Table 23 Guide to the selection of revegetation techniques (Greening Australia, 2008)

SITE INFORMATION AND PURPOSE(S) OF REVEGETATION	REVEGETATION TECHNIQUE				
	Natural regeneration	Direct seeding by machine	Direct seeding by hand	Planting by machine	Planting by hand
Soil type					
Sands	•	•	•	•	•
Non wetting sands	•	With spray mulches, Rodden Scalping Seeder, Rippa Seeder			
Light soils	•	•	•	•	•
Heavy clays	•	Burford or Eco Seeder with gypsum	•		•
Sticky clays	•	•			•
Cracking clays	•	•			•
Heavy wet soils in high rainfall	•	Mouldboard Plough & Rippa Seeder	Mouldboard Plough		•
Saline	•	M-Profile mounding			
Environment					
Flats	•	•	•	•	•
Light granitic hills	•	•	•		•
Rocky or stony country	•	Burford / Hamilton Tree Seeder	•		•
Waterlogged	•	M-Profile mounding			
Hard to access rocky hill tops	•		•		•
Steep hills	•	Burford Tree Seeder, Rippa Seeder, Dozer Terracing	•		•
Intact remnants and ground flora (i.e. low degree of disturbance desired)	•		•		•
Riparian	•		•		•
Isolated dead trees	•	•	•		•
Scale of works					
Broadscale	•	•		•	
Medium (e.g. belts)	•	•	•	•	•
Small scale or spots	•		•		•
Desired end result					
Random or natural	•	•	•		•
Uniform spacings			•	•	•
Input level					
Time efficient	•	•			
Labour efficient	•	•			
Low cost	•	•			
Low equipment input	•	•			
High community involvement					
			•		•
Low machinery access					
	•		•		•
Types of species being used					
Rare	•				•
Understorey	•				•
Readily available	•	•	•	•	•

• = technique is relevant / appropriate

A combination of techniques is often used to successfully re-establish vegetation. For example, seedlings can be used in conjunction with direct seeding to accommodate flowering times or light and water different needs of local species. Seedlings of species such as Acacias and other colonizing species can improve soil conditions so that they are more suitable for the establishment of secondary and subsequent species.

For more information on seed collection and local provenance ranges, reference should be made to the relevant Florabank Guidelines (see below).

FLORABANK GUIDELINES

Florabank has developed a series of 10 guidelines which provide the current best practice for Australian native seed collection and use. First published in 1999-2000, they have been updated at regular intervals to reflect changes in our understanding of Australia's flora.

The following guidelines which apply to native seed collection for this project:

- **FloraBank Code of Practice**: Model code of practice for community-based collectors and suppliers
- **Guideline 4: Keeping records on native seed**: What records you should keep about seed has been collected or stored, how to keep them by hand or on computer to a standard.
- **Guideline 5: Seed collection from woody plants for local revegetation**: A working approach to collecting good seed for revegetation including strategies to maximise genetic quality of seed collected, issues about provenance (seed origin), local and non-local collections.
- **Guideline 6: Native seed collection methods**: An overview of how to approach seed collection and the manual and mechanical methods to use.
- **Guideline 10 - Seed collection ranges for revegetation**: This guideline is about collecting local seed for revegetation and builds on our previous publication on the topic, FloraBank Guideline 5: Seed collections from woody plants for local revegetation. It is primarily intended for people who have a regional role in carrying out revegetation, regeneration or the rehabilitation of degraded sites, perhaps advising others about these activities.

The best rule of thumb is to keep distances between collection point and revegetation site to a minimum, and match soil types, topography and elevation as closely as possible.

PLANT SPECIES LISTS FOR REVEGETATION

In 2009 the SMCMA prepared the Draft Native Vegetation of the Sydney Metropolitan SMCMA Region. This report provides a comprehensive description of each vegetation community in the Sydney Basin. The description provides an overview of the environmental characteristics of the community, in particular soil or geology type, elevation gradients and/or climatic features and spatial distribution within the study area. It may also describe prominent (and conspicuous) plant species found in the community using common names where available.

As well, a floristic summary reports average height ranges for each vegetation layer in the community, average projected foliage cover, and typical species. Notes on conservation status for the community are also provided, along with relationship to other vegetation communities. A table of diagnostic species for the community is provided, and is based on site sample data for sites with this community, contrasted with all the other vegetation communities. A species is considered to be diagnostic if it is frequently present in this community and not as frequently present in other communities. A species that is present across a range of communities is considered to be uninformative in defining the community.

This list of species was used as the basis for revegetation species lists for this project. A species that is diagnostic for the community is considered a core species for revegetation, while a species that is considered uninformative whilst being present in more than 20% of sites surveyed with this vegetation community is listed as additional species for revegetation, and provides a greater – but still relevant – diversity for that community on the site.

VEGETATION COMMUNITIES IN PARRAMATTA RIVER CATCHMENT

A total of 26 native vegetation communities are currently recorded from the Parramatta River catchment area. This includes 13 communities that are protected under the NSW Threatened Species Conservation Act 1995 as Endangered Ecological Communities. Of these, 4 are afforded further protection under federal legislation (EP&BC Act) as nationally endangered communities.

An additional 5 non native vegetation communities are also noted as present.

VEGETATION COMMUNITY (OEH, 2013)	NSW ENDANGERED ECOLOGICAL COMMUNITY	FEDERAL ENDANGERED ECOLOGICAL COMMUNITY	AREA IN CATCHMENT
Sydney Turpentine-Ironbark Forest	Sydney turpentine-ironbark forest	Sydney Turpentine Ironbark Forest of the Sydney Basin Bioregion	309.75
Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	124.75
Castlereagh Ironbark Forest	Cooks River/Castlereagh ironbark forest in the Sydney Basin Bioregion		60.82
Cumberland Shale Hills Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	7.74
Cumberland Riverflat Forest	River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions		61.11
Estuarine Saltmarsh	Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions		26.17
Estuarine Mangrove Forest			146.44
Estuarine Swamp Oak Forest	Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions		27.56
Cumberland Swamp Oak Riparian Forest	River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions		13.03

VEGETATION COMMUNITY (OEH, 2013)	NSW ENDANGERED ECOLOGICAL COMMUNITY	FEDERAL ENDANGERED ECOLOGICAL COMMUNITY	AREA IN CATCHMENT
Coastal Freshwater Wetland	Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions		2.9
Coastal Sandstone Gallery Rainforest			19.28
Coastal Enriched Sandstone Moist Forest			171.61
Coastal Enriched Sandstone Dry Forest			266.48
Coastal Sandstone Gully Forest			5.42
Hornsby Enriched Sandstone Exposed Woodland			14.13
Blue Gum High Forest	Blue Gum High Forest in the Sydney Basin Bioregion	Blue Gum High Forest of the Sydney Basin Bioregion	184.3
Coastal Shale-Sandstone Forest			103.35
Estuarine Reedland			1.56
Coastal Sandstone Foreshores Forest			17.56
Sydney Foreshores Shale Forest			1.46
Coastal Flats Swamp Mahogany	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner		1.23

VEGETATION COMMUNITY (OEH, 2013)	NSW ENDANGERED ECOLOGICAL COMMUNITY	FEDERAL ENDANGERED ECOLOGICAL COMMUNITY	AREA IN CATCHMENT
Forest	bioregions		
Castlereagh Scribbly Gum Woodland	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion		0.84
Riverflat Paperbark Swamp Forest	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions		0.61
Coastal Headland Banksia Heath			2.17
Coastal Warm Temperate Rainforest			2.61
Seagrass Meadows			5.05
Rock, Sand, Built landscapes			0.01
Artificial Wetlands			32.98
Urban Native and Exotic Cover			1542.76
Weeds and Exotics			188.74
Plantations			59.84

Supplementary planting (revegetation) species lists have been prepared for the main communities – excluding those communities that have a mapped area within the catchment of less than 1ha, are wholly marine, or are highly degraded/modified or artificial communities. These are provided in the following sections of this appendix.

SUPPLEMENTARY PLANTING FOR HABITAT EXTENSION

Use a mixture of trees, shrubs, grasses and herbs to increase diversity and availability of food and other habitat resources. Use species with a range of flowering and fruiting seasons to provide year-round resources. Combine revegetation with weed control activities, and the management of reserves to promote fauna habitat, such as establishment of “no whip/no mow” zones (see section on MANAGEMENT ACTIONS FOR FAUNA in this report).

Identify appropriate vegetation community and select plant species from the following tables for each community listed in the previous table.

Sydney Turpentine Ironbark Forest (EEC)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 24. Flowering times for plants found in Sydney Turpentine Ironbark Forest (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina littoralis	Y		Y	Y
Allocasuarina torulosa				Y
Angophora costata	Y	Y		
Angophora floribunda	Y	Y		
Elaeocarpus reticulatus	Y			
Eucalyptus fibrosa		Y		
Eucalyptus globoidea			Y	Y
Eucalyptus paniculata subsp. paniculata	Y	Y	Y	
Eucalyptus pilularis		Y		
Eucalyptus punctata		Y	Y	
Eucalyptus resinifera	Y	Y		
Eucalyptus saligna		Y		
Syncarpia glomulifera	Y	Y		
SHRUBS				
Acacia decurrens	Y			Y
Acacia falcata				Y
Acacia floribunda				Y
Acacia implexa		Y	Y	
Acacia linifolia		Y	Y	
Acacia longifolia subsp. longifolia		Y		
Acacia myrtifolia				Y
Acacia parramattensis		Y		
Acacia ulicifolia			Y	Y
Backhousia myrtifolia	Y	Y		
Breynia oblongifolia	Y	Y	Y	Y
Bursaria spinosa		Y	Y	
Clerodendrum tomentosum	Y			
Correa reflexa	Y			Y
Dodonaea triquetra	Y	Y		
Exocarpos cupressiformis		Y		
Hakea sericea	Y			Y
Homalanthus populifolius	Y			
Kunzea ambigua		Y		
Leucopogon juniperinus	Y			Y
Lomatia silaifolia		Y		

SPECIES NAME	**SPRING**	**SUMMER**	**AUTUMN**	**WINTER**
Maytenus silvestris		Y		
Notelaea longifolia			Y	Y
Ozothamnus diosmifolius	Y	Y		
Persoonia linearis		Y	Y	Y
Pimelea linifolia	Y	Y	Y	Y
Pittosporum revolutum	Y			
Pittosporum undulatum	Y			
Platylobium formosum	Y			
Polyscias sambucifolia		Y		
Zieria smithii	Y			
GRASSES/GROUNDCOVERS				
Aristida vagans		Y	Y	
Austrodanthonia tenuior	Y	Y		
Austrostipa pubescens	Y	Y	Y	
Austrostipa rudis	Y	Y	Y	
Cheilanthes sieberi subsp. sieberi	N/A			
Cymbopogon refractus	Y	Y	Y	Y
Dianella caerulea		Y		
Dianella longifolia		Y		
Dianella revoluta var. revoluta		Y		
Dichelachne micrantha	Y	Y	Y	
Dichondra repens	N/A			
Digitaria parviflora	Y	Y	Y	
Echinopogon caespitosus var. caespitosus	Y	Y		
Echinopogon ovatus	Y	Y		
Entolasia marginata	Y	Y	Y	
Entolasia stricta	Y	Y	Y	
Eragrostis leptostachya	Y	Y		
Hibbertia aspera subsp. aspera	Y			
Hibbertia dentata	Y	Y		
Lomandra filiformis	Y			
Lomandra longifolia	Y			
Lomandra multiflora	Y			
Oplismenus aemulus	Y	Y		
Oplismenus imbecillis	Y	Y		
Pratia purpurascens	Y	Y	Y	
Pseuderanthemum variabile	Y	Y		
Themeda australis	Y	Y	Y	
VINES/CREEPERS				
Billardiera scandens	Y			
Clematis aristata	Y			
Clematis glycinoides var. glycinoides	Y			
Desmodium rhytidophyllum	Y	Y	Y	

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Desmodium varians	Y	Y	Y	
Eustrephus latifolius	Y			
Glycine clandestina	Y	Y		
Glycine microphylla	Y	Y		
Glycine tabacina	Y	Y		
Kennedia rubicunda	Y	Y		
Morinda jasminoides	Y	Y		
Pandorea pandorana	Y			
Parsonsia straminea		Y		
Smilax glyciphylla	Y	Y		
Tylophora barbata		Y		

Blue Gum High Forest (EEC)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 25. Flowering times for plants found in Blue Gum High Forest (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina torulosa				Y
Alphitonia excelsa		Y	Y	
Angophora costata	Y	Y		
Angophora floribunda	Y	Y		
Elaeocarpus reticulatus	Y			
Eucalyptus paniculata subsp. paniculata	Y	Y	Y	
Eucalyptus pilularis		Y		
Eucalyptus resinifera	Y	Y		
Eucalyptus saligna		Y		
Melia azedarach			Y	
Syncarpia glomulifera	Y	Y		
SHRUBS				
Acacia decurrens	Y			Y
Acacia floribunda				Y
Acacia implexa		Y	Y	
Acacia parramattensis		Y		
Acmena smithii		Y		
Breynia oblongifolia	Y	Y	Y	Y
Bursaria spinosa		Y	Y	
Callistemon salignus	Y	Y		
Clerodendrum tomentosum	Y			
Dodonaea triquetra	Y	Y		
Glochidion ferdinandi	Y	Y	Y	Y

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Homalanthus populifolius	Y			
Indigofera australis	Y			
Leucopogon juniperinus	Y			Y
Maytenus silvestris		Y		
Myrsine variabilis				Y
Notelaea longifolia			Y	Y
Ozothamnus diosmifolius	Y	Y		
Pittosporum revolutum	Y			
Pittosporum undulatum	Y			
Polyscias sambucifolia		Y		
Trema tomentosa		Y		
Zieria smithii	Y			
GRASSES/GROUNDCOVERS				
Carex inversa	Y	Y		
Dianella caerulea		Y		
Dichelachne micrantha	Y	Y	Y	
Dichondra repens	N/A			
Digitaria parviflora	Y	Y		
Echinopogon caespitosus var. caespitosus	Y	Y		
Echinopogon ovatus	Y	Y		
Entolasia marginata	Y	Y	Y	
Geranium homeanum	Y	Y		
Lomandra filiformis	Y			
Lomandra longifolia	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Oplismenus aemulus	Y	Y		
Oplismenus imbecillis	Y	Y		
Plectranthus parviflorus	Y	Y	Y	
Poa affinis	Y	Y		
Pratia purpurascens	Y	Y	Y	
Pseuderanthemum variabile	Y	Y		
Rubus parvifolius	Y			
Sigesbeckia orientalis	Y	Y	Y	
Themeda australis	Y	Y	Y	
VINES/CREEPERS				
Billardiera scandens	Y			
Cayratia clematidea		Y		
Cissus antarctica		Y		
Cissus hypoglauca		Y		
Clematis aristata	Y			
Clematis glycinoides var. glycinoides	Y			
Desmodium rhytidophyllum	Y	Y	Y	
Desmodium varians	Y	Y	Y	

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Eustrephus latifolius	Y			
Geitonoplesium cymosum	Y			
Glycine clandestina	Y	Y		
Glycine microphylla	Y	Y		
Glycine tabacina	Y	Y		
Morinda jasminoides	Y	Y		
Pandorea pandorana	Y			
Passiflora herbertiana	Y	Y		
Smilax australis	Y			
Smilax glyciphylla	Y	Y		
Stephania japonica var. discolor		Y		
Tylophora barbata		Y		

Cumberland Shale Plains Woodland (Cumberland Plain Woodland EEC)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 26. Flowering times for plants found in Cumberland Shale Plains Woodland (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Angophora floribunda	Y	Y		
Eucalyptus crebra	Y	Y		Y
Eucalyptus eugenioides	Y	Y		
Eucalyptus fibrosa		Y		
Eucalyptus moluccana		Y		
Eucalyptus tereticornis	Y			Y
SHRUBS				
Acacia decurrens	Y			Y
Acacia falcata				Y
Acacia implexa		Y	Y	
Acacia parramattensis		Y		
Breynia oblongifolia	Y	Y	Y	Y
Daviesia ulicifolia	Y			
Dodonaea viscosa	Y	Y		
Exocarpos cupressiformis		Y		
Indigofera australis	Y			
Leucopogon juniperinus	Y			Y
Melaleuca decora		Y		
Ozothamnus diosmifolius	Y	Y		
GRASSES/GROUNDCOVERS				
Aristida ramosa		Y	Y	
Aristida vagans		Y	Y	
Arthropodium milleflorum	Y		Y	Y

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Austrodanthonia racemosa var. racemosa	Y	Y	Y	
Austrodanthonia tenuior	Y	Y		
Austrostipa rudis	Y	Y	Y	
Bothriochloa macra		Y	Y	Y
Brunoniella australis	Y	Y	Y	
Cheilanthes sieberi subsp. sieberi	N/A			
Chloris ventricosa	Y	Y	Y	
Cymbopogon refractus	Y	Y	Y	Y
Dianella longifolia		Y		
Dianella revoluta var. revoluta		Y		
Dichelachne micrantha	Y	Y	Y	
Dichelachne parva	Y	Y		
Dichondra repens	N/A			
Digitaria ramularis		Y	Y	
Echinopogon caespitosus var. caespitosus	Y	Y		
Echinopogon ovatus	Y	Y		
Entolasia marginata	Y	Y	Y	
Eragrostis brownii	Y	Y	Y	
Eragrostis leptostachya		Y	Y	
Euchiton sphaericus	Y			
Juncus usitatus	Y	Y		
Lachnagrostis filiformis	Y	Y		
Lomandra filiformis	Y			
Lomandra multiflora	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Opercularia diphylla	Y			
Oplismenus aemulus	Y	Y		
Panicum effusum		Y		
Panicum simile		Y	Y	
Plantago debilis		Y		
Plantago gaudichaudii	Y	Y	Y	
Plectranthus parviflorus	Y	Y	Y	
Poa labillardierei	Y	Y		
Setaria distans	Y			
Sporobolus creber	Y	Y	Y	
Sporobolus elongatus	Y	Y	Y	
Stackhousia viminea		Y		
Themeda australis	Y	Y	Y	
Tricoryne elatior	Y	Y		
VINES/CREEPERS				
Clematis glycinoides var. glycinoides	Y			
Desmodium brachypodum	Y	Y	Y	

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Desmodium rhytidophyllum	Y	Y	Y	
Desmodium varians	Y	Y	Y	
Glycine clandestina	Y	Y		
Glycine microphylla	Y	Y		
Glycine tabacina	Y	Y		
Hardenbergia violacea	Y			

Cumberland Shale Hills Woodland (Cumberland Plain Woodland)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 27. Flowering times for plants found in Cumberland Shale Hills Woodland (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Eucalyptus crebra	Y	Y		Y
Eucalyptus moluccana		Y		
Eucalyptus tereticornis	Y			Y
SHRUBS				
Acacia implexa		Y	Y	
Acacia parramattensis		Y		
Bursaria spinosa		Y	Y	
Dodonaea viscosa	Y	Y		
Senecio hispidulus	Y	Y		
Senecio quadridentatus	Y	Y	Y	
Sida corrugata	Y	Y	Y	
GRASSES/GROUNDCOVERS				
Aristida ramosa		Y	Y	
Aristida vagans		Y	Y	
Arthropodium milleflorum	Y		Y	Y
Asperula conferta	Y			
Austrodanthonia racemosa var. racemosa	Y	Y	Y	
Austrodanthonia tenuior	Y	Y		
Bothriochloa macra		Y	Y	Y
Brunoniella australis	Y	Y	Y	
Carex inversa	Y	Y		
Cheilanthes distans	Y	Y	Y	Y
Cheilanthes sieberi subsp. sieberi	Y	Y	Y	Y
Chloris truncata		Y	Y	Y
Chloris ventricosa	Y	Y	Y	
Cymbopogon refractus	Y	Y	Y	Y
Cyperus gracilis	Y			
Dianella longifolia		Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Dichelachne micrantha	Y	Y	Y	
Dichelachne parva	Y	Y		
Dichondra repens	N/A			
Echinopogon ovatus	Y	Y		
Einadia nutans	Y	Y	Y	
Einadia trigonos	Y	Y	Y	
Elymus scaber		Y	Y	
Eragrostis leptostachya		Y	Y	
Fimbristylis dichotoma		Y	Y	
Galium propinquum	Y	Y		
Geranium solanderi	Y	Y		
Hypericum gramineum	Y	Y		
Hypoxis hygrometrica	Y	Y		
Lachnagrostis filiformis	Y	Y		
Lomandra confertifolia	Y			
Mentha satureioides	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Oplismenus imbecilis	Y	Y		
Oxalis perennans	Y	Y	Y	Y
Plectranthus parviflorus	Y	Y	Y	
Poa labillardierei	Y	Y		
Scleria mackaviensis		Y	Y	
Scutellaria humilis	Y	Y	Y	
Sida corrugata	Y	Y	Y	
Solanum pungetium	Y	Y		
Sporobolus creber	Y	Y	Y	
Sporobolus elongatus	Y	Y	Y	
Themeda australis	Y	Y	Y	
Tricoryne elatior	Y	Y		
Veronica plebeia	Y	Y		
Wahlenbergia communis	Y	Y	Y	
VINES/CREEPERS				
Clematis glycinoides var. glycinoides	Y			
Desmodium brachypodum	Y	Y	Y	
Desmodium varians	Y	Y	Y	
Glycine clandestina	Y	Y		
Glycine tabacina	Y	Y		
Hardenbergia violacea	Y			

Cumberland Riverflat Forest (River Flat Eucalypt Forest EEC)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 28. Flowering times for plants found in Cumberland Riverflat Forest (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Angophora floribunda	Y	Y		
Casuarina glauca	Y			
Eucalyptus amplifolia		Y		
Eucalyptus baueriana	Y	Y		
Eucalyptus crebra	Y	Y		Y
Eucalyptus moluccana		Y		
Eucalyptus saligna		Y		
Eucalyptus tereticornis	Y			Y
Exocarpos cupressiformis		Y		
Grevillea robusta	Y		Y	Y
SHRUBS				
Acacia decurrens	Y			Y
Acacia implexa		Y	Y	
Acacia parramattensis		Y		
Breynia oblongifolia	Y	Y	Y	Y
Bursaria spinosa		Y	Y	
Hibiscus heterophyllus	Y	Y		
Jacksonia scoparia		Y		
Maytenus silvestris		Y		
Melaleuca decora		Y		
Melaleuca nodosa	Y			
Notelaea longifolia			Y	Y
Ozothamnus diosmifolius	Y	Y		
Persoonia linearis		Y	Y	Y
Pittosporum undulatum	Y			
Polyscias sambucifolia		Y		
Trema tomentosa		Y		
GRASSES/GROUNDCOVERS				
Austrodanthonia racemosa var. racemosa	Y	Y	Y	
Austrodanthonia tenuior	Y	Y		
Austrostipa ramosissima	Y			
Bothriochloa macra	Y	Y		
Brunoniella australis	Y	Y	Y	
Centella asiatica	N/A			
Cheilanthes sieberi subsp. sieberi	N/A			
Commelina cyanea	Y	Y	Y	
Cymbopogon refractus	Y	Y	Y	Y
Cyperus gracilis	Y			
Cyperus laevis	Y	Y		
Dianella longifolia		Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Dichelachne micrantha	Y	Y	Y	
Dichelachne parva	Y	Y		
Dichondra repens	N/A			
Digitaria parviflora		Y	Y	
Echinopogon caespitosus var. caespitosus	Y	Y		
Echinopogon ovatus	Y	Y		
Einadia hastata	Y	Y	Y	
Einadia trigonos	Y	Y	Y	
Entolasia marginata	Y	Y	Y	
Eragrostis leptostachya	Y	Y		
Hibbertia diffusa	Y			
Oplismenus aemulus	Y	Y		
Oplismenus imbecillis	Y	Y		
Panicum effusum	Y			
Plectranthus parviflorus	Y	Y	Y	
Solanum prinophyllum	Y	Y		
Veronica plebeia	Y	Y	Y	
VINES/CREEPERS				
Cayratia clematidea		Y		
Clematis glycinoides var. glycinoides	Y			
Desmodium varians	Y	Y	Y	
Glycine clandestina	Y	Y		
Glycine microphylla	Y	Y		
Glycine tabacina	Y	Y		
Parsonsia straminea		Y		
Polymeria calycina	Y	Y	Y	
Tylophora barbata		Y		

Cumberland Swamp Oak Riparian Forest (Cumberland Riverflat Forest EEC)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 29. Flowering times for plants found in Cumberland Swamp Oak Riparian Forest (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Angophora floribunda	Y	Y		
Casuarina glauca	Y			
Eucalyptus amplifolia		Y		
Eucalyptus baueriana	Y	Y		
Eucalyptus crebra	Y	Y		Y
Eucalyptus eugenioides	Y	Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Eucalyptus fibrosa		Y		
Eucalyptus globoidea			Y	Y
Eucalyptus longifolia	Y			
Eucalyptus moluccana		Y		
Eucalyptus sideroxylon			Y	Y
Eucalyptus tereticornis	Y			Y
SHRUBS				
Acacia decurrens	Y			Y
Acacia parramattensis		Y		
Breynia oblongifolia	Y	Y	Y	Y
Bursaria spinosa		Y	Y	
Exocarpos cupressiformis		Y		
Indigofera australis	Y			
Jacksonia scoparia		Y		
Kunzea ambigua		Y		
Leptospermum polygalifolium subsp. polygalifolium	Y	Y		
Leucopogon juniperinus	Y	Y		
Maytenus silvestris		Y		
Melaleuca decora		Y		
Melaleuca linariifolia		Y		
Melaleuca nodosa	Y			
Melaleuca styphelioides		Y		
Myrsine variabilis				Y
Notelaea longifolia			Y	Y
Ozothamnus diosmifolius	Y	Y		
Pittosporum revolutum	Y			
GRASSES/GROUNDCOVER				
Aristida vagans		Y	Y	
Arthropodium milleflorum	Y		Y	Y
Asplenium flabellifolium	N/A			
Austrodanthonia racemosa var. racemosa	Y	Y	Y	
Baumea juncea	Y			
Carex appressa	Y			
Commelina cyanea	Y	Y	Y	
Echinopogon caespitosus var. caespitosus	Y	Y		
Echinopogon ovatus	Y	Y		
Eclipta platyglossa	Y			
Einadia hastata	Y	Y	Y	
Eleocharis cylindrostachys	Y	Y		
Entolasia marginata	Y	Y	Y	
Eragrostis leptostachya	Y	Y		
Eriochloa pseudoacrotricha	Y	Y		
Goodenia ovata	Y	Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Hydrocotyle peduncularis	Y			
Hypericum gramineum	Y	Y		
Hypolepis muelleri	N/A			
Lomandra longifolia	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Oplismenus aemulus	Y	Y		
Paspalidium criniforme	Y	Y	Y	
Pelargonium inodorum	Y	Y		
Pellaea paradoxa	N/A			
Persicaria decipiens	Y		Y	Y
Phebalium squamulosum	Y			
Phragmites australis	Y	Y	Y	
Poa affinis	Y	Y		
Poa labillardierei	Y			
Pratia purpurascens	Y	Y	Y	
Pseuderanthemum variabile	Y	Y		
Rumex brownii	Y	Y		
Senecio hispidulus	Y	Y	Y	Y
Setaria distans	Y			Y
Sigesbeckia orientalis	Y	Y	Y	
Veronica plebeia	Y	Y	Y	
Wahlenbergia gracilis	Y	Y	Y	
VINES/CREEPERS				
Billardiera scandens	Y			
Cayratia clematidea		Y		
Glycine clandestina	Y	Y		
Glycine microphylla	Y	Y		
Glycine tabacina	Y	Y		
Hardenbergia violacea	Y			
Kennedia rubicunda	Y	Y		
Pandorea pandorana	Y			Y
Parsonsia straminea		Y		
Tylophora barbata		Y		

Coastal Freshwater Reedland EEC

Flowering times for native plant species found in this community are provided blow. Species highlighted in yellow are important species in this community.

Table 30. Flowering times for plants found in Coastal Freshwater Reedland (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				

Casuarina glauca	Y			
SHRUBS				
Melaleuca ericifolia	Y	Y		
Melaleuca decora		Y		
Melaleuca linariifolia		Y		
GRASSES/GROUNDCOVERS				
Baumea juncea	Y			
Blechnum indicum	N/A			
Bolboschoenus fluviatilis	Y	Y		
Carex appressa	Y	Y	Y	Y
Eleocharis sphacelata	Y	Y	Y	
Gleichenia dicarpa	N/A			
Hemarthria uncinata var. uncinata		Y	Y	
Hydrocotyle verticillata	Y			
Hypolepis muelleri	N/A			
Isachne globosa		Y	Y	
Juncus continuus		Y		
Juncus kraussii	Y	Y		
Juncus planifolius	Y	Y	Y	
Philydrum lanuginosum	Y	Y		
Phragmites australis	Y	Y	Y	
Typha orientalis	Y	Y	Y	
VINES/CREEPERS				
Parsonsia straminea	Y	Y		

Castlereagh Ironbark Forest (Cooks River/Castlereagh Ironbark Forest EEC)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 31. Flowering times for plants found in Castlereagh Ironbark Forest (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Eucalyptus crebra	Y	Y		Y
Eucalyptus fibrosa		Y		
Eucalyptus eugenioides	Y	Y		
Eucalyptus longifolia	Y			
Eucalyptus tereticornis	Y			
Exocarpos cupressiformis		Y		
SHRUBS				
Acacia decurrens	Y			Y
Acacia falcata				Y
Acacia parramattensis		Y		
Acacia pubescens	Y			
Bursaria spinosa		Y	Y	
Daviesia ulicifolia	Y			
Dillwynia parvifolia	Y	Y		
Dillwynia sieberi	Y			
Leucopogon juniperinus	Y			Y
Lissanthe strigosa	Y			Y
Maytenus silvestris		Y		
Melaleuca decora		Y		
Melaleuca nodosa	Y			
Notelaea longifolia			Y	Y

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Olearia microphylla	Y			Y
Ozothamnus diosmifolius	Y	Y		
Persoonia linearis		Y	Y	Y
Polyscias sambucifolia		Y		
Pultenaea villosa	Y	Y		
GRASSES/GROUNDCOVERS				
Aristida vagans		Y	Y	
Austrodanthonia tenuior	Y	Y		
Austrostipa rudis	Y	Y	Y	
Bossiaea prostrata	Y			
Brunoniella australis	Y	Y	Y	
Calotis cuneifolia	Y	Y	Y	Y
Cheilanthes sieberi subsp. sieberi	Y	Y	Y	Y
Cymbopogon refractus	Y	Y	Y	Y
Dianella longifolia		Y		
Dianella revoluta var. revoluta		Y		
Dichelachne micrantha	Y	Y	Y	
Dichondra repens	Y	Y		
Echinopogon caespitosus var. caespitosus	Y	Y		
Echinopogon ovatus	Y	Y		
Einadia hastata	Y	Y	Y	
Entolasia marginata	Y	Y	Y	
Entolasia stricta	Y	Y	Y	
Euchiton sphaericus	Y			
Gonocarpus tetragynus		Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Goodenia hederacea subsp. hederacea	Y	Y		
Hibbertia aspera subsp. aspera	Y			
Hibbertia pedunculata	Y	Y		
Hypericum gramineum	Y	Y		
Lagenophora stipitata	Y	Y		
Laxmannia gracilis	Y			Y
Lepidosperma laterale	Y	Y		
Lomandra filiformis	Y			
Lomandra multiflora	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Opercularia diphylla	Y			
Oxalis perennans	Y	Y	Y	Y
Panicum simile		Y	Y	
Poa labillardierei	Y	Y		
Pomax umbellata	Y			
Poranthera microphylla	Y	Y		
Pratia purpurascens		Y	Y	
Setaria distans	Y			Y
Themeda australis	Y	Y	Y	
Vernonia cinerea var. cinerea	Y	Y	Y	
Veronica plebeia	Y	Y	Y	
Wahlenbergia gracilis	Y	Y	Y	
VINES/CREEPERS				
Billardiera scandens	Y			
Desmodium varians	Y	Y	Y	

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Glycine clandestina	Y	Y		
Glycine microphylla	Y	Y		
Glycine tabacina	Y	Y		
Hardenbergia violacea	Y			
Polymeria calycina	Y	Y	Y	

Estuarine Saltmarsh (Coastal Saltmarsh EEC)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 32. Flowering times for plants found in Estuarine Saltmarsh (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Aegiceras corniculatum			Y	Y
Avicennia marina	Y	Y	Y	Y
Casuarina glauca	Y			
SHRUBS				
Rhagodia candolleana		Y	Y	
GRASSES/ GROUNDCOVERS				
Juncus kraussii	Y	Y		
Paspalum vaginatum		Y		
Samolus repens	Y	Y	Y	
Sarcocornia quinqueflora	Y	Y		
Sporobolus virginicus	Y	Y	Y	Y
Tetragonia tetragonoides	Y	Y		Y
Suaeda australis	Y	Y		
Zoysia macrantha		Y		

Estuarine Swamp Oak Forest (Swamp oak floodplain forest EEC)

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 33. Flowering times for plants found in Estuarine Swamp Oak Forest (EEC)

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Avicennia marina	Y	Y	Y	Y
Casuarina glauca	Y			
SHRUBS				
Acacia longifolia	Y			Y
Cupaniopsis anacardioides		Y	Y	Y
Glochidion ferdinandi	Y	Y		
Melaleuca ericifolia	Y	Y		
Melaleuca linariifolia	Y	Y		
Melaleuca styphelioides	Y	Y		
Pittosporum undulatum	Y			
GRASSES/GROUNDCOVERS				
Apium prostratum	Y	Y		
Atriplex australasica		Y		
Baumea juncea	Y	Y		
Carex appressa	Y	Y	Y	Y
Centella asiatica	Y	Y	Y	Y
Commelina cyanea	Y	Y	Y	
Entolasia marginata	Y	Y	Y	Y
Ficinia nodosa	Y			
Goodenia ovata	Y	Y		

Juncus kraussii	Y	Y		
Lobelia anceps		Y	Y	Y
Phragmites australis	Y			
Samolus repens	Y	Y	Y	
Sarcocornia quinqueflora	Y	Y		
Sporobolus virginicus	Y	Y	Y	Y
Suaeda australis	Y	Y		
Tetragonia tetragonioides	Y	Y		Y
Viola banksii	Y	Y		
VINES/CREEPERS				
Parsonsia straminea		Y		
Stephania japonica var discolor		Y		

Sydney Coastal Sandstone Enriched Moist Forest

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 34. Flowering times for plants found in Sydney Coastal Sandstone Enriched Moist Forest

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina littoralis	Y		Y	Y
Allocasuarina torulosa				Y
Angophora costata	Y	Y		
Ceratopetalum apetalum	Y			
Elaeocarpus reticulatus	Y			
Endiandra sieberi				Y
Eucalyptus pilularis		Y		
Eucalyptus piperita		Y		
Ficus rubiginosa	Y			
Schizomeria ovata	Y			
Syncarpia glomulifera	Y	Y		
Synoum glandulosum			Y	Y
SHRUBS				
Acacia floribunda				Y
Acacia linifolia		Y	Y	
Acacia longifolia subsp. longifolia		Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Acacia longissima	Y	Y	Y	Y
Acacia terminalis	Y	Y		Y
Acacia ulicifolia			Y	Y
Acmena smithii		Y		
Banksia integrifolia subsp. integrifolia		Y	Y	Y
Banksia serrata		Y		
Breynia oblongifolia	Y	Y	Y	Y
Callicoma serratifolia	Y			
Ceratopetalum gummiferum	Y			
Clerodendrum tomentosum		Y		
Crowea saligna		Y	Y	Y
Dodonaea triquetra	Y	Y		
Glochidion ferdinandi	Y	Y	Y	Y
Grevillea linearifolia	Y			Y
Homalanthus populifolius	Y			
Leptospermum polygalifolium subsp. polygalifolium	Y	Y		
Leucopogon lanceolatus var. lanceolatus	Y			Y
Maytenus silvestris		Y		
Myrsine variabilis				Y
Notelaea longifolia			Y	Y
Ozothamnus diosmifolius	Y	Y		
Persoonia linearis		Y	Y	Y
Persoonia pinifolia			Y	
Pittosporum revolutum	Y			
Pittosporum undulatum	Y			
Platylobium formosum	Y			
Polyscias sambucifolia		Y		
Trema tomentosa		Y		
Zieria pilosa	Y			
Zieria smithii	Y			
GRASSES/GROUNDCOVERS				
Blechnum cartilagineum	N/A			
Dianella caerulea		Y		
Entolasia marginata	Y	Y	Y	
Entolasia stricta	Y	Y	Y	
Gahnia clarkei	Y	Y		
Gahnia sieberiana	Y	Y		
Lomandra filiformis	Y			
Lomandra longifolia	Y			
Lomandra obliqua	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Oplismenus aemulus	Y	Y		
Oplismenus imbecillis	Y	Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Poa affinis	Y	Y		
Pratia purpurascens	Y	Y	Y	
Pseuderanthemum variabile	Y	Y		
Pteridium esculentum	N/A			
Setaria distans	Y			Y
VINES/CREEPERS				
Billardiera scandens	Y			
Cissus hypoglauca		Y		
Clematis aristata	Y			
Clematis glycinoides var. glycinoides	Y			
Eustrephus latifolius	Y			
Geitonoplesium cymosum	Y			
Morinda jasminoides	Y	Y		
Pandorea pandorana	Y			
Sarcopetalum harveyanum	Y	Y		
Smilax australis	Y			
Smilax glyciphylla	Y	Y		
Stephania japonica var. discolor		Y		
Tylophora barbata		Y		

Coastal Enriched Sandstone Dry Forest

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 35. Flowering times for plants found in Sydney Coastal Sandstone Enriched Moist Forest

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina littoralis	Y		Y	Y
Allocasuarina torulosa				Y
Angophora costata	Y	Y		
Corymbia gummifera		Y	Y	
Elaeocarpus reticulatus	Y			
Eucalyptus haemastoma	Y	Y		
Eucalyptus pilularis		Y		
Eucalyptus piperita		Y		
Syncarpia glomulifera	Y	Y		
SHRUBS				
Acacia linifolia		Y	Y	
Acacia longifolia subsp. longifolia		Y		
Acacia suaveolens	Y		Y	Y
Acacia terminalis	Y	Y		Y
Acacia ulicifolia			Y	Y
Banksia ericifolia ssp ericifolia	Y		Y	Y

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Banksia integrifolia subsp. integrifolia		Y	Y	Y
Banksia serrata		Y		
Banksia spinulosa	Y		Y	Y
Bossiaea obcordata	Y			
Breynia oblongifolia	Y	Y	Y	Y
Ceratopetalum gummiferum	Y			
Correa reflexa	Y			Y
Dodonaea triquetra	Y	Y		
Epacris pulchella		Y	Y	
Glochidion ferdinandi	Y	Y	Y	Y
Grevillea linearifolia	Y			Y
Grevillea sericea	Y	Y	Y	Y
Hakea sericea	Y			Y
Hibbertia aspera		Y		
Kunzea ambigua		Y		
Lasiopetalum ferrugineum	Y			
Leptospermum polygalifolium subsp. polygalifolium	Y	Y		
Leptospermum trinervium	Y	Y		
Leucopogon juniperinus	Y			Y
Leucopogon lanceolatus var. lanceolatus	Y			Y
Macrozamia communis	Y			
Micrantheum ericoides	Y			
Notelaea longifolia			Y	Y
Olearia microphylla	Y			Y
Ozothamnus diosmifolius	Y	Y		
Persoonia levis	Y	Y		
Persoonia linearis		Y	Y	Y
Persoonia pinifolia			Y	
Phyllanthus hirtellus	Y	Y		
Pimelia linifolia	Y	Y	Y	Y
Pittosporum undulatum	Y			
Platylobium formosum	Y			
Platysace linearifolia		Y	Y	
Podocarpus spinulosus	N/A			
Polyscias sambucifolia		Y		
Pomaderris elliptica ssp elliptica	Y	Y		
Pultenaea daphnoides	Y			
Pultenaea flexilis	Y			
Xylomelum pyriforme	Y			
Zieria pilosa	Y			
Zieria smithii	Y			
GRASSES/GROUNDCOVERS				
Actinotus helianthi	Y	Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Actinotus minor	Y	Y	Y	
Austrostipa pubescens	Y	Y	Y	
Caesia parviflora	Y	Y		
Calochlaena dubia	N/A			
Dianella caerulea		Y		
Echinopogon caespitosus var. caespitosus	Y	Y		
Entolasia marginata	Y	Y	Y	
Entolasia stricta	Y	Y	Y	
Gonocarpus teucroides		Y		
Goodenia hederacea ssp hederacea	Y	Y		
Hibbertia aspera subsp. aspera	Y			
Hibbertia dentata	Y	Y		
Imperata cylindrica var major		Y		
Lepidosperma gunnii	Y	Y		
Lepidosperma laterale	Y	Y		
Lepidosperma urophorum	Y	Y		
Lomandra gracilis	Y			
Lomandra longifolia	Y			
Lomandra obliqua	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Oplismenus aemulus	Y	Y		
Poa affinis	Y	Y		
Pomax umbellata	Y			
Pratia purpurascens	Y	Y	Y	
Pseuderanthemum variabile	Y	Y		
Pteridium esculentum	N/A			
Themeda australis	Y	Y	Y	Y
Xanthosia pilosa				
Xanthosia tridentata				
VINES/CREEPERS				
Cassytha glabella	Y	Y	Y	Y
Cassytha pubescens	Y			
Cissus hypoglauca		Y		
Eustrephus latifolius	Y			
Geitonoplesium cymosum	Y			
Pandorea pandorana	Y			
Smilax glyciphylla	Y	Y		

Coastal Sandstone Gully Forest

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 36. Flowering times for plants found in Sydney Coastal Sandstone Gully Forest

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina littoralis	Y		Y	Y
Angophora costata	Y	Y		
Ceratopetalum apetalum	Y			
Corymbia gummifera		Y	Y	
Elaeocarpus reticulatus	Y			
Eucalyptus piperita		Y		
Eucalyptus sieberi	Y	Y		
SHRUBS				
Acacia elongata	Y			Y
Acacia linifolia		Y	Y	
Acacia longifolia subsp. longifolia	Y	Y		Y
Acacia obtusifolia		Y		
Acacia oxycedrus	Y			Y
Acacia suaveolens	Y		Y	Y
Acacia terminalis	Y	Y		Y
Acacia ulicifolia			Y	Y
Amperea xiphoclada		Y		
Aotus ericoides	Y			Y
Astrotricha longifolia	Y			
Baeckea linifolia		Y		
Banksia ericifolia subsp. ericifolia	Y		Y	Y
Banksia marginata		Y	Y	Y
Banksia serrata		Y		
Banksia spinulosa	Y		Y	Y
Bauera rubioides	Y	Y		
Boronia ledifolia	Y			Y
Boronia pinnata	Y			Y
Bossiaea heterophylla			Y	
Bossiaea stephensonii	Y			Y
Callicoma serratifolia	Y			
Ceratopetalum gummiferum	Y			
Chloanthes stoechadis	Y			Y
Crowea saligna		Y	Y	Y
Dampiera purpurea	Y	Y		
Dampiera stricta	Y	Y		Y
Darwinia procera	Y			Y
Dillwynia retorta	Y			Y

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Dodonaea triquetra	Y	Y		
Doryanthes excelsa	Y			
Epacris longiflora	Y		Y	Y
Epacris pulchella				
Gompholobium latifolium	Y	Y		
Grevillea buxifolia	Y	Y	Y	
Grevillea capitellata	Y	Y		Y
Grevillea diffusa	Y			Y
Grevillea linearifolia	Y			Y
Grevillea longifolia	Y			
Grevillea mucronulata	Y		Y	Y
Grevillea sericea	Y	Y	Y	Y
Hakea dactyloides	Y	Y		
Hakea gibbosa	Y			
Hakea salicifolia	Y			
Hakea sericea	Y			Y
Hibbertia monogyna	Y	Y	Y	
Hibbertia nitida	Y			
Lambertia formosa	Y	Y	Y	Y
Lasiopetalum ferrugineum	Y			
Leionema dentatum	Y			
Leptomeria acida		Y		
Leptospermum grandifolium	Y	Y		
Leptospermum polygalifolium	Y	Y		
Leptospermum squarrosum		Y	Y	
Leptospermum trinervium	Y	Y		Y
Leucopogon amplexicaulis	Y			Y
Leucopogon ericoides	Y			Y
Leucopogon setiger	Y			Y
Logania albiflora	Y			
Lomatia myricoides		Y		
Lomatia silaifolia		Y		
Micrantheum ericoides	Y			Y
Monotoca scoparia			Y	Y
Persoonia levis	Y	Y	Y	Y
Persoonia pinifolia		Y	Y	
Petrophile pulchella	Y	Y		
Phyllanthus hirtellus	Y	Y	Y	Y
Pimelea linifolia	Y	Y		

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Platylobium formosum	Y		Y	
Platysace lanceolata		Y	Y	
Platysace linearifolia		Y		
Podocarpus spinulosus	N/A			
Pomaderris andromedifolia	Y			
Prostanthera linearis	Y	Y		
Pultenaea daphnoides	Y			
Pultenaea linophylla	Y			
Pultenaea polifolia	Y			
Pultenaea rosmarinifolia	Y	Y		
Pultenaea stipularis	Y	Y		
Ricinocarpos pinifolius	Y			Y
Styphelia longifolia		Y	Y	Y
Styphelia tubiflora			Y	Y
Tristania neriifolia		Y		
Woollsia pungens	Y	Y	Y	Y
Xanthorrhoea arborea		Y	Y	
Xanthorrhoea media	Y	Y		Y
Zieria laevigata	Y			
Zieria pilosa	Y			
GRASSES/GROUNDCOVERS				
Actinotus helianthi	Y	Y		
Actinotus minor	Y	Y	Y	
Caustis flexuosa	Y	Y		
Dianella caerulea		Y		
Dianella prunina	Y			
Dracophyllum secundatum	Y	Y		Y
Drosera binata	Y	Y		
Drosera spatulata	Y	Y		
Entolasia stricta	Y	Y	Y	
Gahnia erythrocarpa	Y			
Gahnia sieberiana	Y	Y		
Gleichenia dicarpa	N/A			
Gleichenia microphylla	N/A			
Gleichenia rupestris	N/A			
Gonocarpus teucrioides		Y		
Hibbertia bracteata	Y	Y		
Hibbertia linearis	Y	Y		
Lepidosperma filiforme	Y			

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Lepidosperma laterale	Y	Y		
Lepyrodia scariosa	Y	Y	Y	Y
Lindsaea microphylla	N/A			
Lomandra gracilis	Y			
Lomandra longifolia	Y			
Lomandra obliqua	Y			
Mitrasacme polymorpha	Y	Y		
Opercularia aspera	Y	Y		
Pteridium esculentum	N/A			
Schoenus brevifolius	Y	Y		
Schoenus melanostachys	Y	Y		
Selaginella uliginosa	N/A			
Sticherus flabellatus	N/A			
Stylidium productum	Y	Y		
Tetrarrhena juncea	Y	Y	Y	Y
Tetratheca ericifolia	Y	Y		Y
Xanthosia pilosa	Y	Y	Y	Y
Xanthosia tridentata	Y	Y		Y
VINES/CREEPERS				
Billardiera scandens	Y			
Cassytha glabella	Y	Y	Y	Y
Cassytha pubescens	Y			
Marsdenia flavescens		Y		
Marsdenia suaveolens		Y		
Smilax glyciphylla	Y	Y		

Coastal Sandstone Gallery Rainforest

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 37. Flowering times for plants found in Sydney Coastal Sandstone Gallery Rainforest

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina torullosa				Y
Ceratopetalum apetalum	Y			
Eucalyptus pilularis		Y		
Eucalyptus piperita		Y		
Syncarpia glomulifera	Y	Y		
SHRUBS				

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
Acacia irrorata	Y	Y		
Acacia longifolia subsp. longifolia	Y	Y		Y
Acacia parramattensis		Y		
Acmena smithii		Y		
Austromyrtus tenuifolia		Y		
Backhousia myrtifolia	Y	Y		
Callicoma serratifolia	Y			
Leptospermum polygalifolium subsp polygalifolium	Y	Y		
Lomatia myricoides		Y		
Notelaea longifolia				Y
Pittosporum revolutum	Y			
Pittosporum undulatum	Y			
Pultenaea daphnoides	Y			
Pultenaea flexilis	Y			
Tristaniopsis laurina		Y		
GRASSES/GROUNDCOVERS				
Adiantum aethiopicum	N/A			
Calochlaena dubia	N/A			
Christella dentata	N/A			
Doodia caudata	N/A			
Juncus usitatus	Y	Y		
Lomandra longifolia	Y			
Oplismenus aemulus	Y	Y		
Oplismenus imbecillis	Y	Y		
Sticherus flabellatus	N/A			
Viola hederacea	Y	Y		
VINES/CREEPERS				
Cassytha pubescens	Y			
Morinda jasminoides	Y	Y		
Smilax glyciphylla	Y	Y		

Hornsby Enriched Sandstone Exposed Woodland

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 38. Flowering times for plants found in Hornsby Enriched Sandstone Exposed Woodland

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina littoralis	Y		Y	Y
Angophora bakeri		Y		
Angophora hispida		Y		

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
Corymbia gummifera		Y	Y	
Eucalyptus haemastoma	Y	Y		
Eucalyptus piperita		Y		
SHRUBS				
Acacia linifolia		Y	Y	
Acacia longifolia subsp. longifolia	Y	Y		Y
Acacia suaveolens	Y		Y	Y
Acacia terminalis	Y	Y		Y
Acacia ulicifolia			Y	Y
Banksia ericifolia subsp. ericifolia	Y		Y	Y
Banksia oblongifolia		Y	Y	Y
Banksia serrata		Y		
Banksia spinulosa var. spinulosa	Y		Y	Y
Boronia ledifolia	Y			Y
Boronia pinnata	Y			Y
Bossiaea heterophylla			Y	
Bossiaea scolopendria	Y			
Dampiera stricta	Y	Y		Y
Darwinia biflora	Y			Y
Dillwynia retorta	Y			Y
Dodonaea triquetra	Y	Y		
Epacris pulchella		Y	Y	
Grevillea buxifolia subsp. buxifolia	Y	Y	Y	
Grevillea sericea subsp. sericea	Y	Y	Y	Y
Grevillea speciosa	Y	Y	Y	
Hakea dactyloides	Y	Y		
Hakea sericea	Y			Y
Hovea linearis	Y			Y
Isopogon anethifolius	Y			
Kunzea ambigua		Y		
Lambertia formosa	Y	Y	Y	Y
Leptospermum trinervium	Y	Y		Y
Leucopogon ericoides	Y			Y
Leucopogon microphyllus	Y	Y	Y	Y
Lomatia silaifolia		Y		
Micrantheum ericoides	Y			Y
Persoonia lanceolata	Y	Y	Y	Y
Persoonia levis	Y	Y	Y	Y
Persoonia pinifolia		Y	Y	
Petrophile pulchella	Y	Y		
Phyllanthus hirtellus	Y	Y	Y	Y
Phyllota phylicoides	Y			Y
Pimelea linifolia	Y	Y		
Platysace linearifolia		Y	Y	

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
Polyscias sambucifolia		Y		
Pultenaea tuberculata	Y			
Styphelia tubiflora			Y	Y
Woollsia pungens	Y	Y	Y	Y
Xanthorrhoea media	Y	Y		Y
GRASSES/GROUNDCOVERS				
Actinotus minor	Y	Y	Y	
Austrostipa pubescens	Y	Y	Y	
Caustis flexuosa	Y	Y		
Cyathochaeta diandra	N/A			
Dianella caerulea		Y		
Dianella prunina	Y			
Entolasia marginata	Y	Y	Y	
Entolasia stricta	Y	Y	Y	
Gonocarpus teucrioides		Y		
Goodenia bellidifolia subsp. bellidifolia	Y	Y		
Hibbertia aspera	Y			
Hibbertia bracteata	Y	Y		
Lepidosperma laterale	Y	Y		
Lepyrodia scariosa	Y	Y	Y	Y
Lindsaea linearis	N/A			
Lindsaea microphylla	N/A			
Lomandra cylindrica	Y			
Lomandra glauca	Y			
Lomandra multiflora subsp. multiflora	Y			
Lomandra obliqua	Y			
Patersonia glabrata	Y			
Patersonia sericea	Y			Y
Schoenus brevifolius	Y	Y		
Schoenus ericetorum	Y			
Xanthosia pilosa	Y	Y	Y	Y
Xanthosia tridentata	Y	Y		Y
VINES/CREEPERS				
Billardiera scandens	Y			
Cassytha pubescens	Y			
Smilax glyciphylla	Y	Y		

Coastal Shale-Sandstone Forest

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 39. Flowering times for plants found in Coastal Shale-Sandstone Forest

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
TREES				

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
Allocasuarina littoralis	Y		Y	Y
Angophora costata	Y	Y		
Corymbia gummifera		Y	Y	
Elaeocarpus reticulatus	Y			
Eucalyptus globoidea			Y	Y
Eucalyptus pilularis		Y		
Eucalyptus resinifera ssp resinifera	Y	Y		
Syncarpia glomulifera	Y	Y		
SHRUBS				
Acacia linifolia		Y	Y	
Acacia longifolia subsp. longifolia	Y	Y		Y
Acacia myrtifolia				Y
Acacia suaveolens	Y		Y	Y
Acacia ulicifolia			Y	Y
Banksia spinulosa var. spinulosa	Y		Y	Y
Banksia serrata		Y		
Bossiaea obcordata	Y			
Ceratopetalum gummiferum	Y			
Dodonaea triquetra	Y	Y		
Epacris pulchella		Y		
Glochidion ferdinandi	Y	Y	Y	Y
Grevillea sericea	Y	Y	Y	Y
Hakea sericea	Y			Y
Lambertia formosa	Y	Y	Y	Y
Lasiopetalum ferrugineum	Y			
Leptospermum trinervium	Y	Y		Y
Leucopogon juniperinus	Y			Y
Lomatia silaifolia		Y		
Micrantheum ericoides	Y			Y
Notelaea longifolia				Y
Olearia microphylla	Y			
Ozothamnus diosmifolius	Y	Y		
Persoonia laurina	Y	Y		
Persoonia levis	Y	Y	Y	Y
Phyllanthus hirtellus	Y	Y	Y	Y
Pimelea linifolia	Y	Y		
Pittosporum undulatum	Y			
Platylobium formosum	Y		Y	
Platysace linearifolia		Y		
Polyscias sambucifolia		Y		
Pultenaea hispidula	Y			
Xanthorrhoea media	Y	Y		Y

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
GRASSES/GROUNDCOVERS				
Aristida vagans		Y	Y	
Austrostipa pubescens	Y	Y	Y	
Brunoniella pumilio	Y	Y	Y	
Cyathochaeta diandra	N/A			
Dianella caerulea		Y		
Dianella revoluta var. revolute		Y		
Echinopogon caespitosus var. caespitosus	Y	Y		
Entolasia marginata	Y	Y	Y	
Entolasia stricta	Y	Y	Y	
Gonocarpus teucrioides		Y		
Goodenia hederacea subsp. hederacea	Y	Y		
Hibbertia aspera subsp. aspera	Y			
Hibbertia empetrifolia sspp empetrifolia	Y			
Hybanthus monopetalus	Y	Y		
Imperata cylindrica		Y		
Lepidosperma laterale	Y	Y		
Lindsaea linearis	N/A			
Lindsaea microphylla	N/A			
Lomandra filiformis	Y			
Lomandra longifolia	Y			
Lomandra multiflora	Y			
Lomandra obliqua	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Opercularia varia	Y			
Panicum simile		Y	Y	
Patersonia glabrata	Y			
Pomax umbellata	Y			
Pteridium esculentum	N/A			
Tetrarrhena juncea	Y	Y	Y	Y
Themeda australis	Y	Y	Y	
Xanthosia tridentata	Y	Y		Y
VINES/CREEPERS				
Billardiera scandens	Y			
Cassytha pubescens	Y			
Glycine clandestina	Y	Y		
Hardenbergia violacea	Y			
Smilax glyciphylla	Y	Y		

Coastal Sandstone Foreshores Forest

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 40. Flowering times for plants found in Coastal Sandstone Foreshores Forest

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina littoralis	Y		Y	Y
Allocasuarina torulosa				Y
Angophora costata	Y	Y		
Elaeocarpus reticulatus	Y			
Eucalyptus capitellata		Y		
Eucalyptus globoidea			Y	Y
Eucalyptus pilularis		Y		
Eucalyptus piperita		Y		
Eucalyptus resinifera	Y	Y		
Eucalyptus sieberi	Y	Y		
Syncarpia glomulifera	Y	Y		
SHRUBS				
Acacia linifolia		Y	Y	
Acacia longifolia ssp longifolia	Y	Y		Y
Acacia myrtifolia				Y
Acacia suaveolens	Y		Y	Y
Banksia spinulosa	Y		Y	Y
Bossiaea obcordata	Y			
Comesperma ericinum	Y	Y	Y	Y
Daviesia ulicifolia	Y			
Dodonaea triquetra	Y	Y		
Epacris pulchella		Y	Y	
Grevillea sericea	Y	Y	Y	Y
Hakea sericea	Y			Y
Lasiopetalum ferrugineum	Y			
Leucopogon juniperinus	Y			Y
Micrantheum ericoides	Y			Y
Olearia microphylla	Y			
Ozothamnus diosmifolius	Y	Y		
Persoonia laurina	Y	Y		
Persoonia levis	Y	Y	Y	Y
Phyllanthus hirtellus	Y	Y	Y	Y
Pittosporum undulatum	Y			
Platylobium formosum	Y		Y	
Polyscias sambucifolia		Y		
Prostanthera denticulata	Y	Y		

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
Pultenaea hispidula	Y			
GRASSES/GROUNDCOVERS				
Aristida vagans		Y	Y	
Austrostipa pubescens	Y	Y	Y	
Bossiaea obcordata	Y			
Cyathochaeta diandra	N/A			
Dianella caerulea		Y		
Dianella revoluta var. revoluta		Y		
Echinopogon caespitosus var. caespitosus	Y	Y		
Entolasia stricta	Y	Y	Y	
Goodenia hederacea ssp hederacea	Y	Y		
Goodenia heterophylla	Y	Y		
Hibbertia aspera subsp. aspera	Y			
Hibbertia empetrifolia sspp empetrifolia	Y			
Hybanthus monopetalus	Y	Y		
Imperata cylindrica		Y		
Lagenophora stipitata	Y	Y		
Lepidosperma laterale	Y	Y		
Lindsaea microphylla	N/A			
Lomandra longifolia	Y			
Lomandra multiflora	Y			
Lomandra obliqua	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Opercularia varia	Y			
Panicum simile		Y	Y	
Patersonia glabrata	Y			
Pratia purpurascens	Y	Y	Y	
Pteridium esculentum	N/A			
Rytidosperma pallidum	Y	Y		
Tetrarrhena juncea	Y	Y	Y	Y
Themeda australis	Y	Y	Y	
Xanthosia tridentata	Y	Y		Y
VINES/CREEPERS				
Billardiera scandens	Y			
Cassytha pubescens	Y			
Glycine clandestina	Y	Y		
Smilax glyciphylla	Y	Y		

Sydney Foreshores Shale Forest

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 41. Flowering times for plants found in Sydney Foreshores Shale Forest

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Allocasuarina littoralis	Y		Y	Y
Angophora costata	Y	Y		
Duboisia myoporoides	Y			Y
Eucalyptus botryoides		Y	Y	
Eucalyptus haemastoma	Y	Y		
Eucalyptus pilularis		Y		
Eucalyptus punctata		Y	Y	
Eucalyptus tereticornis	Y			Y
Synoum glandulosum			Y	Y
SHRUBS				
Acacia maidenii		Y	Y	Y
Acacia mearnsii	Y	Y		
Banksia integrifolia subsp. integrifolia		Y	Y	Y
Breynia oblongifolia	Y	Y	Y	Y
Clerodendrum tomentosum	Y			
Eupomatia laurina		Y		
Hakea sericea	Y			Y
Kunzea ambigua		Y		
Leucopogon juniperinus	Y			Y
Myrsine variabilis			Y	Y
Notelaea longifolia				Y
Phyllanthus hirtellus	Y	Y	Y	Y
Pittosporum undulatum	Y			
GRASSES/GROUNDCOVERS				
Aristida vagans		Y	Y	
Austrostipa pubescens	Y	Y	Y	
Crassula sieberiana	Y	Y		
Davallia solida var pyxidata	N/A			
Dianella caerulea		Y		
Dichondra repens	Y	Y		
Digitaria parviflora	Y	Y	Y	
Echinopogon caespitosus var. caespitosus	Y	Y		
Entolasia stricta	Y	Y	Y	
Eragrostis brownii	Y	Y	Y	
Gahnia aspera	Y	Y		
Goodenia hederacea ssp hederacea	Y	Y		

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
Hydrocotyle laxiflora	Y			
Imperata cylindrica		Y		
Lagenophora stipitata	Y	Y		
Lepidosperma laterale	Y	Y		
Lomandra filiformis	Y			
Lomandra longifolia	Y			
Lomandra multiflora	Y			
Lomandra obliqua	Y			
Microlaena stipoides var. stipoides	Y	Y	Y	
Oplismenus aemulus	Y	Y		
Oplismenus imbecillis	Y	Y		
Oxalis perennans	Y	Y	Y	Y
Panicum simile		Y	Y	
Poranthera microphylla	Y	Y		
Pratia purpurascens	Y	Y	Y	
Pseuderanthemum variabile	Y	Y		
Pyrrosia rupestris	N/A			
Rytidosperma pallidum	Y	Y		
Themeda australis	Y	Y	Y	
Veronica plebeia	Y	Y	Y	
Xanthosia tridentata	Y	Y		Y
VINES/CREEPERS				
Billardiera scandens	Y			
Cassytha pubescens	Y			
Cissus hypoglauca		Y		
Clematis aristata	Y			
Glycine microphylla	Y	Y		
Hibbertia dentata	Y			
Hibbertia scandens	Y			
Pandorea pandorana	Y			
Smilax glyciphylla	Y	Y		

Coastal Warm Temperate Rainforest

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 42. Flowering times for plants found in Coastal Warm Temperate Rainforest

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Ceratopetalum apetalum	Y			
Cryptocarya glaucescens	Y	Y		
Cryptocarya microneura	Y	Y	Y	

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
Cyathea australis	N/A			
Doryphora sassafras	Y			
Livistona australis		Y		
Polyosma cunninghamii	Y		Y	
Schizomeria ovata	Y			
Syncarpia glomulifera	Y	Y		
Synoum glandulosum			Y	Y
SHRUBS				
Acmena smithii		Y		
Backhousia myrtifolia	Y	Y		
Callicoma serratifolia	Y			
Claoxylon australe	Y			
Diospyros australis		Y	Y	
Elaeodendron australe	Y			Y
Eupomatia laurina		Y		
Ficus coronata	Y	Y		
Guioa semiglauca	Y			
Notelaea longifolia				Y
Pittosporum multiflorum	Y			Y
Pittosporum revolutum	Y			
Pittosporum undulatum	Y			
Tasmannia insipida	Y			Y
Trochocarpa laurina		Y		
Wilkiea huegeliana		Y		
GRASSES/GROUNDCOVERS				
Adiantum formosum	N/A			
Adiantum hispidulum	N/A			
Arthropteris tenella	N/A			
Asplenium australasicum	N/A			
Asplenium flabellifolium	N/A			
Blechnum cartilagineum	N/A			
Blechnum nudum	N/A			
Blechnum patersonii	N/A			
Calochlaena dubia	N/A			
Doodia aspera	N/A			
Gahnia aspera	Y	Y		
Gymnostachys anceps	Y	Y	Y	Y
Hymenophyllum cupressiforme	N/A			
Lastreopsis microsora	N/A			
Microsorum scandens	N/A			
Oplismenus imbecillis	Y	Y		
Pellaea falcata	N/A			

SPECIES NAMES	SPRING	SUMMER	AUTUMN	WINTER
Platycerium bifurcatum	N/A			
Pseuderanthemum variabile	Y	Y		
Pyrrosia rupestris	N/A			
Schelhammera undulata	Y			
VINES/CREEPERS				
Cissus antarctica		Y		
Cissus hypoglauca		Y		
Eustrephus latifolius	Y			
Geitonoplesium cymosum	Y			
Morinda jasminoides	Y	Y		
Palmeria scandens				Y
Pandorea pandorana	Y			
Parsonsia straminea	Y	Y		
Smilax australis	Y			
Stephania japonica var. discolor		Y		

Coastal Headland Banksia Heath

Flowering times for native plant species found in this community are provided below. Species highlighted in yellow are important species in this community.

Table 43. Flowering times for plants found in Coastal Headland Banksia Heath

SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
TREES				
Angophora hispida	Y			
SHRUBS				
Acacia longifolia subsp. longifolia	Y	Y		Y
Acacia suaveolens	Y		Y	Y
Allocasuarina distyla	Y			Y
Baeckea imbricata	Y	Y		
Banksia ericifolia subsp. ericifolia				
Banksia oblongifolia		Y	Y	Y
Banksia serrata		Y		
Callistemon linearis	Y	Y		
Dampiera stricta	Y	Y		Y
Darwinia fascicularis	Y	Y		Y
Dillwynia floribunda	Y			
Dillwynia retorta	Y			Y
Epacris longiflora	Y		Y	Y
Epacris microphylla var. microphylla	Y	Y		Y
Hakea teretifolia	Y	Y		
Kunzea ambigua		Y		
Lasiopetalum ferrugineum	Y			

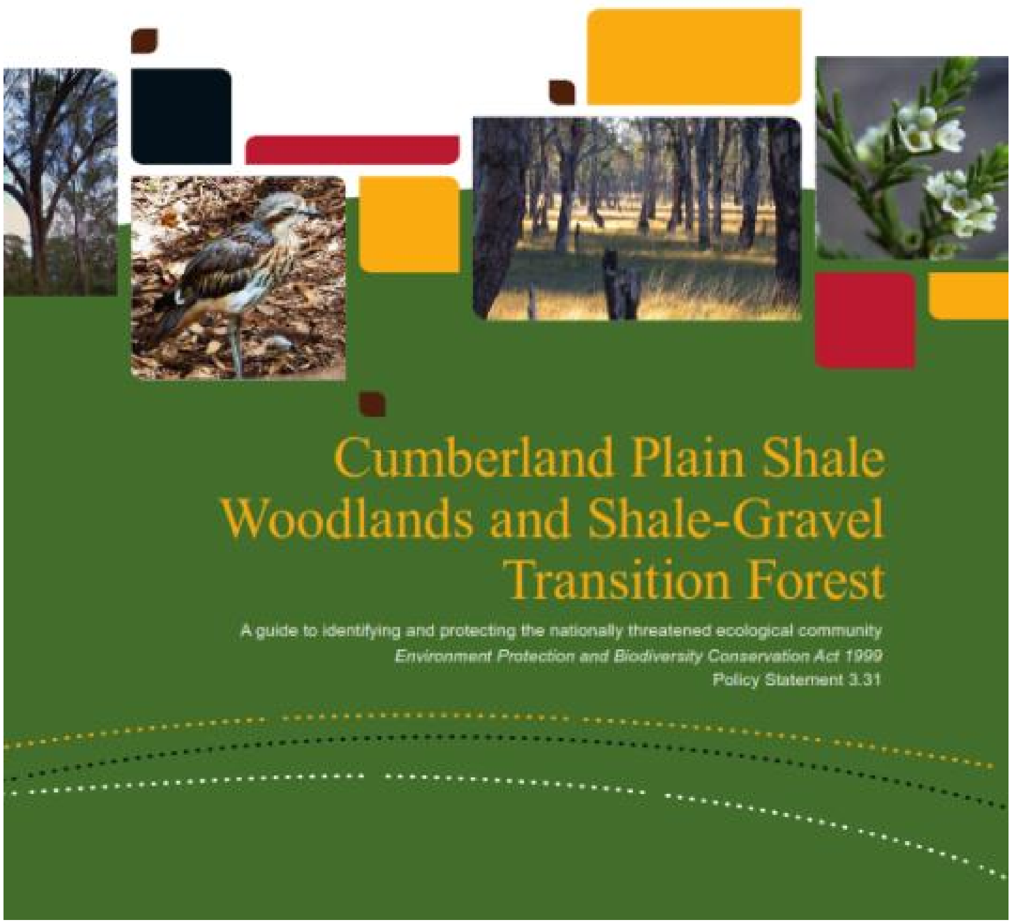
SPECIES NAME	SPRING	SUMMER	AUTUMN	WINTER
Leptospermum laevigatum	Y			Y
Leptospermum squarrosum		Y	Y	
Leucopogon microphyllus	Y	Y	Y	Y
Melaleuca armillaris		Y		
Melaleuca nodosa	Y			
Monotoca elliptica	Y			Y
Persoonia lanceolata	Y	Y	Y	Y
Pimelea linifolia	Y	Y		
Philotheca buxifolia	Y			Y
Pittosporum undulatum	Y			
Woollsia pungens	Y	Y	Y	Y
Zieria laevigata	Y			
GRASSES/GROUNDCOVERS				
Actinotus helianthi	Y	Y		
Actinotus minor	Y	Y	Y	
Cyathochaeta diandra	N/A			
Dianella caerulea		Y		
Entolasia stricta	Y	Y		
Ficinia nodosa	Y			
Gonocarpus teucrioides		Y		
Goodenia stelligera	Y	Y		
Hypolaena fastigiata	Y	Y	Y	
Lepidosperma concavum	Y	Y		
Lepidosperma viscidum	Y			
Lepyrodia scariosa	Y	Y		
Lomandra longifolia	Y			
Xanthosia pilosa	Y	Y		
Xanthosia tridentata	Y	Y		
VINES/CREEPERS				
Billardiera scandens	Y			
Cassytha pubescens	Y			

BEST PRACTICE FOR BUSH REGENERATION IN CUMBERLAND PLAIN WOODLANDS

Please refer to the following publications:

1) Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest: A guide to identifying and protecting the nationally threatened ecological community. Environment Protection and Biodiversity Conservation Act 1999, Policy Statement 3.31. (DEWHA, 2010)

Australian Government
Department of the Environment, Water, Heritage and the Arts



2) Bringing Back the Bush to Western Sydney: Best Practice Guidelines for Bush Regeneration on the Cumberland Plain. (DIPNR, 2003)

STANDARD WEED CONTROL TECHNIQUES

Cut and Paint Method

This method is an effective way to remove woody weeds such as Privet and Mock Olive. It involves cutting the stem or trunk of the plant just above the ground level and applying non-residual glyphosate herbicide (such as Biactive Roundup®) to the cut area.

This weed removal technique can be used to clear large areas of woody weeds without affecting surrounding native vegetation, and can be utilised in primary, secondary and maintenance weeding.

Procedure:

1. Using secateurs, loppers or saw, cut the stem of the plant as close to the ground as possible;
2. Apply undiluted herbicide to the cut area using an applicator within 20-30 second of cutting before plant cell closes.

Stem Injection: Drilling and Frilling

Removing large weedy trees will involve drilling holes at 2 cm increments around the trunk of the trees, and filling the holes with herbicide. Caution must be taken when using this method to eradicate large trees, as dead tree material becomes brittle and could become a potential public/site safety risk. Poisoning prior to removal can mean that the cost of tree lopping and removal can be reduced, as all leaf matter fall from the tree through poisoning, reducing the volume of waste requiring removal.

Procedure:

1. Using a cordless drill, drill holes into the trunk at a 45° angle and apply undiluted herbicide immediately into the drill holes.
2. Repeat this process at 2-5cm spacings around the trunk.

Frilling involves a similar procedure using a hammer and chisel, and can be used over waterways safely. It is also useful when there is difficult to access stems, or when it is not convenient to carry multiple spare batteries for a cordless drill.

Procedure:

1. Slots are chiseled using 15mm or 25mm wood chisels and cut at 45° angles into the trunk. Slots must completely penetrate the outer bark so that the herbicide reaches the meristematic tissue where it can be translocated throughout the whole plant. Undiluted herbicide is applied immediately into the holes.
2. Repeat this process at spacings that are 2-3 times the width of the chisel blade. This will allow re-treatment if required, without ringbarking the tree.

Scrape and Paint Method

Scraping is used to remove mainly exotic vines or weed species not easily eradicated using the cut and paint method or manual removal. The stem of the vine or plant should be scraped with a knife as close to the ground as possible. The scrape should be at least 20 cm long (or longer depending on the size of the plant) and undiluted herbicide applied to the exposed area.

Procedure:

1. Using a knife, apply a 20-100cm scrape along the main vines to expose the sapwood below the bark.
2. Apply undiluted herbicide to the scraped area immediately.

Manual Removal

Shallow rooted annuals, perennials, and juvenile plants can be removed by hand. This labour intensive but low impact method is principally used during primary, secondary and maintenance weeding. Hand tools are used to remove the root system of the weeds and minimise soil disturbance. This is the preferred method of weed removal within sensitive areas as no herbicides or machinery is required.

Many plants which will not regrow from their roots (eg many grasses) can be crowned: hold leaves and stems together, and use a knife to cut through all the roots below the 'crown'.

Herbicide Spraying

The use of herbicide can be used to successfully control large weed infestations. Repeated applications may be required to ensure complete weed eradication. Herbicide spraying is not recommended near remnant vegetation as herbicide drifts can affect non-target species. Protect native plants from treatment.

Extra precautions should be taken when spraying near watercourses, and this must be undertaken by a licensed EPA (Environmental Protection Authority) approved operator. Approval from the EPA may be required. Exercise caution when spraying as 'over spray' may have detrimental effects on surrounding plants, environment and public. Environmental control measures for applying herbicide include:

- Only a non-residual glyphosate herbicide should be used (e.g. Nufarm Weedmaster®, Biactive Roundup®). Refer to the instructions on the herbicide pack to determine the appropriate concentrations to apply to the weeds;
- Ensure that any staff member applying herbicide wears appropriate protective gear (i.e. overalls, covered shoes, gloves, glasses and mask);
- Apply herbicide sparingly using a spray pack with an appropriate applicator head and spray guard; and
- Do not spray herbicide on windy or rainy days, or when rain is forecast for subsequent days.

Consultation with the Blacktown City Council Noxious Weeds Division should be undertaken prior to commencing any spraying to ensure that all matters of safety and regulations are adhered to. All herbicide use should be undertaken with a registered herbicide as specified on the herbicide product label or relevant off-label permit published by the Australian Pesticides & Veterinary Medicines Authority and in consultation with Parramatta City Council. Personnel must be qualified in the storage, transport and application of herbicide chemicals.

Developing a Weed Management Strategy

DECC has developed detailed guidelines for regeneration of vegetation in the Western Sydney region in the publication "Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland" (2005). Techniques for treatment of pasture grasses and associated weed species in a mixed understorey are appropriate for use on the site, in particular the proposed conservation zone where exotic species are likely to suppress natural regeneration of the groundlayer and understorey. Selective weed control should be aimed at a staged reduction of pasture grasses to aid natural recruitment of native grass species present on site. The guidelines state that the following practices demonstrate how a combination of methods can achieve maximum weed control and survival of native species in situations where a native understorey is present:

- Where annual weeds are tall, apply herbicide using a 'wick wiper'
- Where it is required to control small privets, sida (paddy's lucerne) and other small woody species in native grasslands use garlon® at low concentrations.
- In areas of no or few native grasses, the use of the selective herbicide fusilade® to control exotic grasses will allow native herbs to survive.
- Bulbs such as watsonia in grassy native areas can be effectively controlled by a process of first whippersnipping back the grass and bulbs. Subsequent regrowth in the bulbs is at a faster rate than the native grasses, allowing discrete herbicide treatment of bulb leaves during times of active bulb growth.
- To prevent seed drop from grasses and herbaceous weeds in areas of native understorey, target the aerial parts using a hand-held flame thrower to consume the plant and scorch seed.
- Reducing weed levels by slashing or mowing (as outlined above) may be a useful interim measure.

STANDARD PLANTING NOTES

Site Preparation

Weed Eradication

Weeds can be a major issue for the aquatic and terrestrial environments. The successful establishment of planted species is reliant on removing weeds and providing a weed free habitat over a lengthy period of time. Weed infestations are undesirable because they compete with and displace native species, and contribute to decline in native habitat health. Excessive growth of weeds or infestations can destroy natural habitats and are not easily eradicated. Weed invasions may inhibit or out-compete native plantings, particularly in new areas. Sites should be monitored for weeds on a regular basis and weed invasions must be managed.

Appropriate treatment methods exist for each species of weed plant, and accommodate habit, growth and dispersal processes (see Section #). It is important to remove only vegetative cover that is intended to be replaced by landscape treatment. At any stage in the works process, remove only the area of weeds that can be remediated within a workable timeframe. Existing native vegetation should be retained unless the proposed treatment cannot be achieved without its removal. Areas of potential conflict may include wetland areas and bank treatment areas.

Top Soil Preparation

Before doing any excavation, remember to ascertain the location of existing underground services. Obtain an analysis of existing soils to determine their suitability. Ameliorate existing soils as required. Regrade existing site soils and add 250mm imported top soil, if required. Compact soil layers lightly and uniformly using a mix roller (or similar) to a compacted depth of 150mm. Lightly water each layer with a fine mist spray prior to installing the following layer. Avoid differential subsidence and excess compaction to produce a planting surface that is void of branches and rocks greater than 50mm diameter and is of a smooth and even till.

Jute Matting Installation

Steep sloping banks, areas subject to high levels of disturbance from animals, humans, wind or rainfall/runoff should be stabilised. Using jute matting and/or coir logs are ideal for this; selection will depend on the degree of slope and disturbance. For most areas 750gsm jute matting is sufficient, unless the slope is very steep, or there is a significant level of erosion. Install jute matting to required areas after completion of weed eradication and top soil preparation. Peg using 300mm U pegs at 300mm centres along the edges and through the centre. Overlap adjacent sections by at least 200mm, with upstream sections over lapping downstream sections. Lay jute from top of bank to bottom.

Guidelines for Plant Installation

Guidelines for the selection of plant stock and related materials were provided in Rockdale Wildlife Friendly Design Guidelines – Phase 1 Report, which provided general guidelines for these items. Guidelines relating to the installation of plant material have been reproduced here:

- Plant material should be planted immediately after delivery, or stored in a protected location
- Plant installation should not proceed when air temperature exceeds 28°C, or drops to below 5°C, or in excessively windy weather, as adverse weather conditions will affect the successful establishment of plants
- Water plants well immediately before planting
- Set out plant materials as scheduled to locations and quantities shown on the approved plant layout drawings
- Planting holes for all plants are to be at least double the width and the same depth as the container
- Incorporate fertiliser and water storing granules into backfill at the manufacturers recommended rates
- Remove plant from tube (or pot) and gently tease out exposed roots
- Place plant in planting hole and backfill pit with soil so that the top of the plant rootball is at the same level as the surrounding soil
- Gently compact around plant with soil excavated from hole, and remove any debris detrimental to normal plant growth
- Form a small bowl around plantings by moulding topsoil and dispose of any excess excavated soil responsibly
- Stake, tie and mulch plants and water well immediately after planting

- The use of a plant guard is recommended. These are generally made from recycled plastics and are widely commercially available. Three bamboo stakes are positioned evenly around the plant in a triangle to hold the guard in place.
- Regular maintenance of plant guards is essential to prevent damage to the plant. Guards need to be removed when the plant has grown taller than the guard
- Use of plastic plant guards creates a warm, moist growing space for young plants. It also creates a barrier between the plant and the surrounding area, so that follow-up spraying of weeds can be conducted with no harm to the plants. The space inside the guard also needs to be weeded to prevent choking of the plant

Establishment phase maintenance

The establishment phase is important because juvenile plants need to be protected until they become tolerant of local conditions. This phase typically covers a 12 month period from the time of planting. The most important activities required during the establishment phase include:

- Watering;
- Monitoring of plant establishment and growth;
- Replanting;
- Weed control;
- Plant protection;
- Restriction of public access.

Monitoring plant growth and replanting

Regular, long-term maintenance of plant species within the wetland is essential to ensure that the system functions as desired. The health of the plants should be visually inspected fortnightly during the first two months and monthly thereafter.

Plants may suffer from transplant shock, disease or from insufficient watering during the first 6 months following installation. Discolouration or wilted leaves indicate poor plant health and could be caused by inadequate watering, disease or lack of nutrients. Plants that have not grown since being planted or showing signs of discolouration in the leaves may require the application of fertilisers. If plant survival rates are below 90% or if plants have been predated or displaced during storm events replanting should be undertaken.

Weed control

During storm events, there is a possibility that sediment may be mobilised, which can facilitate weed invasion. Weeds are undesirable as they compete with establishing plants for light, nutrients and space. It is preferable to manually remove weeds before their abundant growth requires herbicide application. Recent research has confirmed that glyphosate is detrimental to the survival of soil and litter macro-arthropods, and there are on-going implications for restoration processes in rainforests and other wetland forests (Nakamura et al, 2008).

- During the warmer months from late spring to early autumn, the site should be monitored fortnightly and weeded as required; and
- During the cooler months, from mid autumn to early spring, the site should be monitored and cleared of weeds on a monthly basis.

If an abundance of small weeds do germinate and manual removal is not feasible, herbicide treatment may be the most cost effective management strategy.

Protection from predation

Some birds, macropods, possums and gliders, and sometimes people, are known to cause significant damage to seedlings, and it is important to minimise damage during the establishment phase. If seedlings are seriously damaged or removed the area should be replanted with larger plants, or clumps of well-established plants can be transplanted. Protection options include installation of guards, exclusion fencing, netting, scare tactics and distraction feeding.

Plant replacement

Regular maintenance of plants is essential to ensure that the wetland system functions as desired. Plant health and coverage should be monitored on a monthly basis.

When to replant

Additional plants should be installed if:

- Survival rates are below 90%;
- Plants have been predated upon or displaced by storm events; or
- Plants have been removed when sediment is removed.

Take care not to confuse plants in senescence (‘hibernation’) with those that are dead or unhealthy. Senescence generally occurs over the winter months. Although plants in senescence may appear dead or lose their foliage, they can be distinguished from dead or unhealthy plants by:

- Remnants of viable plant growth;
- Green shoots at the base of the plant; and
- A firmly anchored root system.

Replanting techniques

The following list summarises the appropriate replanting technique:

1. Dig a hole twice the size of the plant root-ball using a shovel, hoe or hand tools;
2. Dig the plant in so that the top of the root-ball is slightly below or level with the surrounding soil surface;
3. Place a fertiliser tablet near the root-ball (optional); and
4. Back-fill the hole and firm down the surrounding soil to ensure that there is complete contact between the roots and soil; and that the plant is not easily dislodged.

APPENDIX 4: MANAGEMENT ACTIONS FOR FAUNA– FURTHER INFORMATION

Manage streambanks as potential habitat for water rats

Like the platypus, water-rats are most often glimpsed swimming on the surface of lakes or rivers in the early morning or evening. Although generally similar in terms of size and colour, the two species can be distinguished by examining either end of their body - the water-rat lacks a bill, and has a distinctive white tip to its tail. Unlike platypus, water-rats often emerge from the water to eat (sitting up and holding their meal in their forepaws) or run along the bank searching for food. On land they strongly resemble a miniature otter, with a thick coat of soft fur; densely whiskered, blunt muzzle; broad, partly webbed hind feet; and furry, tapering tail.

Studies in the upper Yarra River catchment have shown that platypus and water-rats will use the same burrows, though not at the same time. Such behaviour is not surprising - platypus and water-rats are about the same size and both animals make use of many different burrows over time. Although water-rats are widely distributed in Australia, the animals appear to be relatively uncommon along many waterways. These studies have also indicated that a single pair of adult water-rats occupied three kilometres of relatively pristine stream. However, almost nothing is known of the factors which limit the number of water-rats occupying various habitats.

Platypus and water-rats both function as top predators in Australian freshwater systems and probably compete to some extent for food. Both are known to eat aquatic insects, spiders, crayfish (yabbies), freshwater mussels, shrimps, and frogs. Unlike the platypus, a water-rat has a formidable set of teeth which can be used to kill and eat fish, tortoises and water birds - sometimes up to the size of ducks. The grinding surfaces of water-rat molar teeth are quite smooth, an adaptation that may be particularly effective at dealing with the hard, encased bodies of many aquatic invertebrates (Australian Platypus Conservancy, 2009).

The Water-rat generally occurs in permanent fresh or brackish water, although it can also be found in marine environments, including coastal mangroves in New Guinea (Flannery 1995). *Hydromys chrysogaster* appears to be able to persist in urban areas and may be one of the few native species to have benefitted, at least in some areas, from human activity. The Water-rat typically forages close to the shoreline, restricting its movements to shallow water (up to 2 m in depth). In sufficiently shallow areas, it wades through the water in search of aquatic prey, and it dives in areas of greater depth (Watts & Aslin 1981). Prey is often taken to a favourite feeding platform, such as a log, rock, or stump, located close to the water, where remains of its food are left.

The water rat is a largely carnivorous rodent, with crustaceans, aquatic insects, and fish forming the bulk of its diet. Among insects, water beetles (and water bugs are favoured, and nymphs of damselflies and dragonflies can be seasonally important items. Birds, mammals, frogs, reptiles, mussels, spiders, and plants are also occasionally taken, with plants more commonly consumed in winter or during periods of limited resources (Woollard et al 1978). *Hydromys chrysogaster* is a generalist species and shares the good dispersal capabilities often associated with this life history. It is known to forage on land and may move considerable distances when doing so. Water-rats undertake regular movements along shorelines, where their tracks and runs may be readily seen, and also follow regular routes when crossing bodies of water (Harris 1978). Water rats are mainly nocturnal, although they differ from most Australian rodents in being partially diurnal. They are most active in the hours following sunset, but may also be found swimming or foraging during daylight in the early morning or early evening. They are territorial and may be quite aggressive when populations are at high density (CSIRO Water for a Healthy Country, 2004).

Figure 109. Water rat tracks near Subiaco Creek

Although native rodents are usually nocturnal, the Water-rat is most active around sunset and may even forage during the day. The burrow is usually hidden among vegetation and built along the banks of rivers and lakes. The round entrance has a diameter of about 15 cm. In dense populations, males are territorial and defend their areas aggressively. In these circumstances, it is common to see Water-rats with damaged tails as a result of these fights. The main threats to the Water-rat today are habitat alteration as a result of flood mitigation and swamp drainage, and predation by introduced animals such as cats and foxes. (Australian Museum http://australianmuseum.net.au/Water-rat)

Most of the hydrological issues that affect water rats are very similar to those identified for platypuses, and have been addressed in the PCC Platypus Recovery Plan (Grant, 2007) for Toongabbie Creek. It may be that the possible platypus sightings that prompted the development of the management plan were actually sightings of water rats. Surveys conducted as part of the recovery plan did not record platypuses, but also didn't report sightings of water rats, suggesting that these animals are in very low numbers throughout the catchment. Whether this is the natural situation for this species remains unclear.

Grant (2007) describes parts of Toongabbie Creek as having some of the characteristic habitat features associated with the presence of platypuses (and water rats) in other areas, especially the presence of earth banks consolidated with overhanging riparian vegetation, large pools of over one metre in depth and availability of benthic macroinvertebrate species. He describes the pools in Quarry Branch Creek as quite small and the riffles and runs separating them very shallow and narrow, with little flow. He notes that it seems unlikely that platypuses would occupy this stream on a long-term basis. Platypuses are known to be very susceptible to fox predation under such shallow water conditions. Like the platypus, water rats may forage in the shallow pools, but they are also vulnerable to predation by foxes and cats, and would be more likely to be found in areas where there is deeper water and better sheltering vegetation on steeper banks over these pools.

Key threats identified by Grant (2007) for platypuses are applicable for water rats, and include:

- Rapid rise of creek flows following storm events
- Rubbish mobilisation by stormwater
- Undercutting and slumping of earth banks, especially in areas with limited riparian vegetation

Key actions for protection of water rat habitat include:

- Conduct surveys for water rats before implementing streambank stabilisation works
- Before clearing an area, check for burrow entrances and mark a buffer zone of at least one metre around these to protect any animals that may be utilising them.
- DO NOT OVER CLEAR! Use a staged weed control program, starting with the top of the bank, and ensuring that good cover (including canopy species as well as midstorey and understorey species) is established there before clearing weeds from steep banks below.
- Revegetate with local provenance native species suitable for the community (refer Section B for species lists).
- Avoid the use of geotextiles wherever possible. If geotextiles are required to stabilise the area, give preference to jute mesh rather than jute matting, and plant into the mesh spaces. This will allow continuing access for smaller birds and animals to nest burrows.
- Be careful about overuse of herbicides as this can have an adverse effect on the local invertebrate fauna, which is a major component of the ecosystem and provides food for many of the animals that use streambank burrows.
- Once canopy trees have been established, plant groundcover species such as Lomandras, Dianellas, ferns and vines on steeper bank areas to provide stability. These will become established quickly and provide shelter for potential burrows.
- Regular follow up weeding will be necessary to maintain any areas that have been cleared and planted. For steep areas, identify a good access route and use this to access the site. This will reduce soil compaction and/or disturbance, and prevent damage to young plants while they are establishing. If necessary, install steps to reduce erosion around the site. Careful consideration should be given to the location of these as this provides access to the public and creates a potential source of ongoing disturbance.

Improve small bird habitat by planting a range of shrub species

Small birds generally includes superb fairy-wrens, variegated fairy-wrens, redbrowed finches (also known as firetails), eastern spinebills, eastern yellow robins, spotted pardalotes, white-browed scrubwrens, silvereyes, thornbills and other little brown birds.

Small birds that are forced out into the open through loss of sufficiently dense habitat or by social necessity can be attacked and killed by larger birds and animals, such as dogs, cats, rats, fox, owls, etc. Young females or males (depending on the species) are forced out of a family to find a mate in another family. They will die if they have no protective cover to move safely to other habitat areas used by other populations or are too distant from another population. When breeding areas are removed, within bushland or an urban area, small birds may survive a season or two but soon the population may be lost due to limited recruitment, predation and/or competition from aggressive species such as noisy miner, common myna or the carnivorous grey butcherbird.

Many wrens and other small birds are fairly weak flyers and do not travel far. Some small bird species will stay within a reasonably small territory, which is restricted in size by the availability of suitable protective vegetation. Increasingly the suitable areas for small birds are becoming isolated with no suitable, protective connections with other bushland or habitat areas. Most small native birds will use overgrown weedy areas for protection and as a food source. Privet and lantana stands can provide shelter for small birds, while many weed species provide seeds and nectar as food sources.

It is important to ensure that habitat areas which are in use by small native birds are managed appropriately. Try to protect the habitat which is in use until such time as native habitat with similar attributes is available and being used for shelter and nesting. The complex vegetation structure, with its many microhabitats in the upper, mid and lower layers, is what needs to be protected and rehabilitated. This includes the midstorey, in particular, with its associated understorey of small shrubs, grasses and herbs; vines; rocks; fallen, hollow and decaying logs and branches.

When creating small bird habitat it is also necessary to consider the predators and other threats to small birds within an area and try to take these into account. Plants recommended for small bird habitat include prickly species of *Hakea, Bursaria, Banksia, Lambertia, Woollsia, Styphelia, Epacris, Daviesia* and *Dillwynia*, and also the prickly Acacia ulicifolia. These species provide some protection from predation, as well as food sources and suitable nesting sites for many small bird species.

Areas comprised of native grasslands, with scattered shrubs, can provide excellent food and foraging opportunities for small birds. Small birds need a dense, closely planted, central area of tall shrubs in which to roost, possibly nest and to use as a refuge. Within and outside of this area they need a diverse mix of smaller shrubs, grasses and ground covers in which to forage for food. A small island of vegetation can also benefit from a vine scrambling over the top to create a protective cover. The central area needs a few spiky plants for added protective value. Consideration should also be given to minimising human disturbance and the threat from cats, dogs, rodents and bigger birds.

Improve wetlands habitat by planting a mix of reeds, sedges, and wetland shrubs

The following species are commonly found in Coastal Freshwater Reedlands, located in a number of areas in Parramatta LGA (Table 69). Revegetation may be necessary to improve the quality of this wetland habitat by increasing diversity, or simply by replacing weed species with native species. Species indicated as positive are key species for the community, while those listed as uninformative are commonly found in this community and other similar communities.

Table 44. Plants for revegetation of Coastal Freshwater Reedland (S_FrW03; DECCW, 2009)

SPECIES NAME	FIDELITY CLASS
Baumea juncea	uninformative
Blechnum indicum	positive
Bolboschoenus fluviatilis	uninformative
Carex appressa	uninformative
Casuarina glauca	uninformative
Eleocharis sphacelata	positive
Gleichenia dicarpa	uninformative
Hemarthria uncinata var. uncinata	uninformative
Hydrocotyle verticillata	positive
Hypolepis muelleri	positive
Isachne globosa	positive
Juncus continuus	uninformative

Juncus kraussii	positive
Juncus planifolius	uninformative
Melaleuca decora	uninformative
Melaleuca ericifolia	positive
Melaleuca linariifolia	uninformative
Parsonsia straminea	uninformative
Philydrum lanuginosum	uninformative
Phragmites australis	positive
Typha orientalis	positive

Plant roosting trees for nocturnal carnivorous birds (including owls and frogmouths)

The Powerful Owl inhabits eucalypt forests and woodlands, gallery rainforest and inland riverine woodland. It often roosts and nests in dense gully eucalypt forest. Common roost sites are sheltered groves of mid-storey trees, e.g. sheoaks, turpentine, acacias, paperbarks, and rainforest trees. The Powerful Owl requires hollows for nesting, and many of its prey species are also hollow-dependent.

Once a pair of Powerful Owls has bonded, they will be mates for life. They will stay within their large home range territory, repeatedly using their favourite hollow nesting trees. It's crucial that the Powerful Owl pairs have access to these hollows, which are usually found only in the oldest, tallest eucalypts in a densely vegetated gully. Ideally, the nesting tree will be not only old, but wide, with a diameter of around at least 80cm at breast height. To reach this size, most trees need to be at least 150 years old!

In more urbanised areas Powerful Owls will roost during the day in weed trees such as dense privet patches in stream hollows, and this must be considered when planning to control weeds in an area (McNabb, 2011; M. Brainwood, pers obs).

Each species utilises various habitat types within their home range.

- The Powerful Owl has a home range that varies with quality of habitat and density of prey, usually about 1000ha (1km2), within tall moist eucalypt forests containing large trees and a dense mid storey and a fern understorey.1
- The Sooty Owl has a home range that varies with quality of habitat and density of prey, usually about 300 to 800ha. This species prefers denser vegetation in tall moist eucalypt forests, palm gullies and rainforest areas in coastal regions.
- The Masked Owl has a home range of approximately 1000 to 1200 hectares with a core area of about 150ha. The Masked Owl prefers open forest areas with open understorey.

Sooty and Masked Owls roost throughout the day in tree hollows. Powerful Owls roost throughout the day in the thick foliage of mid storey trees, often within gullies.

Threats to survival in an urbanised environment for these species include:

- Habitat clearing and fragmentation, which also reduces habitat for prey items
- Removal of tree hollows

- Bushfires and/or non-prescribed bushfire regimes
- Collisions with motor vehicles
- Competition for prey by introduced species
- Predation of fledglings by foxes
- Competition for larger tree hollows by European bees
- Competition for smaller tree hollows by Laughing Kookaburras
- Secondary poisoning from eating rats poisoned brodifacoum-based rodenticides

Long term habitat management approaches should be directed towards maintaining connectivity within and between large patches of forest to link areas of suitable habitat and to ensure the protection of prey by maintaining understorey and ground cover habitat within bushland areas. Recovery Plans have been prepared for these large forest owls by the NSW Department of Environment and Conservation. Management actions that promote the conservation of owl species include:

- Support protection and management of bushland containing owl species.
- Encourage and plan for tree retention, particularly habitat trees on private land.
- Revegetation of riparian and creekline habitats, for movement and foraging opportunities.
- Retain old growth forest, including the ground cover, such as fallen logs to maintain habitat for prey species.
- Increase community awareness and involvement in owl conservation of the community through local environment network.

Include plant species that provide food resources for the Grey-headed Flying Fox

The favourite food of the Grey-headed Flying-fox is the nectar and pollen of eucalypts and other native trees, such as paperbarks and banksias. Flying-foxes also like eating rainforest fruits, such as figs and lilly pilly berries, which they chew to extract the juice and then spit out the fibre and the large seeds. Small seeds are often swallowed and may not pass through the gut until up to one hour later, by which time flying-foxes could be 35-50 km away from the tree that the seed came from. By dispersing rainforest seeds over wide areas, flying-foxes give seeds a chance to grow away from the parent plant, and potentially expand remnant patches of valuable rainforest vegetation. It is estimated that a single flying-fox can dispense up to 60,000 seeds in one night.

Flowering trees in the diet list were primarily of the Myrtaceae and Proteaceae, although single species of Arecaceae, Fabaceae and Pittosporacea were also used (Table 70). The majority of species were eucalypts (genus Eucalyptus, Corymbia or Angophora; Ebby & Law, 2008).

Table 45. Blossom species utilised by Grey-headed Flying Foxes in the Sydney region. Species highlighted in yellow are considered very important in Flying Fox diets.

BLOSSOM SPECIES IN FLYING FOX DIET	
Banksia integrifolia v. integrifolia	Coast Banksia
Banksia serrata	Old Man Banksia
Grevillea robusta	Silky Oak
Angophora costata	Smooth-barked Apple
Angophora floribunda	Rough-barked Apple

BLOSSOM SPECIES IN FLYING FOX DIET	
Corymbia eximia	Yellow Bloodwood
Corymbia gummifera	Red Bloodwood
Eucalyptus acmenoides	White Mahogany
Eucalyptus amplifolia	Cabbage Gum
Eucalyptus botryoides	Southern Mahogany
Eucalyptus deanei	Mountain Blue Gum
Eucalyptus fibrosa	Broad-leaved Ironbark
Eucalyptus moluccana	Grey Box
Eucalyptus muelleriana	Yellow Stringybark
Eucalyptus paniculata	Grey Ironbark
Eucalyptus parramattensis	Parramatta Red Gum
Eucalyptus pilularis	Blackbutt
Eucalyptus piperita	Sydney Peppermint
Eucalyptus propinqua	Small-fruited Grey Gum
Eucalyptus punctata	Large-fruited Grey Gum
Eucalyptus resinifera	Red Mahogany
Eucalyptus robusta	Swamp Mahogany
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus siderophloia	Grey Ironbark
Eucalyptus tereticornis	Forest Red Gum
Melaleuca quinquenervia	
Syncarpia glomulifera	Turpentine

The fruit diet of Grey-headed flying foxes is taxonomically diverse, with feeding often limited to one species in a family. There are numerous trees on the list, seven liana or climbers, and one mistletoe. Almost all of these species occur in rainforest vegetation, except for *Rhagodia candolleana* (Seaberry Saltbush), which is a scrambling climber found in saline or sandy coastal habitats (Table 71).

Table 46.Species in the fruit diet of Grey-headed flying foxes in the Sydney region

FRUIT SPECIES IN FLYING FOX DIET	
Livistona australis	Cabbage Palm
Archontophoenix cunninghamiana	Bangalow Palm
Avicennia marina	Grey Mangrove
Rhagodia candolleana	Seaberry Saltbush
Schizomeria ovata	Crabapple
Diospyros pentamera	Myrtle Ebony
Elaeocarpus reticulatus	Blueberry Ash
Polyosma cunninghamii	Featherwood
Melia azedarach	White Cedar
Hedycarya angustifolia	Native Mulberry
Ficus coronata	Sandpaper Fig
Ficus macrophylla	Moreton Bay Fig
Ficus rubiginosa	Rusty Fig

Acmena smithii	Lilly Pilly
Syzygium australe	Brush Cherry
Passiflora herbertiana	Native Passionfruit
Pittosporum undulatum	Sweet Pittosporum
Alphitonia excelsa	Red Ash
Morinda jasminoides	Morinda
Diploglottis australis	Native Tamarind
Planchonella australis	Black Apple
Solanum aviculare	Kangaroo Apple
Cissus hypoglauca	Five-leaf Water Vine

Manage streambanks as potential habitat for Spotted Pardalotes and terrestrial migratory birds that use burrows in earth banks

A range of species in several faunal groups use earth burrows of varying sizes as roosting and breeding habitat, including terrestrial migratory birds, small native rodents, lizards and snakes. The main issues for maintaining habitat for this range of species are:

- Controlling erosion to prevent bank slumping and collapse
- Maintaining vegetation cover to provide shelter and landing sites, and protection for the burrow entrances
- Limiting access by humans and introduced predators

The following are management recommendations to facilitate this:

- Before clearing an area, check for burrow entrances and mark a buffer zone of at least one metre around these to protect any animals that may be utilising them.
- DO NOT OVER CLEAR! Use a staged weed control program, starting with the top of the bank, and ensuring that good cover (including canopy species as well as midstorey and understorey species) is established there before clearing weeds from steep banks below.
- Revegetate with local provenance native species suitable for the community (refer Section B for species lists)
- If geotextile is required to stabilise the area, give preference to jute mesh rather than jute matting, and plant into the mesh spaces. This will allow continuing access for smaller birds and animals to nest burrows.
- Clear steep banks in a mosaic pattern where possible to retain undisturbed areas while treated areas become re-established.
- For areas with dense weed infestations (especially vines), spot spray and plant canopy species first, and install tall guards to protect these from smothering by weeds.
- Be careful about overuse of herbicides as this can have an adverse effect on the local invertebrate fauna, which is a major component of the ecosystem and provides food for many of the animals that use streambank burrows.
- Once canopy trees have been established, plant groundcover species such as Lomandras, Dianellas, ferns and vines on steeper bank areas to provide stability. These will become established quickly and provide shelter for potential burrows.

- Regular follow up weeding will be necessary to maintain any areas that have been cleared and planted. For steep areas, identify a good access route and use this to access the site. This will reduce soil compaction and/or disturbance, and prevent damage to young plants while they are establishing. If necessary, install steps to reduce erosion around the site. Careful consideration should be given to the location of these as this provides access to the public and creates a potential source of ongoing disturbance.

Increase availability of feeding and roosting habitat resources for microbats

Microbats (Microchiropteran bats) are relatively small mammals with weights ranging from a mere 3 grams up to 40 grams. These species are specially adapted for flight with wing membranes up to 25cm. They use a combination of eyesight and echolocation for finding their way around and locating prey, being mostly insects, even on the darkest nights. These bats represent a diverse and significant component of the mammal fauna of NSW. They comprise about 25% of Australia's mammals and in north-eastern NSW, for example this ratio increases to almost 39%. Nineteen microbat species are listed as threatened under the NSW Threatened Species Conservation Act 1995 (TSC Act), of which two were recorded in recent surveys in Parramatta LGA.

All microbats require roost sites for both day and night time resting, predator protection, social contact and breeding. Individual species are very specific in their choice of roost sites ranging from hollows and cavities in trees to rock overhangs, caves and subterranean tunnels. They may also use stormwater culverts, flood mitigation structures and the underside of timber and concrete bridges. These sites often alternate due to different weather, seasons or even on a daily basis. Whilst all bat roost sites are important for day to day survival, roosts used for winter, cold weather hibernation and breeding (maternity sites) are most significant. These sites are often used seasonally. This means that the species may only be present at certain times of the year. To determine the significance of roost sites, assessments may be required over a number of seasons.

Roost and maternity sites for bats can differ depending on each bat's specific requirements. Broadly, they can be separated into those species which exclusively use tree hollows, those that may use tree hollows as well as other structures such as bridges, buildings or abandoned bird nests, and those bats that use subterranean roost sites (caves, mine shafts or tunnels). Whilst bats may use small tree hollows, they tend to select roost sites in hollows in the largest trees available. Numbers of bats (10 or more) often roost together in the same tree hollow and in caves and disused mines, hundreds and often thousands of bats may roost together, particularly during breeding.

Retention of a range of hollow-bearing trees (preferably the largest trees) and protection of vegetation around the entrance to caves and mine shafts is paramount to protecting the diversity of bat species. Bats are vulnerable to disturbance of roost sites such as tree hollows, caves and subterranean tunnel roost sites, as large numbers representing significant proportions of regional populations can congregate in one roost site for protection and breeding. In particular, disturbance of maternity colonies during spring and summer breeding and raising of young and during winter when animals congregate for warmth, can result in a significant impact on regional populations. Protection of trees with hollows, trees with defoliating (loose) bark and rock overhangs, caves and subterranean tunnels are vital for the conservation of microbats.

Table 47. Preferred roosting habitats for NSW microbat species (from Private Native Forestry – Advisory Note No.7, Department of Environment and Climate Change, 2007)

SCIENTFIC NAME	COMMON NAME	ROOST SITES	STATUS
Nyctimene robinsoni	Eastern Tube-nosed Bat	Foliage	V
Syconycteris australis	Common Blossom-bat	Foliage	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Hollows, bark, nests, structures	V
Rhinolophus megaphyllus	Eastern Horseshoe Bat	Caves, structures	
Chalinolobus dwyeri	Large-eared Pied Bat	Cave, bird nests	V
Chalinolobus gouldii	Gould's Wattled Bat	Hollows, foliage, structures	
Chalinolobus morio	Chocolate Wattled Bat	Hollows, bark, nests, structures	
Chalinolobus nigrogriseus	Hoary Wattled Bat	Hollows, rock crevices	V
Chalinolobus picatus	Little Pied Bat	Caves, hollows, structures	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Hollows, bark, structures, caves	V
Kerivoula papuensis	Golden-tipped Bat	Bird nests, hollows	V
Miniopterus australis	Little Bentwing-bat	Caves, hollows, structures	V
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	Caves, structures	V
Myotis adversus	Large-footed Myotis	Caves, hollows, structures, foliage	V
Myotis macropus	Southern Myotis	Caves, hollows, structures, foliage	V
Nyctophilus bifax	Eastern Long-eared Bat	Hollows, foliage, bark	V
Nyctophilus geoffroyi	Lesser Long-eared Bat	Hollows, bark, structures	
Nyctophilus gouldii	Gould's Long-eared Bat	Hollows, bark	
Nyctophilus timoriensis	Eastern Long-eared Bat	Hollows, bark	V
Scoteanax rueppellii	Greater Broad-nosed Bat	Hollows, bark, structures	V
Scotorepans balstoni	Inland Broad-nosed Bat	Hollows, structures	
Scotorepans greyii	Little Broad-nosed Bat	Hollows, structures	
Scotorepans orion	Eastern Broad-nosed Bat	Hollows, structures	
Vespadelus baverstocki	Inland Forest Bat	Hollows, structures	V
Vespadelus darlingtoni	Large Forest Bat	Hollows, structures	
Vespadelus pumilis	Eastern Forest Bat	Hollows, structures	
Vespadelus regulus	Southern Forest Bat	Hollows, structures	
Vespadelus troughtoni	Eastern Cave Bat	Caves, bird nests, structures	V
Vespadelus vulturnus	Little Forest Bat	Hollows, structures	
Mormopterus beccarii	Beccari's Freetail-bat	Hollows, bark, structures	V
Mormopterus norfolkensis	Eastern Freetail-bat	Hollows, bark, structures	V
Mormopterus species	Eastern Freetail Bat	Hollows	
Mormopterus species	Inland Freetail Bat	Hollows, structures	

Mormopterus species	Southern Freetail Bat	Hollows, structures	
Mormopterus 'Species 6'	Hairy-nosed Freetail Bat	Hollows, bark, structures	V
Tadarida (=Nyctinomus) australis	White-striped Freetail Bat	Hollows	

Installation of supplementary roosting habitat for microbats is a good way to support the continuing success of local populations, whether as a temporary measure while suitable plants become established, or as a more permanent increase in the availability of habitat. Ipswich City Council (2009) provided designs for nest boxes suitable for microbats (Figure 187a; 188). Additional designs for bat boxes are available from Backyard Buddies (Figure 189; 2010). Using a mixture of designs increases the likelihood that there will be suitable habitat for a number of microbat species.

Figure 110. (a) Microbat roosting box; (b) Microbat roosting tube

A good alternative to the bat box is the bat tube (Figure 110 (b)). This can be made out of 6 inch PVC pipe, with an opening at the bottom, cut on a 45 degree angle, and a PVC cap at the top – screw caps are best for this as it makes cleaning and replacing the lining easier. Line the inside with shade cloth attached using pop rivets. A galvanised strip or similar can also be pop riveted to the tube and used to attach it to a tree. Don't use wire to attach it as this will eventually ringbark the tree. Painting the tube green or brown helps it to blend in, which helps to prevent vandalism.

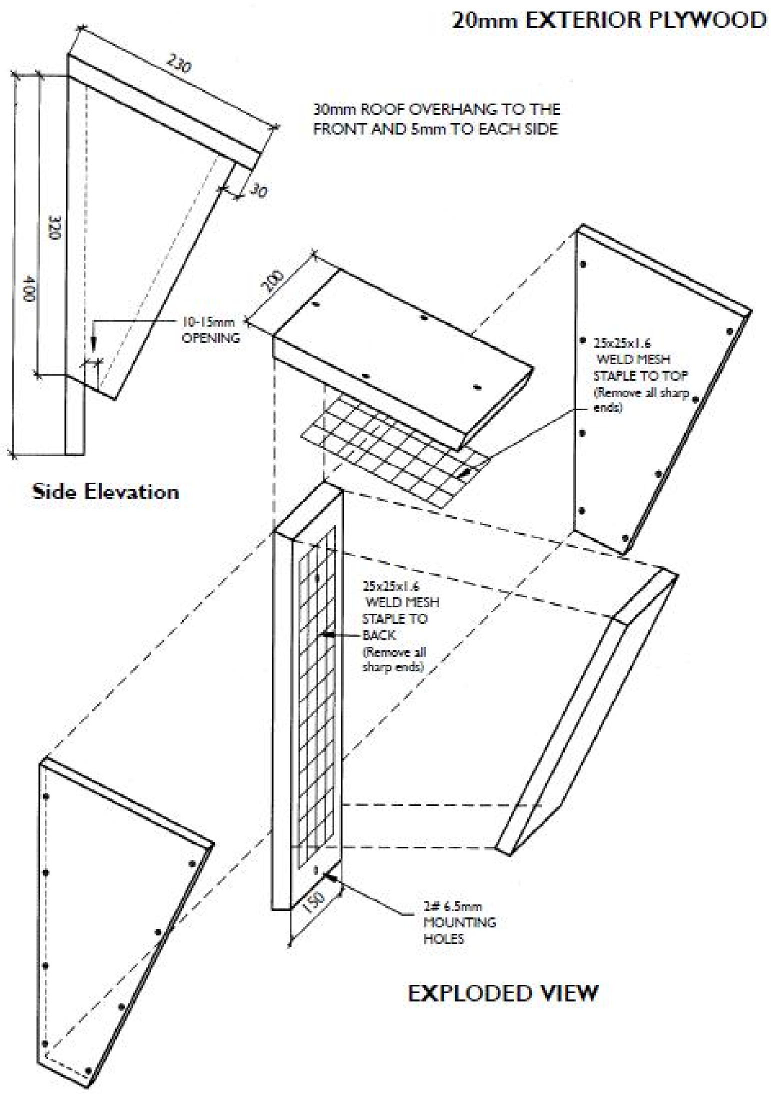


Figure 111. Design for construction of microbat roosting habitat box (Ipswich City Council, 2009)

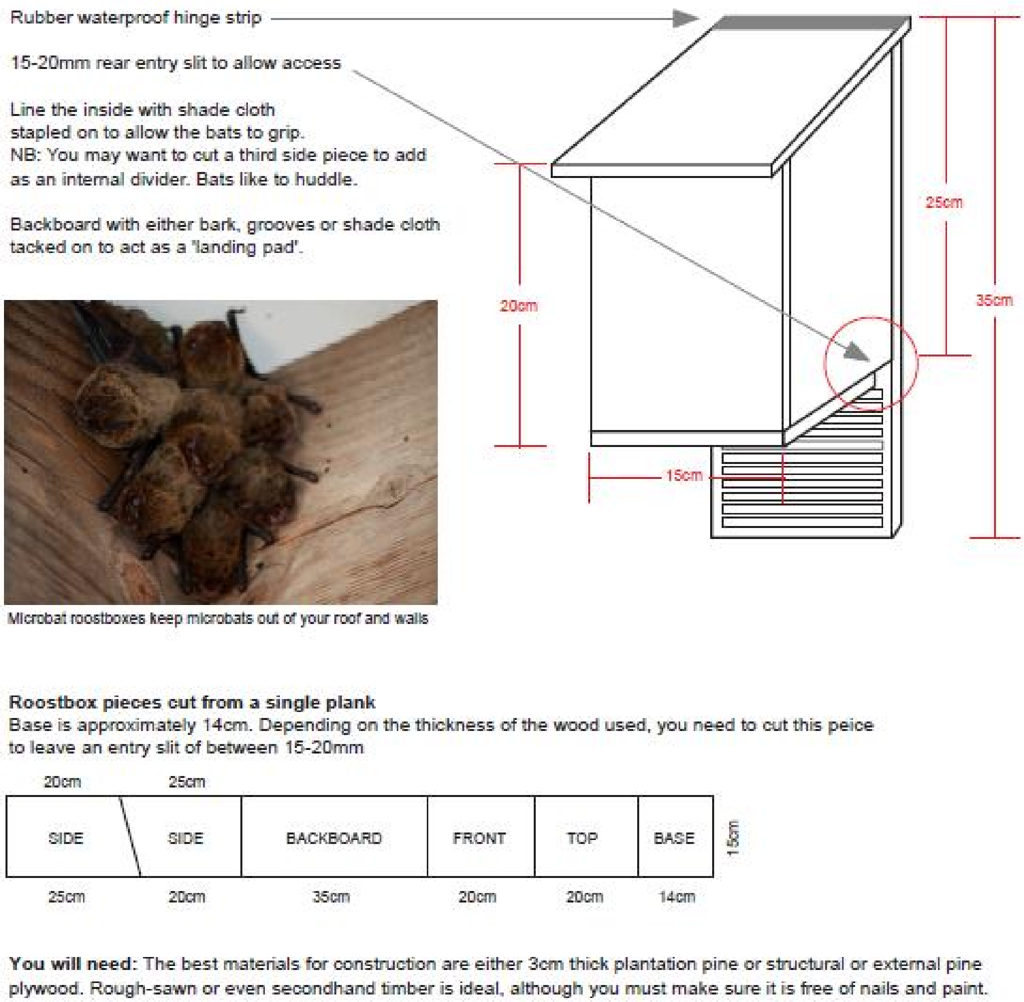


Figure 112. Design for microbat roosting box (Backyard Buddies, 2010)

The nest box should be placed preferably in an evergreen tree away from bright lights, and approximately 3m from the ground. Bats are curious and will investigate and new objects in their territory. Don't forget to monitor the next box or tube for bee and wasp infestation. If this occurs, call a professional bee keeper or wasp exterminator to have them removed.

Feral bees and their control

The origin of feral bees

Feral bees are European Honeybees that have flown away from managed hives and formed their own colonies in the environment. They become extremely aggressive, commonly swarm and and even displace native animals from their homes. Their honey has little value to commercial honey production or crop pollination (DEC, Feral Bee Strategy 2005). Feral bees can carry exotic bee diseases and mites, so by controlling bees we can control these diseases. Managed bees are the European Honeybees (*Apis mellifera*) managed by registered (and sometimes unregistered) beekeepers.

Feral bees out compete native birds and animals for natural nesting hollows in trees. With an increase in habitat clearing and an increase in urbanisation there have been changes in bird species distribution largely due to the loss of remnant bushlands and large, mature, hollow bearing trees. Hollow bearing trees are important nesting sites for many bird and reptile species and invertebrates.

The feral bee problem in NSW

The introduced honeybee is abundant and widely but patchily distributed as a feral species across New South Wales. Feral honeybees occur in colonies, usually centered on tree hollows, independently of managed hives that are maintained by beekeepers. There is evidence that honeybees impact on indigenous species in two broad ways, firstly via competition for tree hollows, and secondly via competition for floral resources.

Breeding colonies of honeybees occupy large hollows in trees. These hollows are completely taken over by honeybees, and are removed from the pool of hollows available to native species. Due to the long time required for hollow formation (e.g. 150 years for Blackbutt, Eucalyptus pilularis; Brown Barrel, E. fastigata and Messmate, E. obliqua) and the long term nature of bee occupation this represents a long term loss of a critical resource.

Due to the physiological characteristics of eucalypt growth, hollow formation is a common trait of this group of plants. Australian fauna, particularly birds and mammals, make extensive use of this structural element of habitat, and at least 20% of bird species are hollow-dependent. All arboreal marsupials use tree hollows, and dependent upon them for shelter and breeding sites. Tree hollows are also used by many species of microchiropteran bats and small scansorial mammals.

Honeybees, both feral and managed, are frequent visitors at flowers, and often remove 80% or more of the floral resources produced. This can result in competitive displacement of native fauna that use the floral resources, including honeyeaters and native bees. Removal of pollen by honeybees has been shown to affect seed set in several plant species, including Melastoma and Grevillea macleayana. Feral honeybees may also reduce seed set in species of Persoonia due to inefficient transfer of pollen. Honeybees can have neutral or beneficial effects on some Banksia species, although these effects may become manifest only after honeybees have depleted populations of native pollinators.

Bees swarm when they feel overcrowded. It is a natural occurrence. A swarm occurs when the queen bee, accompanied by several thousand worker bees leaves the nest (wild) or beehive and searches for a new home. Upon leaving the nest or hive, the swarm will often only travel a short distance (up to 100m) and gather on a nearby tree branch, house eave or other handy structure while scout bees travel further a-field to locate a permanent site.

Feral bee control

Recommendations for management of feral bees are as follows:

- Where hives are detected in bushland trees, it is recommended that fumigation be undertaken by licensed pest control operators.
- Once a hive is built in a tree hollow, the nest is rendered almost permanently unusable for nesting birds. Supplementary habitat such as nest boxes should be considered in areas where there have been multiple hives. While the hollows are unlikely to be used by birds or animals for a long time, removal of bees will prevent their spread into other hollows in the area.
- Some awareness/education amongst apiarists about the need to manage the size of the colonies in their hives could help manage the main source of feral bees.
- Encourage reporting of hives observed in bushland, and refer local residents to an apiarist for control of swarms and hives in residential areas.
- For nest boxes, prevention is the ultimate goal - to do something to a hollow that deters bees from building in the first place, and preferably something that does not have to be renewed constantly. The most promising idea involves placing a fabric on the underside of the lid, on the basis that bees start to build their honeycomb from the top down. A number of materials have been trialled, including carpet (some success but not effective enough) and treated sheep skin (total failure). Polyester wool is partially effective, although difficult to work with (Australian Nestbox Co, 2012).
- Honeybee Australis provides a list of beekeepers that will remove swarms and hives in the Parramatta/Western Sydney area: http://www.honeybee.com.au/service/swarm/index.html

Research on the efficacy of methods for feral bee control

At present the usual method for controlling feral colonies of honeybees is to individually poison each feral colony that is found. Shelltox pest strips and other over-the-counter insecticides have all been used to some extent to kill individual colonies. This is labour intensive and not an effective method of controlling or eradicating feral colonies of honeybees over a wide area. Some efficient broadacre technique needs to be developed to help land managers remove feral colonies from sensitive areas. However, considerable research will be required before any broadacre methods can be introduced. The most likely method(s) of control will involve using baits laced with certain chemicals that honeybees take back to the hive that eventually kill the hive. There are three areas requiring research:

a) the impact of the baiting program on nontarget animals both from primary and secondary poisoning;
b) the success of the baiting program in eliminating feral colonies from a region (ie what proportion of colonies within a specified distance from a baiting station are destroyed); and
c) the speed with which the baited area is recolonised by feral honeybees.

Bell Miner Associated Dieback and some control techniques

What is Bell Miner Associated Dieback

Dieback is a condition in which trees progressively die, from the top downward. The condition spreads through the leaves and branches and often the whole plant will eventually die. The hardwood forests of north-east NSW are increasingly suffering from a form of dieback. This type of dieback is strongly associated with sap-feeding insects called psyllids and psyllids are strongly associated with the native bell miner or bellbird.

Bell miners are a natural part of eucalypt forests, and they normally have a minor (and positive) impact on forests. However, bell miner populations have increased in size, and the birds have become more widely distributed. Impacts on other forests have been noted in areas where the bell miner population has increased. Bell miners have been implicated in the spread of dieback, in addition to other factors such as:

- tree stress
- psyllid infestation
- dense forest understories
- weed invasion
- drought
- logging
- road construction
- pasture improvement
- loss of biodiversity (both plants and animals)
- soil nutrient changes
- changing fire patterns
- changing grazing regimes.

Bell miner habitat preferences

Bell miners prefer Eucalypt forests with dense understorey vegetation which is important for nesting and roosting. Colonies of Bell miners are often found in close proximity to riparian habitat, Lantana thickets, rainforest or wet sclerophyll understorey in central and northern NSW.

In relatively undisturbed eucalypt forest where the presence of Bell miner colonies is not associated with the dieback of the canopy, the understorey is often relatively diverse. It is possible that a diverse understorey, which favours a diverse avifauna, will be antagonistic to Bell miner colonisation. On the other hand, it is likely that conversion of a diverse understorey to a grassy understorey with few shrubs will also be to the disadvantage of Bell miners. In the presence of high numbers of weeds in the flora, this process is likely to have severe consequences for biodiversity.

While the influence of vegetation structure in providing habitat for Bell miners is not completely understood, controlling Lantana is advocated to disrupt Bell miner colonies and to stimulate a more complex native flora. Removal of Lantana thickets will initiate and facilitate natural regenerative processes to promote the establishment of structurally complex mid and lower strata. However, to prevent reinvasion of a site by Lantana requires the establishment of a dense shade producing canopy by undertaking a regular and systematic follow-up maintenance program. Hence the management of Lantana requires a more integrated solution than simply relying on a fire regime (Meeks, 2006).

Bell miner effects on forests

Bell miners have been implicated in the demise of forests by assisting in the increasing abundance of psyllids that eventually lead to Bell miner Associated Dieback. The aggressive behaviour of Bell miners exclude other forest honeyeaters and removal trials show that soon after Bell miners are reduced in abundance (via habitat modification), other birds rapidly recolonise sites. Investigations are currently under way to find out more about the complex condition that has come to be known as 'Bell miner Associated Dieback'.

Various pathogens, such as species of Phytophthora, Armillaria, Pythium, and Fusarium, have been sampled from stands of Sydney Blue Gum affected by psyllid associated dieback in NSW, as well as from areas of healthy forest. In addition, wood-boring insects (e.g. termites, hepialid and cossid moths, longicorn beetle larvae) are also commonly found in the stems of eucalypts with crown dieback, suggesting that once canopy dieback has commenced, many other interacting factors facilitate canopy decline. There has not been any study to separate the affects of various factors in the development of canopy dieback. The incidence and impacts of Phytophthora, which was once considered a serious problem largely in south-western Australia and Tasmania, are now more widely recognised in south-eastern Australia. Any activity which increases soil movement or soil disturbance has the potential to increase the impact of soil borne pathogens on a forest stand. A healthy and diverse community may be the best insurance against attack from potential insect pests and fungal pathogens (Wardell-Johnson et al, 2006).

Phytophthora cinnamomi is detected frequently in Bell miner infested forests, but the presence of this soil pathogen has not been linked to poor crown condition of *E. saligna*. Thus, it is likely that Phytophthora and other pathogens are more common and widespread than generally believed. There has been no study of the impacts of disease or interactions of disease and other agents of disturbance hypothesised to be associated with BMAD.

Bell Miner control methods

A number of key recommendations have been made for control of Bell Miners, including:

- removal of Lantana
- replacement with a diverse and complex midstorey and understorey of native species to favour a diverse native avifauna over Bell miners
- considerable success has been achieved using splatter gun sprayers. These gas powered sprayers deliver large droplet sprays in a highly targeted manner distances of 7 to 9m. Best results are generally obtained with a spray mix using glyphosate and metsulfuron methyl at higher concentrations (check label directions for the correct mixture), with a surfactant and/or penetrant such as Pulse or LI500.
- Once the Lantana is dead, mulch the dead material on site and ensure Lantana is retreated as required. For larger areas and areas where there is a limited source of native seed, use brush matting with seed or direct seed in conjunction with planting.

CONSTRUCTED HABITAT ELEMENTS FOR RESERVES

Natural nest hollows

A high proportion of Australian birds and mammals are dependent on hollows in trees for nesting and shelter. Over 20% of our native fauna are obligate hollow users. Gibbons and Lindenmayer (2002) have found that more than 300 native species utilise tree hollows in Australia, underlining the importance of this diminishing natural resource. Fauna including mammals, reptiles, amphibians and birds all use tree hollows, even native bees.

The number of suitable nesting hollows in trees is declining throughout New South Wales, and particularly in Sydney. Trees are dying and falling over and very few trees are becoming the age at which hollows form. It can take over 120 years for suitable hollows to develop in a eucalypt tree. There is also a huge trade in the older trees for fire wood which is recognized as a major reason for the decline in some woodland species. Nesting boxes provide an important supplement to naturally occurring hollows in urban areas. A number of native birds and mammals frequently come into urban areas to feed from native trees planted in suburban gardens. However they are unable to breed due to the lack of sufficient nesting hollows.

Native species that use nest boxes

Bats

A number of species of insectivorous bats occur in the Sydney area. They all require daytime roosts, normally tree hollows. Bats are excellent at controlling insect pests around the home. These special boxes are designed for bats only and will not attract unwanted pest species such as bees or feral birds. The area below the box should also be free from obstructions to allow easy access. Boxes should be placed as high as possible and facing to the west or east to get the morning sun.

Figure 113. Bats are becoming regular users of roost boxes.

Parrots

Parrots are amongst the most colourful of the Australian birds. Many of those in the Sydney suburban area feed on nectar from eucalypts. They require hollow branches in which to breed. Some parrot species (eg Lorikeets) tend to do better when nesting close together as this helps them compete with the more agressive Starlings and Indian Mynahs. Two types of parrot boxes are available, vertical and horizontal.

Figure 114. Parrots are colourful users of nestboxes.

Ducks

Several duck species are known to use hollows in trees. Wood Duck and Black Ducks use tree hollows and will use nest boxes. Other duck species, such as Chestnut and Grey Teal will use nesting boxes if they are placed over water. This box has a special entrance that prevents predators from getting eggs, and can be placed on a tree or post.

Possums: large and small

The two common species of Possums in the Sydney area are the Brushtail and Ringtail Possums. The larger Brushtail is well known for entering suburban homes. By giving them a house of its own will keep them out of yours. The smaller Ringtail possum can make its own nest in dense undergrowth, but will use nesting boxes.

Figure 115. Ringtail possums in a "natural" nesting box.

Sugar gliders

Another possum species in many parts of Australia is the Sugar Glider. These beautiful animals can live in groups of five or more. They have a diet of insects, nectar and tree sap. It has been found that eucalypts that have Sugar Gliders living on them are healthier than those without. This is because of the large numbers of insect pests that they consume. Like the Squirrel Glider, Sugar Gliders prefer small entrances to their nests. In highly urbanised environments, many of the other gliders will favour nesting boxes with small entrances.

Other bird species

Many other Australian birds use nest hollows, including Tree-Creepers, Owlet Nightjars, Owls, Pardalotes and Kookaburras. There are nest boxes available that have been designed for these species, and these will be discussed in more detail in the next section.

Looking after your nest box

Ideally boxes should be placed away from night time lights and at least three metres from the ground and located in a sheltered location. Choosing a location will depend on the target species, and surrounding vegetation. Aspect is usually very important – don't face them west: gliders in particular hate this! You should put a small amount of wood shavings or shredded bark in the bottom of your nesting box. This provides some insulation as well as nesting material.

Feral species

A number of introduced animals compete with Australian animals for nesting hollows. Of these the Starlings, Indian Mynahs and Honey Bees are the most destructive. They compete with native species for nesting hollows and some will even build nests over the tops of nests of native animals. Introduced species and their nests should be removed from nesting hollows and boxes. Nests built by Indian Mynahs and Starlings usually are very untidy and often contain plastic and other bits of rubbish. In the case of bees a pest strip placed in a box for a few days will kill them. All dead bees and honey comb should be removed (the honey should not be consumed).

Caution: Bees can be very aggressive. We recommend you contact a professional pest controller for advice.

Nest boxes need to be installed and maintained by suitably qualified professionals (Figure 5). Boxes should be constructed by a suitably skilled person, and made from marine plywood and painted inside and out. Maintenance regimes for nestboxes for different species will vary. The frequency of cleaning should be determined separately for each type of nestbox. Take care not to disturb residents of nest boxes – eg clean nest boxes at night for nocturnal species.

Figure 116. Nest boxes need to be maintained by suitably qualified personnel.

APPENDIX 5 DETAILED SITE RECORDS

APPENDIX 6 SPECIES LISTS BY LGA

Table 48 ASHFIELD SPECIES LIST 2000-2014

CLASS	FAMILY NAME	*SCIENTIFICNAME*	COMMON NAME	COUNT
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	18
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	1
AVES	Anatidae	*Anas castanea*	Chestnut Teal	2
AVES	Anatidae	*Anas gracilis*	Grey Teal	1
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	8
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	200
AVES	Ardeidae	*Butorides striatus*	Striated Heron	1
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	4
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	51
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	29
AVES	Artamidae	*Strepera graculina*	Pied Currawong	25
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	49
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	13
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	60
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	12
AVES	Cacatuidae	*Nymphicus hollandicus*	Cockatiel	2
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	3
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	25
AVES	Columbidae	*Columba leucomela*	White-headed Pigeon	1
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	58
AVES	Corvidae	*Corvus coronoides*	Australian Raven	18
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	12
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	1
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	58
AVES	Hirundinidae	*Petrochelidon ariel*	Fairy Martin	9
AVES	Hirundinidae	*Petrochelidon nigricans*	Tree Martin	1
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	36
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	1
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	24
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	2
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	23
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	75
AVES	Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	1
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	11
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	37
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	44
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	10

CLASS	FAMILY NAME	*SCIENTIFICNAME*	COMMON NAME	COUNT
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	1
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	15
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	1
AVES	Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	1
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	1
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	2
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	104
AVES	Rallidae	*Gallirallus philippensis*	Buff-banded Rail	1
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	31
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	20
AVES	Turnicidae	*Turnix varius*	Painted Button-quail	1
AVES	Tytonidae	*Tyto javanica*	Eastern Barn Owl	1
MAMMALIA	Peramelidae	*Perameles nasuta*	Long-nosed Bandicoot	1
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	1
MAMMALIA	Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	1
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	14
MAMMALIA	Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat	8
MAMMALIA	Vespertilionidae	*Miniopterus schreibersii*	Eastern Bentwing-bat	11
MAMMALIA	Vespertilionidae	*Vespeduelus regulus*	Southern Forest Bat	184
REPTILIA	Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink	1
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	1
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	1
REPTILIA	Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	1

Table 49 AUBURN SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Hylidae	*Litoria aurea*	Green and Golden Bell Frog	5184
AMPHIBIA	Hylidae	*Litoria dentata*	Bleating Tree Frog	17
AMPHIBIA	Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog	930
AMPHIBIA	Hylidae	*Litoria peronii*	Peron's Tree Frog	3335
AMPHIBIA	Hylidae	*Litoria verreauxii*	Verreaux's Frog	1
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	3718
AMPHIBIA	Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	5070
AMPHIBIA	Myobatrachidae	*Limnodynastes tasmaniensis*	Spotted Grass Frog	134
AMPHIBIA	Myobatrachidae	*Uperoleia laevigata*	Smooth Toadlet	1
AVES	Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	132
AVES	Acanthizidae	*Acanthiza lineata*	Striated Thornbill	5
AVES	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	1344
AVES	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	22

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Acanthizidae	*Gerygone albogularis*	White-throated Gerygone	7
AVES	Acanthizidae	*Gerygone levigaster*	Mangrove Gerygone	18
AVES	Acanthizidae	*Gerygone mouki*	Brown Gerygone	1
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	181
AVES	Acanthizidae	*Smicrornis brevirostris*	Weebill	6
AVES	Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	79
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	137
AVES	Accipitridae	*Accipiter novaehollandiae*	Grey Goshawk	3
AVES	Accipitridae	*Aquila audax*	Wedge-tailed Eagle	1
AVES	Accipitridae	*Aviceda subcristata*	Pacific Baza	1
AVES	Accipitridae	*Circus approximans*	Swamp Harrier	12
AVES	Accipitridae	*Circus assimilis*	Spotted Harrier	12
AVES	Accipitridae	*Elanus axillaris*	Black-shouldered Kite	194
AVES	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	143
AVES	Accipitridae	*Haliastur sphenurus*	Whistling Kite	5
AVES	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	3
AVES	Accipitridae	*Milvus migrans*	Black Kite	5
AVES	Accipitridae	*Pandion cristatus*	Eastern Osprey	1
AVES	Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler	1525
AVES	Aegothelidae	*Aegotheles cristatus*	Australian Owlet-Nightjar	0
AVES	Alaudidae	*Mirafra javanica*	Horsfield’s Bushlark	2
AVES	Alcedinidae	*Ceyx azureus*	Azure Kingfisher	1
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	312
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	67
AVES	Anatidae	*Anas castanea*	Chestnut Teal	18717
AVES	Anatidae	*Anas gracilis*	Grey Teal	10662
AVES	Anatidae	*Anas platyrhynchos*	Mallard	21
AVES	Anatidae	*Anas rhynchotis*	Australasian Shoveler	37
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	4286
AVES	Anatidae	*Aythya australis*	Hardhead	2064
AVES	Anatidae	*Biziura lobata*	Musk Duck	72
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	1274
AVES	Anatidae	*Cygnus atratus*	Black Swan	746
AVES	Anatidae	*Dendrocygna arcuata*	Wandering Whistling-Duck	1
AVES	Anatidae	*Dendrocygna eytoni*	Plumed Whistling-Duck	1
AVES	Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck	69
AVES	Anatidae	*Oxyura australis*	Blue-billed Duck	1
AVES	Anatidae	*Stictonetta naevosa*	Freckled Duck	2
AVES	Anatidae	*Tadorna tadornoides*	Australian Shelduck	7
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	740
AVES	Anhingidae	*Botaurus poiciloptilus*	Australasian Bittern	3
AVES	Apodidae	*Apus pacificus*	Fork-tailed Swift	2

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	142
AVES	Ardeidae	*Ardea ibis*	Cattle Egret	430
AVES	Ardeidae	*Ardea intermedia*	Intermediate Egret	34
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	365
AVES	Ardeidae	*Ardea pacifica*	White-necked Heron	13
AVES	Ardeidae	*Butorides striatus*	Striated Heron	89
AVES	Ardeidae	*Egretta garzetta*	Little Egret	12
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	1873
AVES	Ardeidae	*Egretta sacra*	Eastern Reef Egret	1
AVES	Ardeidae	*Ixobrychus dubius*	Australian Little Bittern	15
AVES	Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	115
AVES	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	20
AVES	Artamidae	*Artamus leucorynchus*	White-breasted Woodswallow	11
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	2235
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	468
AVES	Artamidae	*Strepera graculina*	Pied Currawong	2022
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	702
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	599
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	13
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	124
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	1101
AVES	Cacatuidae	*Nymphicus hollandicus*	Cockatiel	1
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	1020
AVES	Campephagidae	*Coracina tenuirostris*	Cicadabird	3
AVES	Campephagidae	*Lalage sueurii*	White-winged Triller	25
AVES	Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar	2
AVES	Charadriidae	*Charadrius ruficapillus*	Red-capped Plover	427
AVES	Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	3907
AVES	Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel	455
AVES	Charadriidae	*Pluvialis fulva*	Pacific Golden Plover	48
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	3383
AVES	Charadriidae	*Vanellus miles novaehollandiae*	Masked Lapwing	2
AVES	Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	1091
AVES	Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	0
AVES	Columbidae	*Columba leucomela*	White-headed Pigeon	3
AVES	Columbidae	*Geopelia striata*	Peaceful Dove	2
AVES	Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon	8
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	1024
AVES	Columbidae	*Phaps chalcoptera*	Common Bronzewing	2
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	116

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	3
AVES	Corvidae	*Corvus coronoides*	Australian Raven	5262
AVES	Corvidae	*Corvus orru*	Torresian Crow	3
AVES	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	27
AVES	Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo	3
AVES	Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	2
AVES	Cuculidae	*Chalcites basalis*	Horsfield's Bronze-Cuckoo	134
AVES	Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo	12
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	185
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	107
AVES	Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	22
AVES	Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	1
AVES	Estrildidae	*Neochmia modesta*	Plum-headed Finch	1
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	1553
AVES	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	301
AVES	Estrildidae	*Taeniopygia guttata*	Zebra Finch	198
AVES	Falconidae	*Falco berigora*	Brown Falcon	1
AVES	Falconidae	*Falco cenchroides*	Nankeen Kestrel	85
AVES	Falconidae	*Falco longipennis*	Australian Hobby	23
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	45
AVES	Falconidae	*Falco subniger*	Black Falcon	1
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	4747
AVES	Hirundinidae	*Petrochelidon ariel*	Fairy Martin	2874
AVES	Hirundinidae	*Petrochelidon nigricans*	Tree Martin	65
AVES	Laridae	*Chlidonias hybrida*	Whiskered Tern	16
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	10993
AVES	Laridae	*Gelochelidon nilotica*	Gull-billed Tern	7
AVES	Laridae	*Hydroprogne caspia*	Caspian Tern	18
AVES	Laridae	*Sterna hirundo*	Common Tern	1
AVES	Laridae	*Thalasseus bergii*	Crested Tern	13
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	7153
AVES	Maluridae	*Malurus lamberti*	Variegated Fairy-wren	0
AVES	Maluridae	*Stipiturus malachurus*	Southern Emu-wren	0
AVES	Megaluridae	*Cincloramphus cruralis*	Brown Songlark	3
AVES	Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark	2
AVES	Megaluridae	*Megalurus gramineus*	Little Grassbird	999
AVES	Megaluridae	*Megalurus timoriensis*	Tawny Grassbird	50
AVES	Megapodiidae	*Alectura lathami*	Australian Brush-turkey	1
AVES	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	16
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	1944

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	265
AVES	Meliphagidae	*Epthianura albifrons*	White-fronted Chat	1574
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	223
AVES	Meliphagidae	*Lichenostomus fuscus*	Fuscous Honeyeater	1
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	2640
AVES	Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	506
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	3699
AVES	Meliphagidae	*Manorina melanophrys*	Bell Miner	1
AVES	Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater	5
AVES	Meliphagidae	*Melithreptus brevirostris*	Brown-headed Honeyeater	1
AVES	Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	7
AVES	Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater	15
AVES	Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	10
AVES	Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	7
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	765
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	2253
AVES	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	5
AVES	Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher	10
AVES	Monarchidae	*Myiagra inquieta*	Restless Flycatcher	16
AVES	Monarchidae	*Myiagra rubecula*	Leaden Flycatcher	24
AVES	Motacillidae	*Anthus novaeseelandiae*	Australian Pipit	213
AVES	Motacillidae	*Motacilla tschutschensis*	Eastern Yellow Wagtail	1
AVES	Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	11
AVES	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	135
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	141
AVES	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	12
AVES	Pachycephalidae	*Falcunculus frontatus frontatus*	Crested Shrike-tit	47
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	65
AVES	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	60
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	491
AVES	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	8
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	2733
AVES	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	13
AVES	Petroicidae	*Microeca fascinans*	Jacky Winter	9
AVES	Petroicidae	*Petroica goodenovii*	Red-capped Robin	2
AVES	Petroicidae	*Petroica phoenicea*	Flame Robin	1
AVES	Petroicidae	*Petroica rosea*	Rose Robin	9
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	1803
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	1011
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	3000

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	1257
AVES	Phasianidae	*Coturnix ypsilophora*	Brown Quail	314
AVES	Podargidae	*Podargus strigoides*	Tawny Frogmouth	47
AVES	Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	7
AVES	Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe	209
AVES	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	1347
AVES	Psittacidae	*Alisterus scapularis*	Australian King-Parrot	7
AVES	Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	27
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	263
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	265
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	2363
AVES	Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	7
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	3731
AVES	Psophodidae	*Cinclosoma punctatum*	Spotted Quail-thrush	1
AVES	Rallidae	*Fulica atra*	Eurasian Coot	7670
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	4773
AVES	Rallidae	*Gallirallus philippensis*	Buff-banded Rail	170
AVES	Rallidae	*Lewinia pectoralis*	Lewin's Rail	49
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	3161
AVES	Rallidae	*Porzana fluminea*	Australian Spotted Crake	50
AVES	Rallidae	*Porzana pusilla*	Baillon's Crake	130
AVES	Rallidae	*Porzana tabuensis*	Spotless Crake	55
AVES	Rallidae	*Tribonyx ventralis*	Black-tailed Native-hen	10
AVES	Recurvirostridae	*Cladorhynchus leucocephalus*	Banded Stilt	0
AVES	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	22369
AVES	Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet	4559
AVES	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	270
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	1711
AVES	Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail	27
AVES	Rostratulidae	*Rostratula australis*	Australian Painted Snipe	5
AVES	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	69
AVES	Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	3
AVES	Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	2907
AVES	Scolopacidae	*Calidris canutus*	Red Knot	2
AVES	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	265
AVES	Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	7
AVES	Scolopacidae	*Calidris ruficollis*	Red-necked Stint	48
AVES	Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	311
AVES	Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	4362
AVES	Scolopacidae	*Numenius*	Eastern Curlew	10

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
		madagascariensis		
AVES	Scolopacidae	*Philomachus pugnax*	Ruff	10
AVES	Scolopacidae	*Tringa nebularia*	Common Greenshank	123
AVES	Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	21
AVES	Strigidae	*Ninox novaeseelandiae*	Southern Boobook	7
AVES	Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	1
AVES	Threskiornithidae	*Platalea regia*	Royal Spoonbill	744
AVES	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	78
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	11417
AVES	Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	256
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	2363
AVES	Turdidae	*Zoothera lunulata*	Bassian Thrush	1
AVES	Turnicidae	*Turnix varius*	Painted Button-quail	2
AVES	Tytonidae	*Tyto javanica*	Eastern Barn Owl	12
MAMMALIA	Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	2
MAMMALIA	Macropodidae	*Wallabia bicolor*	Swamp Wallaby	1
MAMMALIA	Molossidae	*Mormopterus "Species 2"*	Undescribed Freetail Bat	3
MAMMALIA	Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	2
MAMMALIA	Molossidae	*Mormopterus planiceps*	Little Mastiff-bat	13
MAMMALIA	Molossidae	*Tadarida australis*	White-striped Freetail-bat	88
MAMMALIA	Muridae	*Hydromys chrysogaster*	Water-rat	1
MAMMALIA	Phalangeridae	*Trichosurus sp.*	Brushtail Possum	1
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	3
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	63163
MAMMALIA	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	30
MAMMALIA	Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat	1
MAMMALIA	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	13
MAMMALIA	Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat	29
MAMMALIA	Vespertilionidae	*Nyctophilus sp.*	long-eared bat	1
MAMMALIA	Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat	1
MAMMALIA	Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat	5
MAMMALIA	Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat	1
REPTILIA	Agamidae	*Amphibolurus muricatus*	Jacky Lizard	1
REPTILIA	Agamidae	*Physignathus lesueurii*	Eastern Water Dragon	2
REPTILIA	Agamidae	*Pogona barbata*	Bearded Dragon	3
REPTILIA	Chelidae	*Chelodina (Chelodina) longicollis*	Eastern Snake-necked Turtle	13
REPTILIA	Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake	3
REPTILIA	Elapidae	*Pseudonaja textilis*	Eastern Brown Snake	1
REPTILIA	Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink	11
REPTILIA	Scincidae	*Ctenotus robustus*	Robust Ctenotus	14

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
REPTILIA	Scincidae	*Ctenotus taeniolatus*	Copper-tailed Skink	2
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	84
REPTILIA	Scincidae	*Eulamprus tenuis*	Barred-sided Skink	12
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	72
REPTILIA	Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	65
REPTILIA	Scincidae	*Saproscincus mustelinus*	Weasel Skink	6
REPTILIA	Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue	77

Table 50 BANKTOWN SPECIES LIST 2000-2014

CLASSNAME	Family Name	*Scientific Name*	Common Name	COUNT
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	1
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	8
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	18
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	2
AVES	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	1
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	14
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	11
AVES	Artamidae	*Strepera graculina*	Pied Currawong	14
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	9
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	14
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	8
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	3
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	17
AVES	Corvidae	*Corvus coronoides*	Australian Raven	19
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	1
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	18
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	1
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	9
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	8
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	8
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	50
AVES	Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	2
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	8
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	16
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	1
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	2
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	1
AVES	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	17
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	10
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	63

CLASSNAME	Family Name	*Scientific Name*	Common Name	COUNT
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	8
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	5
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	8
AVES	Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail	1
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	5
MAMMALIA	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	1
MAMMALIA	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	1
MAMMALIA	Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat	1

Table 51 BLACKTOWN SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	3
AMPHIBIA	Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	5
AVES	Acanthizidae	*Acanthiza lineata*	Striated Thornbill	1
AVES	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	7
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	4
AVES	Acanthizidae	*Smicrornis brevirostris*	Weebill	2
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	9
AVES	Accipitridae	*Accipiter novaehollandiae*	Grey Goshawk	1
AVES	Accipitridae	*Elanus axillaris*	Black-shouldered Kite	4
AVES	Accipitridae	*Haliastur sphenurus*	Whistling Kite	1
AVES	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	2
AVES	Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler	2
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	84
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	1
AVES	Anatidae	*Anas castanea*	Chestnut Teal	3
AVES	Anatidae	*Anas gracilis*	Grey Teal	3
AVES	Anatidae	*Anas platyrhynchos*	Mallard	1
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	20
AVES	Anatidae	*Aythya australis*	Hardhead	3
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	72
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	1
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	6
AVES	Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	1
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	1
AVES	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	1
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	114
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	107
AVES	Artamidae	*Strepera graculina*	Pied Currawong	104
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	93
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	44
AVES	Cacatuidae	*Cacatua sanguinea/tenuirostris*	Little/Long-billed Corella	1
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	35
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	14
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	105
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	82
AVES	Campephagidae	*Coracina novaehollandiae melanops*	Black-faced Cuckoo-shrike	1
AVES	Campephagidae	*Lalage sueurii*	White-winged Triller	1

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	81
AVES	Columbidae	*Macropygia amboinensis*	Brown Cuckoo-Dove	1
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	114
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	9
AVES	Corvidae	*Corvus coronoides*	Australian Raven	110
AVES	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	17
AVES	Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo	1
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	32
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	8
AVES	Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	1
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	60
AVES	Falconidae	*Falco berigora*	Brown Falcon	2
AVES	Falconidae	*Falco cenchroides*	Nankeen Kestrel	1
AVES	Falconidae	*Falco longipennis*	Australian Hobby	3
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	8
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	67
AVES	Hirundinidae	*Petrochelidon ariel*	Fairy Martin	2
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	83
AVES	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	11
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	102
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	25
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	19
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	14
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	117
AVES	Meliphagidae	*Manorina melanophrys*	Bell Miner	69
AVES	Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater	1
AVES	Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	2
AVES	Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater	4
AVES	Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	60
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	11
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	109
AVES	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	1
AVES	Monarchidae	*Myiagra inquieta*	Restless Flycatcher	1
AVES	Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	3
AVES	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	2
AVES	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	1
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	10
AVES	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	2
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	68
AVES	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	3
AVES	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	1
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	9
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	10
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	2
AVES	Podargidae	*Podargus strigoides*	Tawny Frogmouth	11
AVES	Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe	1
AVES	Psittacidae	*Alisterus scapularis*	Australian King-Parrot	11
AVES	Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	16
AVES	Psittacidae	*Lathamus discolor*	Swift Parrot	6
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	80
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	91
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	69
AVES	Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	3

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	114
AVES	Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	2
AVES	Rallidae	*Fulica atra*	Eurasian Coot	3
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	6
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	4
AVES	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	10
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	80
AVES	Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	1
AVES	Threskiornithidae	*Platalea regia*	Royal Spoonbill	1
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	4
AVES	Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	3
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	71
GASTROPODA	Camaenidae	*Meridolum corneovirens*	Cumberland Plain Land Snail	4
MAMMALIA	Molossidae	*Mormopterus "Species 2"*	Undescribed Freetail Bat	2
MAMMALIA	Molossidae	*Tadarida australis*	White-striped Freetail-bat	3
MAMMALIA	Petauridae	*Petaurus breviceps*	Sugar or Squirrel glider	2
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	5
MAMMALIA	Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	2
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	4
MAMMALIA	Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	1
MAMMALIA	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	8
MAMMALIA	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	3
MAMMALIA	Vespertilionidae	*Nyctophilus sp.*	long-eared bat	1
MAMMALIA	Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat	2
MAMMALIA	Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat	3
MAMMALIA	Vespertilionidae	*Vespadelus vulturnus*	Little Forest Bat	2
REPTILIA	Agamidae	*Physignathus lesueurii*	Eastern Water Dragon	1
REPTILIA	Agamidae	*Pogona barbata*	Bearded Dragon	1
REPTILIA	Chelidae	*Chelodina (Chelodina) longicollis*	Eastern Snake-necked Turtle	2
REPTILIA	Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink	3
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	6
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	6
REPTILIA	Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	4

Table 52 BURWOOD SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Anatidae	*Anas platyrhynchos*	Mallard	1
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	2
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	13
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	2
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	9
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	1
AVES	Artamidae	*Strepera graculina*	Pied Currawong	4
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	12
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	4

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	4
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	7
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	11
AVES	Corvidae	*Corvus coronoides*	Australian Raven	7
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	3
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	1
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	23
AVES	Hirundinidae	*Petrochelidon ariel*	Fairy Martin	40
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	104
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	7
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	11
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	11
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	54
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	14
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	102

Table 53 CITY OF CANADA BAY SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Hylidae	*Litoria dentata*	Bleating Tree Frog	2
AMPHIBIA	Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog	1
AMPHIBIA	Hylidae	*Litoria peronii*	Peron's Tree Frog	1
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	2
AMPHIBIA	Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	2
AVES	Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	4
AVES	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	18
AVES	Acanthizidae	*Gerygone levigaster*	Mangrove Gerygone	1
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	4
AVES	Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	1
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	5
AVES	Accipitridae	*Elanus axillaris*	Black-shouldered Kite	2
AVES	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	6
AVES	Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler	2
AVES	Alcedinidae	*Dacelo novaeguinea*	Laughing Kookaburra	1
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	45
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	8
AVES	Anatidae	*Anas castanea*	Chestnut Teal	112
AVES	Anatidae	*Anas gracilis*	Grey Teal	69
AVES	Anatidae	*Anas platyrhynchos*	Mallard	18
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	87
AVES	Anatidae	*Aythya australis*	Hardhead	2
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	16
AVES	Anatidae	*Cygnus atratus*	Black Swan	16
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	31
AVES	Anhingidae	*Botaurus poiciloptilus*	Australasian Bittern	1
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	101
AVES	Ardeidae	*Ardea ibis*	Cattle Egret	22
AVES	Ardeidae	*Ardea intermedia*	Intermediate Egret	3
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	8

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Ardeidae	*Ardea pacifica*	White-necked Heron	2
AVES	Ardeidae	*Butorides striatus*	Striated Heron	32
AVES	Ardeidae	*Egretta garzetta*	Little Egret	3
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	114
AVES	Ardeidae	*Ixobrychus dubius*	Australian Little Bittern	1
AVES	Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	4
AVES	Artamidae	*Artamus leucorynchus*	White-breasted Woodswallow	1
AVES	Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	1
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	158
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	83
AVES	Artamidae	*Strepera graculina*	Pied Currawong	167
AVES	Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	2
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	66
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	59
AVES	Cacatuidae	*Cacatua sanguinea gymnopis*	Little Corella	636
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	21
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	4
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	237
AVES	Cacatuidae	*Eolophus roseicapillus albiceps*	Galah	52
AVES	Cacatuidae	*Nymphicus hollandicus*	Cockatiel	1
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	25
AVES	Campephagidae	*Coracina novaehollandiae melanops*	Black-faced Cuckoo-shrike	10
AVES	Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	33
AVES	Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel	1
AVES	Charadriidae	*Pluvialis fulva*	Pacific Golden Plover	3
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	228
AVES	Charadriidae	*Vanellus miles novaehollandiae*	Masked Lapwing	51
AVES	Charadriidae	*Vanellus tricolor*	Banded Lapwing	1
AVES	Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	1
AVES	Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon	27
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	178
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	3
AVES	Corvidae	*Corvus coronoides*	Australian Raven	284
AVES	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	1
AVES	Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo	1
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	15
AVES	Cuculidae	*Eudynamys orientalis cyanocephala*	Eastern Koel	59
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	21
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	12
AVES	Estrildidae	*Neochmia temporalis temporalis*	Red-browed Finch	2
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	1
AVES	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	1
AVES	Estrildidae	*Taeniopygia guttata*	Zebra Finch	35
AVES	Falconidae	*Falco berigora*	Brown Falcon	1
AVES	Falconidae	*Falco cenchroides*	Nankeen Kestrel	2
AVES	Falconidae	*Falco longipennis*	Australian Hobby	2
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	3
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	174
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	1
AVES	Hirundinidae	*Petrochelidon ariel*	Fairy Martin	8
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	502
AVES	Laridae	*Hydroprogne caspia*	Caspian Tern	3

CLASS NAME	FAMILY NAME	***SCIENTIFIC NAME***	COMMON NAME	COUNT
AVES	Laridae	*Sterna hirundo*	Common Tern	2
AVES	Laridae	*Thalasseus bergii*	Crested Tern	62
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	112
AVES	Maluridae	*Malurus lamberti*	Variegated Fairy-wren	1
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	53
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	2
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	3
AVES	Meliphagidae	*Lichenostomus fuscus*	Fuscous Honeyeater	1
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	17
AVES	Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	10
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	402
AVES	Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	1
AVES	Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	3
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	8
AVES	Meropidae	*Merops ornatus*	Rainbow Bee-eater	3
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	84
AVES	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	1
AVES	Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	2
AVES	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	2
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	95
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	3
AVES	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	4
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	9
AVES	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	2
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	119
AVES	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	1
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	249
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	174
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	485
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	62
AVES	Podargidae	*Podargus strigoides*	Tawny Frogmouth	9
AVES	Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	2
AVES	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	7
AVES	Psittacidae	*Alisterus scapularis*	Australian King-parrot	10
AVES	Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	5
AVES	Psittacidae	*Lophochroa leadbeateri*	Major Mitchell's Cockatoo	4
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	4
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	127
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	1
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	90
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	144
AVES	Psittacidae	*Trichoglossus haematodus moluccanus*	Swainson's (Rainbow) Lorikeet	162
AVES	Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	1
AVES	Rallidae	*Fulica atra*	Eurasian Coot	6
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	10
AVES	Rallidae	*Gallirallus philippensis*	Buff-banded Rail	3
AVES	Rallidae	*Lewinia pectoralis*	Lewin's Rail	1
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	13
AVES	Rallidae	*Porzana fluminea*	Australian Spotted Crake	1
AVES	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	235
AVES	Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet	61
AVES	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	5
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	47

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	254
AVES	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	31
AVES	Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	2
AVES	Scolopacidae	*Heteroscelus brevipes*	Grey-tailed Tattler	1
AVES	Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	1599
AVES	Scolopacidae	*Tringa nebularia*	Common Greenshank	1
AVES	Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	1
AVES	Strigidae	*Ninox novaeseelandiae*	Southern Boobook	2
AVES	Threskiornithidae	*Platalea regia*	Royal Spoonbill	41
AVES	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	8
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	469
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	66
MAMMALIA	Molossidae	*Tadarida australis*	White-striped Freetail-bat	3
MAMMALIA	Muridae	*Hydromys chrysogaster*	Water-rat	7
MAMMALIA	Peramelidae	*Perameles nasuta*	Long-nosed Bandicoot	6
MAMMALIA	Petauridae	*Petaurus breviceps*	Sugar Glider	1
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	10
MAMMALIA	Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	1
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	7
REPTILIA	Agamidae	*Pogona barbata*	Bearded Dragon	1
REPTILIA	Chelidae	*Chelodina (Chelodina) longicollis*	Eastern Snake-necked Turtle	1
REPTILIA	Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink	5
REPTILIA	Scincidae	*Eulamprus heatwolei*	Yellow-bellied Water-skink	1
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	9
REPTILIA	Scincidae	*Eulamprus tenuis*	Barred-sided Skink	1
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	2
REPTILIA	Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	5
REPTILIA	Scincidae	*Saiphos equalis*	Three-toed Skink	1
REPTILIA	Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue	35

Table 54 HOLROYD SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	1
AMPHIBIA	Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	1
AVES	Acanthizidae	*Acanthiza lineata*	Striated Thornbill	1
AVES	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	2
AVES	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	2
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	2
AVES	Acanthizidae	*Smicrornis brevirostris*	Weebill	1
AVES	Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	1
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	2
AVES	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	1
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	3
AVES	Anatidae	*Anas castanea*	Chestnut Teal	1
AVES	Anatidae	*Anas gracilis*	Grey Teal	1

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	3
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	6
AVES	Ardeidae	*Ardea ibis*	Cattle Egret	1
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	2
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	9
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	3
AVES	Artamidae	*Strepera graculina*	Pied Currawong	8
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	3
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	5
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	4
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	3
AVES	Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	1
AVES	Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	1
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	7
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	3
AVES	Corvidae	*Corvus coronoides*	Australian Raven	10
AVES	Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	1
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	3
AVES	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	3
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	6
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	1
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	4
AVES	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	2
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	4
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	1
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	3
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	11
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	2
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	8
AVES	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	1
AVES	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	2
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	1
AVES	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	1
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	2
AVES	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	2
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	1
AVES	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	2
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	1
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	1
AVES	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	1
AVES	Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	1
AVES	Psittacidae	*Lathamus discolor*	Swift Parrot	10

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	3
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	3
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	2
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	11
AVES	Rallidae	*Fulica atra*	Eurasian Coot	3
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	3
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	1
AVES	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	1
AVES	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	3
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	6
AVES	Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail	1
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	2
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	4
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	1
MAMMALIA	Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	1
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	10
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	1
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	2

Table 55 HUNTERS HILL SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	1
AMPHIBIA	Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	1
AVES	Acanthizidae	*Gerygone mouki*	Brown Gerygone	2
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	15
AVES	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	1
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	5
AVES	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	3
AVES	Accipitridae	*Pandion cristatus*	Eastern Osprey	1
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	8
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	1
AVES	Anatidae	*Anas castanea*	Chestnut Teal	5
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	5
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	2
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	1
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	16
AVES	Ardeidae	*Ardea ibis*	Cattle Egret	2
AVES	Ardeidae	*Ardea pacifica*	White-necked Heron	1
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	2
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	13
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	13

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Artamidae	*Strepera graculina*	Pied Currawong	24
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	10
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	16
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	0
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	1
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	0
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	2
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	3
AVES	Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon	20
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	14
AVES	Columbidae	*Columba leucomela*	White-headed Pigeon	1
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	4
AVES	Corvidae	*Corvus coronoides*	Australian Raven	17
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	9
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	11
AVES	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	1
AVES	Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	1
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	10
AVES	Falconidae	*Falco berigora*	Brown Falcon	1
AVES	Falconidae	*Falco cenchroides*	Nankeen Kestrel	1
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	3
AVES	Falconidae	*Falco longipennis*	Australian Hobby	1
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	21
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	6
AVES	Laridae	*Thalasseus bergii*	Crested Tern	1
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	17
AVES	Maluridae	*Malurus lamberti*	Variegated Fairy-wren	2
AVES	Megapodiidae	*Alectura lathami*	Australian Brush-Turkey	0
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	13
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	8
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	28
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	61
AVES	Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	2
AVES	Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater	1
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	0
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	12
AVES	Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	1
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	19
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	13
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	6
AVES	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	1
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	2

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	2
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	10
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	1
AVES	Phasianidae	*Excalfactoria chinensis*	King Quail	1
AVES	Podargidae	*Podargus strigoides*	Tawny Frogmouth	1
AVES	Psittacidae	*Alisterus scapularis*	Australian King-Parrot	3
AVES	Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	15
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	78
AVES	Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	53
AVES	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	102
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	1
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	0
AVES	Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	1
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	4
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	6
AVES	Spheniscidae	*Eudyptula minor*	Little Penguin	1
AVES	Strigidae	*Ninox novaeseelandiae*	Southern Boobook	1
AVES	Strigidae	*Ninox strenua*	Powerful Owl	3
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	1
AVES	Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	50
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	20
MAMMALIA	Molossidae	*Mormopterus "Species 2"*	Undescribed Freetail Bat	1
MAMMALIA	Muridae	*Hydromys chrysogaster*	Water-rat	1
MAMMALIA	Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	1
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	101
MAMMALIA	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	1
MAMMALIA	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	1
MAMMALIA	Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat	1
MAMMALIA	Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat	1
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	1
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	1
REPTILIA	Scincidae	*Saproscincus mustelinus*	Weasel Skink	1

Table 56 LEICHHARDT SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	4
AVES	Accipitridae	*Elanus axillaris*	Black-shouldered Kite	1
AVES	Accipitridae	*Haliastur sphenurus*	Whistling Kite	1
AVES	Alcedinidae	*Ceyx azureus*	Azure Kingfisher	2
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	36
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	7
AVES	Anatidae	*Anas castanea*	Chestnut Teal	14

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Anatidae	*Anas gracilis*	Grey Teal	13
AVES	Anatidae	*Anas platyrhynchos*	Mallard	1
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	399
AVES	Anatidae	*Cygnus atratus*	Black Swan	3
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	9
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	6
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	1
AVES	Ardeidae	*Butorides striatus*	Striated Heron	3
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	30
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	243
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	207
AVES	Artamidae	*Strepera graculina*	Pied Currawong	65
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	84
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	118
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	5
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	171
AVES	Cacatuidae	*Nymphicus hollandicus*	Cockatiel	1
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	17
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	699
AVES	Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon	44
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	240
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	1
AVES	Corvidae	*Corvus coronoides*	Australian Raven	130
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	25
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	15
AVES	Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	
AVES	Falconidae	*Falco longipennis*	Australian Hobby	3
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	2
AVES	Haematopodidae	*Haematopus longirostris*	Australian Pied Oystercatcher	1
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	235
AVES	Hirundinidae	*Petrochelidon nigricans*	Tree Martin	2
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	244
AVES	Laridae	*Thalasseus bergii*	Crested Tern	1
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	14
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	72
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	5
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	2
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	1
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	288
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	8
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	235
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	233
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	2
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	68
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	9
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	117
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	8
AVES	Podargidae	*Podargus strigoides*	Tawny Frogmouth	2
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	10
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	7

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	250
AVES	Psittaculidae	*Polytelis alexandrae*	Princess Parrot	1
AVES	Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	1
AVES	Ralllidae	*Gallirallus philippensis*	Buff-banded Rail	1
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	171
AVES	Strigidae	*Ninox novaeseelandiae*	Southern Boobook	1
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	272
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	26
AVES	Turnicidae	*Turnix varius*	Painted Button-quail	1
MAMMALIA	Peramelidae	*Perameles nasuta*	Long-nosed Bandicoot	2
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	1
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	1002

Table 57 MARRICKVILLE SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog	1
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	4
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	2
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	20
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	31
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	10
AVES	Artamidae	*Strepera graculina*	Pied Currawong	30
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	1
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	1
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	10
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	1
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	4
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	3
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	19
AVES	Corvidae	*Corvus coronoides*	Australian Raven	9
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	4
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	1
AVES	Falconidae	*Falco longipennis*	Australian Hobby	1
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	2
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	26
AVES	Hirundinidae	*Petrochelidon nigricans*	Tree Martin	1
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	7
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	7
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	3
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	1
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	301
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	40
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	4
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	4
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	5
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	1
AVES	Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	4
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	38
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	8

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	19
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	5
MAMMALIA	Peramelidae	*Perameles nasuta*	Long-nosed Bandicoot	40
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	2
MAMMALIA	Vespertilionidae	*Miniopterus schreibersii*	Eastern Bentwing-bat	8
REPTILIA	Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink	4
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	2
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	7
REPTILIA	Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	8
REPTILIA	Scincidae	*Saproscincus mustelinus*	Weasel Skink	1

Table 58 PARRAMATTA CITY SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Hylidae	*Litoria dentata*	Bleating Tree Frog	1
AMPHIBIA	Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog	7
AMPHIBIA	Hylidae	*Litoria peronii*	Peron's Tree Frog	10
AMPHIBIA	Hylidae	*Litoria aurea*	Green and Golden Bell Frog	5
AMPHIBIA	Hylidae	*Litoria tyleri*	Tyler's Tree Frog	1
AMPHIBIA	Hylidae	*Litoria verreauxii*	Verreaux's Frog	2
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	61
AMPHIBIA	Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	12
AMPHIBIA	Myobatrachidae	*Pseudophryne bibronii*	Bibron's Toadlet	4
AMPHIBIA	Myobatrachidae	*Uperoleia laevigata*	Smooth Toadlet	1
AVES	Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	1
AVES	Acanthizidae	*Acanthiza lineata*	Striated Thornbill	16
AVES	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	135
AVES	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	143
AVES	Acanthizidae	*Acanthiza reguloides*	Buff-rumped Thornbill	1
AVES	Acanthizidae	*Gerygone mouki*	Brown Gerygone	183
AVES	Acanthizidae	*Gerygone albogularis*	White-throated Gerygone	1
AVES	Acanthizidae	*Origma solitaria*	Rockwarbler	2
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	224
AVES	Acanthizidae	*Sericornis magnirostra*	Large-billed Scrubwren	2
AVES	Acanthizidae	*Smicrornis brevirostris*	Weebill	2
AVES	Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	41
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	93
AVES	Accipitridae	*Accipiter novaehollandiae*	Grey Goshawk	82
AVES	Accipitridae	*Aviceda subcristata*	Pacific Baza	4
AVES	Accipitridae	*Elanus axillaris*	Black-shouldered Kite	5
AVES	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	7
AVES	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	1
AVES	Accipitridae	*Aquila audax*	Wedge-tailed Eagle	2
AVES	Accipitridae	*Circus assimilis*	Spotted Harrier	1
AVES	Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler	24
AVES	Alcedinidae	*Ceyx azureus*	Azure Kingfisher	2
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	377
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	17
AVES	Anatidae	*Anas castanea*	Chestnut Teal	65
AVES	Anatidae	*Anas platyrhynchos*	Mallard	17

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	167
AVES	Anatidae	*Aythya australis*	Hardhead	20
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	195
AVES	Anatidae	*Cygnus atratus*	Black Swan	11
AVES	Anatidae	*Tadorna tadornoides*	Australian Shelduck	1
AVES	Anatidae	*Anas gracilis*	Grey Teal	14
AVES	Anatidae	*Dendrocygna eytoni*	Plumed Whistling-Duck	9
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	17
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	101
AVES	Apodidae	*Apus pacificus*	Fork-tailed Swift	15
AVES	Ardeidae	*Ardea ibis*	Cattle Egret	13
AVES	Ardeidae	*Ardea intermedia*	Intermediate Egret	14
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	20
AVES	Ardeidae	*Ardea pacifica*	White-necked Heron	7
AVES	Ardeidae	*Butorides striatus*	Striated Heron	6
AVES	Ardeidae	*Egretta garzetta*	Little Egret	1
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	113
AVES	Ardeidae	*Egretta sacra*	Eastern Reef Egret	1
AVES	Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	10
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	374
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	289
AVES	Artamidae	*Strepera graculina*	Pied Currawong	436
AVES	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	4
AVES	Artamidae	*Artamus superciliosus*	White-browed Woodswallow	1
AVES	Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	2
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	828
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	1322
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	153
AVES	Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	1
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	90
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	522
AVES	Cacatuidae	*Nymphicus hollandicus*	Cockatiel	3
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	184
AVES	Campephagidae	*Coracina papuensis*	White-bellied Cuckoo-shrike	2
AVES	Campephagidae	*Lalage sueurii*	White-winged Triller	2
AVES	Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar	2
AVES	Centropodidae	*Centropus phasianinus*	Pheasant Coucal	2
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	119
AVES	Charadriidae	*Vanellus tricolor*	Banded Lapwing	2
AVES	Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	7
AVES	Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel	1
AVES	Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	8
AVES	Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	48
AVES	Columbidae	*Columba leucomela*	White-headed Pigeon	2
AVES	Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon	3
AVES	Columbidae	*Macropygia amboinensis*	Brown Cuckoo-Dove	2
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	298
AVES	Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	0
AVES	Columbidae	*Leucosarcia picata*	Wonga Pigeon	1
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	49
AVES	Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	14

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Corvidae	*Corvus coronoides*	Australian Raven	386
AVES	Corvidae	*Corvus mellori*	Little Raven	1
AVES	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	31
AVES	Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	1
AVES	Cuculidae	*Chalcites basalis*	Horsfield's Bronze-Cuckoo	1
AVES	Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo	2
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	144
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	101
AVES	Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	9
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	274
AVES	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	2
AVES	Estrildidae	*Taeniopygia guttata*	Zebra Finch	3
AVES	Falconidae	*Falco cenchroides*	Nankeen Kestrel	10
AVES	Falconidae	*Falco longipennis*	Australian Hobby	7
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	61
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	227
AVES	Hirundinidae	*Petrochelidon ariel*	Fairy Martin	18
AVES	Hirundinidae	*Petrochelidon nigricans*	Tree Martin	12
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	1
AVES	Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	1
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	83
AVES	Laridae	*Hydroprogne caspia*	Caspian Tern	1
AVES	Laridae	*Thalasseus bergii*	Crested Tern	2
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	462
AVES	Maluridae	*Malurus lamberti*	Variegated Fairy-wren	19
AVES	Megaluridae	*Megalurus gramineus*	Little Grassbird	2
AVES	Megapodiidae	*Alectura lathami*	Australian Brush-turkey	3
AVES	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	125
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	295
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	76
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	288
AVES	Meliphagidae	*Lichenostomus fuscus*	Fuscous Honeyeater	2
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	76
AVES	Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	6
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	634
AVES	Meliphagidae	*Manorina melanophrys*	Bell Miner	114
AVES	Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater	19
AVES	Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	5
AVES	Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater	40
AVES	Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	14
AVES	Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	67
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	69
AVES	Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater	1
AVES	Meliphagidae	*Lichenostomus leucotis*	White-eared Honeyeater	1
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	305
AVES	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	10
AVES	Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher	1
AVES	Monarchidae	*Myiagra inquieta*	Restless Flycatcher	27
AVES	Monarchidae	*Myiagra rubecula*	Leaden Flycatcher	10
AVES	Motacillidae	*Anthus novaeseelandiae*	Australian Pipit	16
AVES	Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	18
AVES	Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	19
AVES	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	40

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	13
AVES	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	16
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	117
AVES	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	9
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	214
AVES	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	32
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	21
AVES	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	167
AVES	Petroicidae	*Microeca fascinans*	Jacky Winter	2
AVES	Petroicidae	*Petroica boodang*	Scarlet Robin	2
AVES	Petroicidae	*Petroica rosea*	Rose Robin	11
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	62
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	16
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	71
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	16
AVES	Phasianidae	*Coturnix pectoralis*	Stubble Quail	1
AVES	Pittidae	*Pitta versicolor*	Noisy Pitta	1
AVES	Podargidae	*Podargus strigoides*	Tawny Frogmouth	18
AVES	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	39
AVES	Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe	2
AVES	Psittacidae	*Alisterus scapularis*	Australian King-Parrot	230
AVES	Psittacidae	*Barnardius zonarius*	Australian Ringneck	2
AVES	Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	173
AVES	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	18
AVES	Psittacidae	*Platycercus adscitus*	Pale-headed Rosella	2
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	300
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	220
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	133
AVES	Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	1
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	900
AVES	Psittacidae	*Lathamus discolor*	Swift Parrot	1
AVES	Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	118
AVES	Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	59
AVES	Rallidae	*Fulica atra*	Eurasian Coot	37
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	118
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	82
AVES	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	9
AVES	Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet	1
AVES	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	142
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	150
AVES	Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail	20
AVES	Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	2
AVES	Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	10
AVES	Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	1
AVES	Scolopacidae	*Tringa nebularia*	Common Greenshank	3
AVES	Strigidae	*Ninox novaeseelandiae*	Southern Boobook	13
AVES	Strigidae	*Ninox strenua*	Powerful Owl	81
AVES	Threskiornithidae	*Platalea regia*	Royal Spoonbill	13
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	549
AVES	Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	26
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	324
AVES	Turdidae	*Zoothera lunulata*	Bassian Thrush	2
AVES	Turnicidae	*Turnix varius*	Painted Button-quail	1
AVES	Tytonidae	*Tyto javanica*	Eastern Barn Owl	1

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
GASTROPODA	Camaenidae	*Meridolum corneovirens*	Cumberland Plain Land Snail	4
MAMMALIA	Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	1
MAMMALIA	Molossidae	*Mormopterus "Species 2"*	Undescribed Freetail Bat	17
MAMMALIA	Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	1
MAMMALIA	Molossidae	*Tadarida australis*	White-striped Freetail-bat	20
MAMMALIA	Muridae	*Hydromys chrysogaster*	Water-rat	2
MAMMALIA	Muridae	*Rattus fuscipes*	Bush Rat	3
MAMMALIA	Petauridae	*Petaurus breviceps*	Sugar Glider	2
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	31
MAMMALIA	Phalangeridae	*Trichosurus sp.*	Brushtail Possum	1
MAMMALIA	Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	19
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	119346
MAMMALIA	Rhinolophidae	*Rhinolophus megaphyllus*	Eastern Horseshoe-bat	2
MAMMALIA	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	28
MAMMALIA	Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat	14
MAMMALIA	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	9
MAMMALIA	Vespertilionidae	*Myotis macropus*	Southern Myotis	6
MAMMALIA	Vespertilionidae	*Nyctophilus sp.*	long-eared bat	6
MAMMALIA	Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	3
MAMMALIA	Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat	5
MAMMALIA	Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat	2
MAMMALIA	Vespertilionidae	*Vespadelus vulturnus*	Little Forest Bat	9
MAMMALIA	Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	1
MAMMALIA	Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat	1
REPTILIA	Agamidae	*Amphibolurus muricatus*	Jacky Lizard	7
REPTILIA	Agamidae	*Physignathus lesueurii*	Eastern Water Dragon	18
REPTILIA	Agamidae	*Pogona barbata*	Bearded Dragon	1
REPTILIA	Chelidae	*Chelodina (Chelodina) longicollis*	Eastern Snake-necked Turtle	7
REPTILIA	Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake	9
REPTILIA	Gekkonidae	*Phyllurus platurus*	Broad-tailed Gecko	5
REPTILIA	Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink	7
REPTILIA	Scincidae	*Ctenotus taeniolatus*	Copper-tailed Skink	9
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	47
REPTILIA	Scincidae	*Eulamprus tenuis*	Barred-sided Skink	1
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	19
REPTILIA	Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	11
REPTILIA	Scincidae	*Saiphos equalis*	Three-toed Skink	6
REPTILIA	Scincidae	*Saproscincus mustelinus*	Weasel Skink	2
REPTILIA	Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue	21
REPTILIA	Scincidae	*Acritoscincus platynota*	Red-throated Skink	1
REPTILIA	Typhlopidae	*Ramphotyphlops nigrescens*	Blackish Blind Snake	1

Table 59 CITY OF RYDE SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Hylidae	*Litoria phyllochroa*	Leaf-green Tree Frog	1
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	12

CLASS NAME	FAMILY NAME	***SCIENTIFIC NAME***	**COMMON NAME**	**COUNT**
AMPHIBIA	Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	6
AVES	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	11
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	8
AVES	Acanthizidae	*Acanthiza lineata*	Striated Thornbill	4
AVES	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	6
AVES	Acanthizidae	*Gerygone mouki*	Brown Gerygone	0
AVES	Accipitridae	*Elanus axillaris*	Black-shouldered Kite	5
AVES	Accipitridae	*Accripiter fasciatus*	Brown Goshawk	4
AVES	Accipitridae	*Accripiter novaehollandiae*	Grey Goshawk	4
AVES	Aegothelidae	*Aegotheles cristanus*	Australian Owlet-Nightjar	2
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	16
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	9
AVES	Alcedinidae	*Dacelo novaeguinea*	Laughing Kookaburra	6
AVES	Anatidae	*Anas castanea*	Chestnut Teal	42
AVES	Anatidae	*Anas gracilis*	Grey Teal	8
AVES	Anatidae	*Anas platyrhynchos*	Mallard	1
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	26
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	1
AVES	Anatidae	*Anas supercilliosa*	Pacific Black Duck	6
AVES	Anatidae	*Cyngus atrus*	Black Swan	2
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	2
AVES	Apodidae	*Hirundapus caudicutus*	White-throated Needletail	2
AVES	Apodidae	*Apus pacificus*	Fork-tailed Swift	12
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	20
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	3
AVES	Ardeidae	*Butorides striatus*	Striated Heron	2
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	15
AVES	Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	2
AVES	Ardeidae	*Egretta garzetta*	Little Egret	1
AVES	Ardeidae	*Ardea novaehollandiae*	White-faced Heron	6
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	38
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	15
AVES	Artamidae	*Strepera graculina*	Pied Currawong	32
AVES	Artamidae	*Artamus cyanopterus*	Dusky Wood swallow	2
AVES	Artamidae	*Gymnorhina tibicen*	Australian Magpie	0
AVES	Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	1
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	42
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	15
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	2
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	15
AVES	Cacatuidae	*Cacatua rosiecapilla*	Galah	5
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	4
AVES	Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	3
AVES	Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	3
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	16
AVES	Campephagidae	*Lalage sueurii*	White-winged Triller	2
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	29
AVES	Charadriidae	*Vanellus miles novaehollandiae*	Masked Lapwing	2
AVES	Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	4
AVES	Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	0
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	26

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Columbidae	*Macropygia amboinensis*	Brown Cuckoo-Dove	4
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	4
AVES	Corvidae	*Corvus coronoides*	Australian Raven	28
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	22
AVES	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	15
AVES	Cuculidae	*Chalcites basalis*	Horsfield's Bronze-Cuckoo	4
AVES	Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo	3
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	9
AVES	Estrildidae	*Neochmia temporaliS*	Red-browed Firetail	4
AVES	Falconidae	*Falco cenchroides*	Nankeen Kestrel	5
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	53
AVES	Hirundinidae	*Petrochelidon ariel*	Fairy Martin	6
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	133
AVES	Laridae	*Thalasseus bergii*	Crested Tern	5
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	7
AVES	Maluridae	*Malurus lamberti*	Variegated Fairy-wren	1
AVES	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	10
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	27
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	3
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	6
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	88
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	9
AVES	Meliphagidae	*Anthochaera lunulata*	Little Wattlebird	4
AVES	Meliphagidae	*Manorina melanocephalus*	Noisy Miner	6
AVES	Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater	4
AVES	Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	4
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	28
AVES	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	4
AVES	Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	2
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	11
AVES	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	6
AVES	Pachycephalidae	*Falcunculus frontatus*	Crested Shrike-tit	2
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	4
AVES	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	5
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	3
AVES	Pardalotidae	*Pardalotus punctata*	Spotted Pardalote	5
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	6
AVES	Petroicidae	*Microeca fascinans*	Jacky Winter	4
AVES	Petroicidae	*Petroica rodinogaster*	Rose Robin	4
AVES	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	0
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	5
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	2
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	80
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	8
AVES	Podargidae	*Podargus strigoides*	Tawny Frogmouth	13
AVES	Psittacidae	*Alisterus scapularis*	Australian King-Parrot	10
AVES	Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	32
AVES	Psittacidae	*Lathamus discolor*	Swift Parrot	30
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	12
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	9
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	8
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	108
AVES	Psittacidae	*Platycercus eximia*	Eastern Rosella	4

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	3
AVES	Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	2
AVES	Rallidae	*Fulica atra*	Eurasian Coot	4
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	3
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	3
AVES	Rallidae	*Fulcia atra*	Eurasian Coot	1
AVES	Rallidae	*Porphryio porphryio*	Purple Swamphen	1
AVES	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	3
AVES	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	9
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	35
AVES	Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	14
AVES	Strigidae	*Ninox novaeseelandiae*	Southern Boobook Owl	4
AVES	Strigidae	*Ninox strenua*	Powerful owl	7
AVES	Threskiornithidae	*Platalea regia*	Royal Spoonbill	3
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	49
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	10
AVES	Timaliidae	*Zosterops lateralis lateralis*	Tasmanian Silver-eye	4
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	15
MAMMALIA	Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	4
MAMMALIA	Pseudocheiridae	*Pseudecheirus peregrinus*	Common Ringtail Possum	3
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	16
MAMMALIA	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	4
MAMMALIA	Vespertilionidae	*Nyctinomus australis*	White-striped Freetail Bat	1
REPTILIA	Agamidae	*Physignathus lesueurii*	Eastern Water Dragon	2
REPTILIA	Elapidae	*Hemiaspis signata*	Black-bellied Marsh Snake	1
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	14
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	14
REPTILIA	Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	12
REPTILIA	Scincidae	*Saproscincus mustelinus*	Weasel Skink	6
REPTILIA	Scincidae	*Cryptoblepharus virgata*	Cream-striped Shinning-skink	4

Table 60 THE HILLS SHIRE SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Hylidae	*Litoria dentata*	Bleating Tree Frog	2
AMPHIBIA	Hylidae	*Litoria peronii*	Peron's Tree Frog	7
AMPHIBIA	Hylidae	*Litoria phyllochroa*	Leaf-green Tree Frog	5
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	41
AMPHIBIA	Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	19
AMPHIBIA	Myobatrachidae	*Pseudophryne australis*	Red-crowned Toadlet	1
AMPHIBIA	Myobatrachidae	*Uperoleia laevigata*	Smooth Toadlet	1
AVES	Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	3
AVES	Acanthizidae	*Acanthiza lineata*	Striated Thornbill	14
AVES	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	9
AVES	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	144
AVES	Acanthizidae	*Acanthiza reguloides*	Buff-rumped Thornbill	1
AVES	Acanthizidae	*Chthonicola sagittata*	Speckled Warbler	3
AVES	Acanthizidae	*Gerygone mouki*	Brown Gerygone	96
AVES	Acanthizidae	*Gerygone albogularis*	White-throated Gerygone	3
AVES	Acanthizidae	*Hylacola pyrrhopygia*	Chestnut-rumped Heathwren	1

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Acanthizidae	*Origma solitaria*	Rockwarbler	1
AVES	Acanthizidae	*Sericornis citreogularis*	Yellow-throated Scrubwren	1
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	178
AVES	Acanthizidae	*Sericornis magnirostra*	Large-billed Scrubwren	1
AVES	Acanthizidae	*Smicrornis brevirostris*	Weebill	2
AVES	Accipitridae	*Accipiter novaehollandiae*	Grey Goshawk	4
AVES	Accipitridae	*Aviceda subcristata*	Pacific Baza	16
AVES	Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	6
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	10
AVES	Accipitridae	*Aquila audax*	Wedge-tailed Eagle	1
AVES	Accipitridae	*Elanus axillaris*	Black-shouldered Kite	3
AVES	Accipitridae	*Haliastur sphenurus*	Whistling Kite	2
AVES	Alcedinidae	*Ceyx azureus*	Azure Kingfisher	1
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	173
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	9
AVES	Anatidae	*Anas castanea*	Chestnut Teal	4
AVES	Anatidae	*Anas gracilis*	Grey Teal	2
AVES	Anatidae	*Anas platyrhynchos*	Mallard	16
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	40
AVES	Anatidae	*Aythya australis*	Hardhead	4
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	59
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	2
AVES	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	34
AVES	Ardeidae	*Ardea ibis*	Cattle Egret	8
AVES	Ardeidae	*Ardea intermedia*	Intermediate Egret	3
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	3
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	20
AVES	Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	1
AVES	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	1
AVES	Artamidae	*Artamus personatus*	Masked Woodswallow	2
AVES	Artamidae	*Artamus superciliosus*	White-browed Woodswallow	1
AVES	Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	1
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	156
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	123
AVES	Artamidae	*Strepera graculina*	Pied Currawong	208
AVES	Artamidae	*Strepera versicolor*	Grey Currawong	3
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	392
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	307
AVES	Cacatuidae	*Cacatua sp*	Corella species	4
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	55
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	37
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	187
AVES	Campephagidae	*Cheramoeca leucosterna*	White-backed Swallow	2
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	71
AVES	Campephagidae	*Coracina papuensis*	White-bellied Cuckoo-shrike	1
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	31
AVES	Climacteridae	*Climacteris picumnus*	Brown Treecreeper	1
AVES	Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	34
AVES	Columbidae	*Columba leucomela*	White-headed Pigeon	2
AVES	Columbidae	*Geopelia cuneata*	Diamond Dove	1

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	1
AVES	Columbidae	*Leucosarcia picata*	Wonga Pigeon	2
AVES	Columbidae	*Macropygia amboinensis*	Brown Cuckoo-Dove	3
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	90
AVES	Coraciidae	*Eurystomus orientalis*	Dollarbird	11
AVES	Corvidae	*Corvus coronoides*	Australian Raven	138
AVES	Corvidae	*Corvus mellori*	Little Raven	1
AVES	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	9
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	24
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	7
AVES	Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	1
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	79
AVES	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	1
AVES	Falconidae	*Falco cenchroides*	Nankeen Kestrel	1
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	2
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	143
AVES	Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	1
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	60
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	183
AVES	Maluridae	*Malurus lamberti*	Variegated Fairy-wren	57
AVES	Megapodiidae	*Alectura lathami*	Australian Brush-turkey	5
AVES	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	37
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	77
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	16
AVES	Meliphagidae	*Glyciphila melanops*	Tawny-crowned Honeyeater	3
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	81
AVES	Meliphagidae	*Lichenostomus fuscus*	Fuscous Honeyeater	2
AVES	Meliphagidae	*Lichenostomus leucotis*	White-eared Honeyeater	1
AVES	Meliphagidae	*Lichenostomus melanops*	Yellow-tufted Honeyeater	9
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	4
AVES	Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	7
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	355
AVES	Meliphagidae	*Manorina melanophrys*	Bell Miner	195
AVES	Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater	31
AVES	Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	3
AVES	Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater	3
AVES	Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	3
AVES	Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	5
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	1
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	65
AVES	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	2
AVES	Monarchidae	*Myiagra inquieta*	Restless Flycatcher	1
AVES	Monarchidae	*Myiagra rubecula*	Leaden Flycatcher	2
AVES	Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	4
AVES	Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	2
AVES	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	53
AVES	Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	1
AVES	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	14
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	74
AVES	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	5
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	87
AVES	Pardalotidae	*Pardalotus punctatus punctatus*	Spotted Pardalote	1

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	14
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	6
AVES	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	105
AVES	Petroicidae	*Petroica boodang*	Scarlet Robin	1
AVES	Petroicidae	*Petroica rosea*	Rose Robin	12
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	11
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	2
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	17
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	2
AVES	Phasianidae	*Coturnix ypsilophora*	Brown Quail	1
AVES	Podargidae	*Podargus strigoides*	Tawny Frogmouth	52
AVES	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	6
AVES	Psittacidae	*Alisterus scapularis*	Australian King-Parrot	144
AVES	Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	161
AVES	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	32
AVES	Psittacidae	*Barnardius zonarius*	Australian Ringneck	1
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	190
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	115
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	14
AVES	Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	72
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	589
AVES	Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	131
AVES	Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	65
AVES	Ptilonorhynchidae	*Sericulus chrysocephalus*	Regent Bowerbird	1
AVES	Rallidae	*Fulica atra*	Eurasian Coot	6
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	23
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	4
AVES	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	116
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	47
AVES	Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail	14
AVES	Strigidae	*Ninox connivens*	Barking Owl	1
AVES	Strigidae	*Ninox novaeseelandiae*	Southern Boobook	46
AVES	Strigidae	*Ninox strenua*	Powerful Owl	27
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	22
AVES	Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	3
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	76
GASTROPODA	Camaenidae	*Meridolum corneovirens*	Cumberland Plain Land Snail	1
MAMMALIA	Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	1
MAMMALIA	Molossidae	*Mormopterus "Species 2"*	Undescribed Freetail Bat	7
MAMMALIA	Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	3
MAMMALIA	Molossidae	*Mormopterus planiceps*	Little Mastiff-bat	1
MAMMALIA	Molossidae	*Mormopterus sp.*	mastiff-bat	2
MAMMALIA	Molossidae	*Tadarida australis*	White-striped Freetail-bat	6
MAMMALIA	Muridae	*Rattus fuscipes*	Bush Rat	4
MAMMALIA	Peramelidae	*Perameles nasuta*	Long-nosed Bandicoot	1
MAMMALIA	Petauridae	*Petaurus breviceps*	Sugar Glider	9
MAMMALIA	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	14
MAMMALIA	Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	25
MAMMALIA	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	16
MAMMALIA	Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	2
MAMMALIA	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	27
MAMMALIA	Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat	7
MAMMALIA	Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	2

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
MAMMALIA	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	306
MAMMALIA	Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat	5
MAMMALIA	Vespertilionidae	*Nyctophilus gouldi*	Gould's Long-eared Bat	62
MAMMALIA	Vespertilionidae	*Nyctophilus sp.*	long-eared bat	4
MAMMALIA	Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat	7
MAMMALIA	Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat	2
MAMMALIA	Vespertilionidae	*Vespadelus vulturnus*	Little Forest Bat	18
REPTILIA	Agamidae	*Amphibolurus muricatus*	Jacky Lizard	1
REPTILIA	Agamidae	*Physignathus lesueurii*	Eastern Water Dragon	6
REPTILIA	Chelidae	*Chelodina (Chelodina) longicollis*	Eastern Snake-necked Turtle	2
REPTILIA	Elapidae	*Demansia psammophis*	Yellow-faced Whip Snake	1
REPTILIA	Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake	1
REPTILIA	Gekkonidae	*Phyllurus platurus*	Broad-tailed Gecko	2
REPTILIA	Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink	1
REPTILIA	Scincidae	*Eulamprus quoyii*	Eastern Water-skink	11
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	11
REPTILIA	Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	6
REPTILIA	Scincidae	*Lampropholis sp.*	unidentified grass skink	3
REPTILIA	Scincidae	*Saiphos equalis*	Three-toed Skink	4
REPTILIA	Scincidae	*Saproscincus mustelinus*	Weasel Skink	1
REPTILIA	Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue	2

Table 61 STRATHFIELD SPECIES LIST 2000-2014

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AMPHIBIA	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	1
AVES	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	9
AVES	Acanthizidae	*Gerygone levigaster*	Mangrove Gerygone	4
AVES	Acanthizidae	*Gerygone mouki*	Brown Gerygone	1
AVES	Acanthizidae	*Gerygone albogularis*	White-throated Gerygone	1
AVES	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	0
AVES	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	4
AVES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	7
AVES	Accipitridae	*Elanus axillaris*	Black-shouldered Kite	13
AVES	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	1
AVES	Accipitridae	*Haliastur sphenurus*	Whistling Kite	1
AVES	Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler	4
AVES	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	7
AVES	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	5
AVES	Anatidae	*Anas castanea*	Chestnut Teal	167
AVES	Anatidae	*Anas gracilis*	Grey Teal	60
AVES	Anatidae	*Anas superciliosa*	Pacific Black Duck	37
AVES	Anatidae	*Aythya australis*	Hardhead	3
AVES	Anatidae	*Chenonetta jubata*	Australian Wood Duck	6
AVES	Anatidae	*Cygnus atratus*	Black Swan	2
AVES	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	3
AVES	Ardeidae	*Ardea ibis*	Cattle Egret	21
AVES	Ardeidae	*Ardea intermedia*	Intermediate Egret	2
AVES	Ardeidae	*Ardea modesta*	Eastern Great Egret	24
AVES	Ardeidae	*Butorides striatus*	Striated Heron	5

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Ardeidae	*Egretta garzetta*	Little Egret	2
AVES	Ardeidae	*Egretta novaehollandiae*	White-faced Heron	32
AVES	Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	2
AVES	Artamidae	*Cracticus tibicen*	Australian Magpie	38
AVES	Artamidae	*Cracticus torquatus*	Grey Butcherbird	20
AVES	Artamidae	*Strepera graculina*	Pied Currawong	37
AVES	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	29
AVES	Cacatuidae	*Cacatua sanguinea*	Little Corella	4
AVES	Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	1
AVES	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	1
AVES	Cacatuidae	*Eolophus roseicapillus*	Galah	8
AVES	Cacatuidae	*Nymphicus hollandicus*	Cockatiel	1
AVES	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	19
AVES	Campephagidae	*Lalage sueurii*	White-winged Triller	7
AVES	Charadriidae	*Charadrius bicinctus*	Double-banded Plover	1
AVES	Charadriidae	*Charadrius ruficapillus*	Red-capped Plover	1
AVES	Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	165
AVES	Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel	60
AVES	Charadriidae	*Pluvialis fulva*	Pacific Golden Plover	85
AVES	Charadriidae	*Pluvialis squatarola*	Grey Plover	1
AVES	Charadriidae	*Vanellus miles*	Masked Lapwing	127
AVES	Charadriidae	*Vanellus tricolor*	Banded Lapwing	1
AVES	Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	17
AVES	Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon	8
AVES	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	43
AVES	Columbidae	*Phaps elegans*	Brush Bronzewing	2
AVES	Corvidae	*Corvus coronoides*	Australian Raven	50
AVES	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	1
AVES	Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	1
AVES	Cuculidae	*Chalcites basalis*	Horsfield's Bronze-Cuckoo	11
AVES	Cuculidae	*Eudynamys orientalis*	Eastern Koel	19
AVES	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	5
AVES	Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	1
AVES	Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	27
AVES	Estrildidae	*Neochmia temporalis*	Red-browed Finch	10
AVES	Estrildidae	*Stagonopleura guttata*	Diamond Firetail	1
AVES	Falconidae	*Falco cenchroides*	Nankeen Kestrel	1
AVES	Falconidae	*Falco longipennis*	Australian Hobby	1
AVES	Falconidae	*Falco peregrinus*	Peregrine Falcon	4
AVES	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	61
AVES	Hirundinidae	*Petrochelidon ariel*	Fairy Martin	32
AVES	Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	151
AVES	Laridae	*Thalasseus bergii*	Crested Tern	1
AVES	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	66
AVES	Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark	5
AVES	Megaluridae	*Megalurus gramineus*	Little Grassbird	3
AVES	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	1
AVES	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	46
AVES	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	10
AVES	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	2
AVES	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	14
AVES	Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	6

CLASS NAME	FAMILY NAME	*SCIENTIFIC NAME*	COMMON NAME	COUNT
AVES	Meliphagidae	*Manorina melanocephala*	Noisy Miner	54
AVES	Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	1
AVES	Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	40
AVES	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	45
AVES	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	2
AVES	Monarchidae	*Myiagra inquieta*	Restless Flycatcher	2
AVES	Monarchidae	*Myiagra rubecula*	Leaden Flycatcher	1
AVES	Motacillidae	*Anthus novaeseelandiae*	Australian Pipit	1
AVES	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	5
AVES	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	5
AVES	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	6
AVES	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	5
AVES	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	1
AVES	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	9
AVES	Petroicidae	*Petroica rosea*	Rose Robin	1
AVES	Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	9
AVES	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	5
AVES	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	14
AVES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	3
AVES	Phasianidae	*Coturnix ypsilophora*	Brown Quail	16
AVES	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	4
AVES	Psittacidae	*Platycercus eximius*	Eastern Rosella	9
AVES	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	12
AVES	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	560
AVES	Psittacidae	*Platycercus elegans*	Crimson Rosella	2
AVES	Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	2
AVES	Rallidae	*Fulica atra*	Eurasian Coot	3
AVES	Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	8
AVES	Rallidae	*Gallirallus philippensis*	Buff-banded Rail	1
AVES	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	3
AVES	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	506
AVES	Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet	46
AVES	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	3
AVES	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	42
AVES	Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail	1
AVES	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	1
AVES	Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	1214
AVES	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	218
AVES	Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	21
AVES	Scolopacidae	*Calidris ruficollis*	Red-necked Stint	11
AVES	Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	28
AVES	Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	4
AVES	Scolopacidae	*Tringa glareola*	Wood Sandpiper	3
AVES	Scolopacidae	*Tringa nebularia*	Common Greenshank	1
AVES	Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	12
AVES	Scolopacidae	*Xenus cinereus*	Terek Sandpiper	3
AVES	Strigidae	*Ninox novaeseelandiae*	Southern Boobook	1
AVES	Threskiornithidae	*Platalea regia*	Royal Spoonbill	24
AVES	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	7
AVES	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	51
AVES	Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	0
AVES	Timaliidae	*Zosterops lateralis*	Silvereye	25
REPTILIA	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	1

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