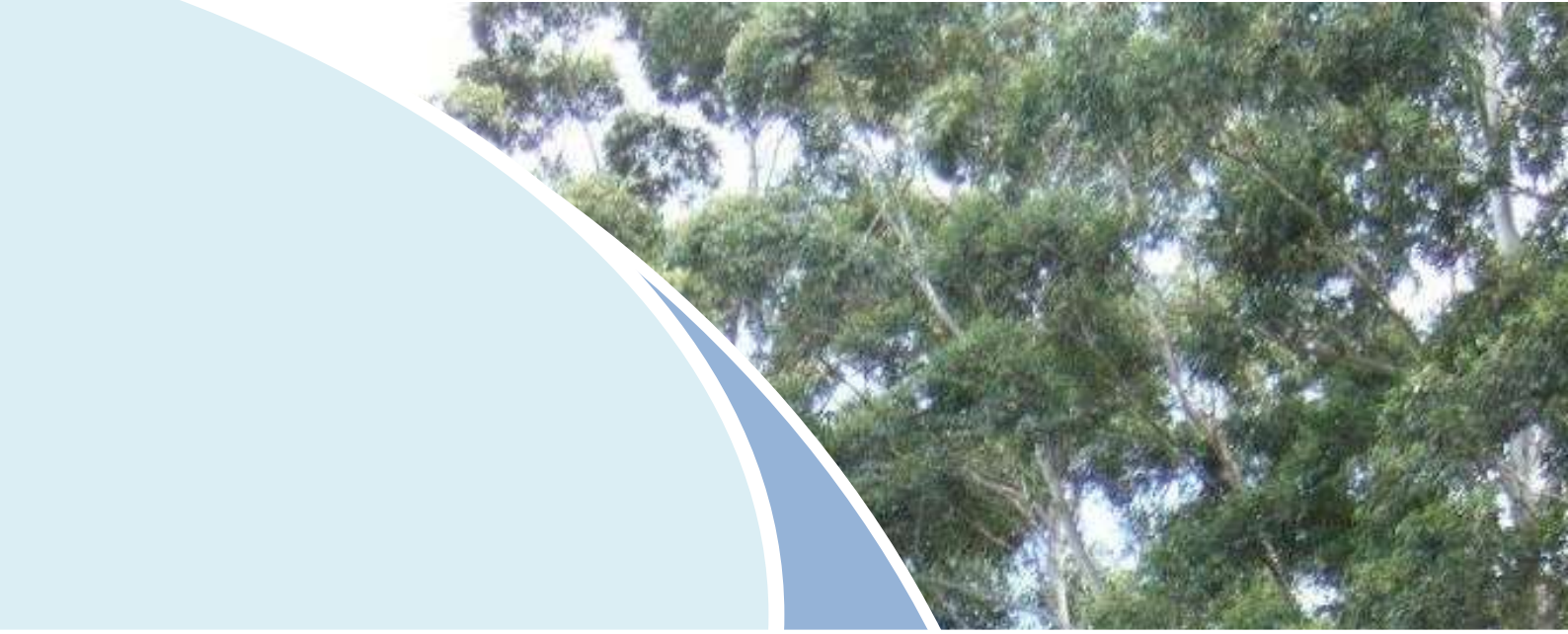

PARRAMATTA RIVER CATCHMENT NATIVE HABITATS AND FAUNA

Prepared for:

Parramatta River Catchment Group

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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.

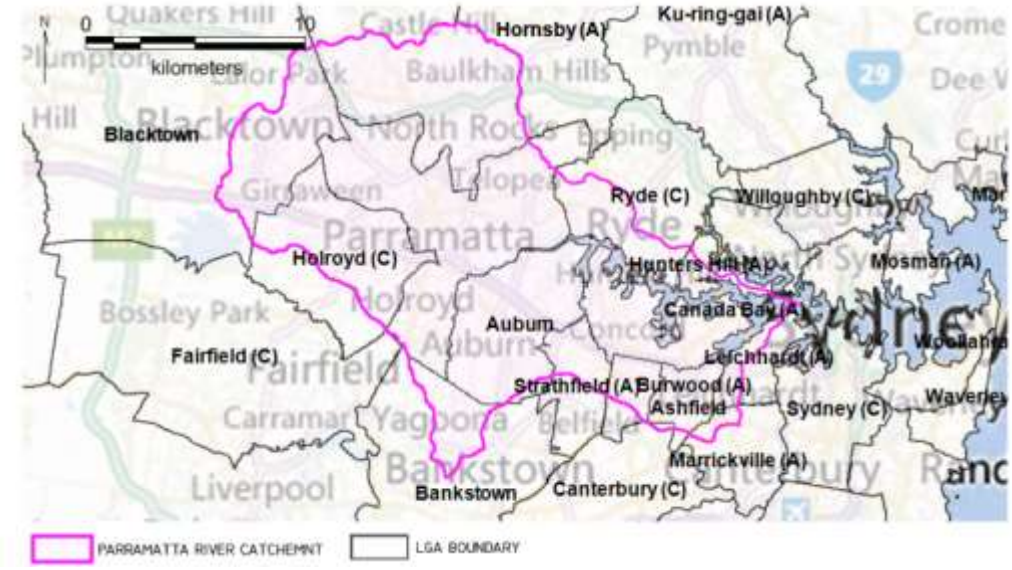


Figure 1 Parramatta River catchment and local government areas

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

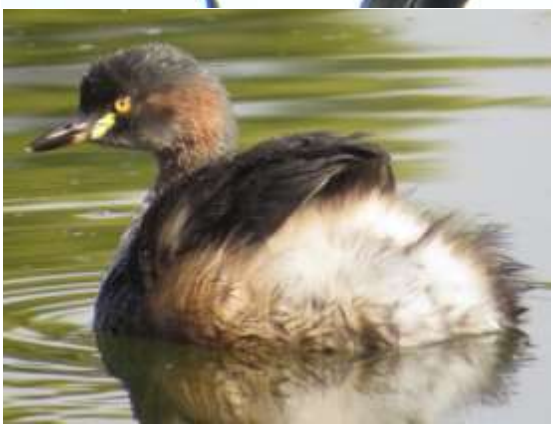
SUPPLEMENTARY SURVEYS

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.

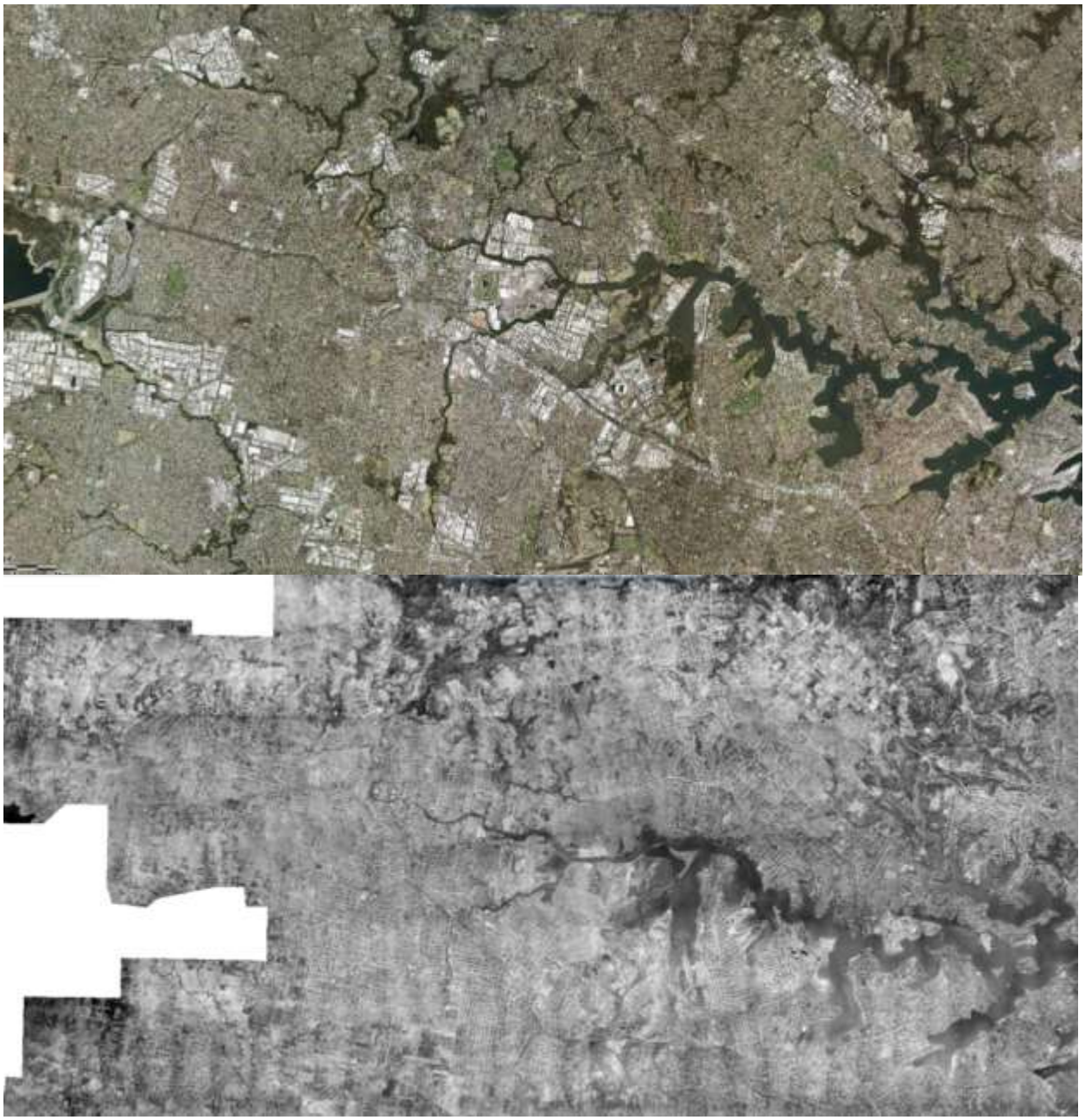


Figure 8 (top) Current aerial photography for the Parramatta River catchment; and (bottom) 1943 aerial photography for the same catchment (Six Maps)

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)

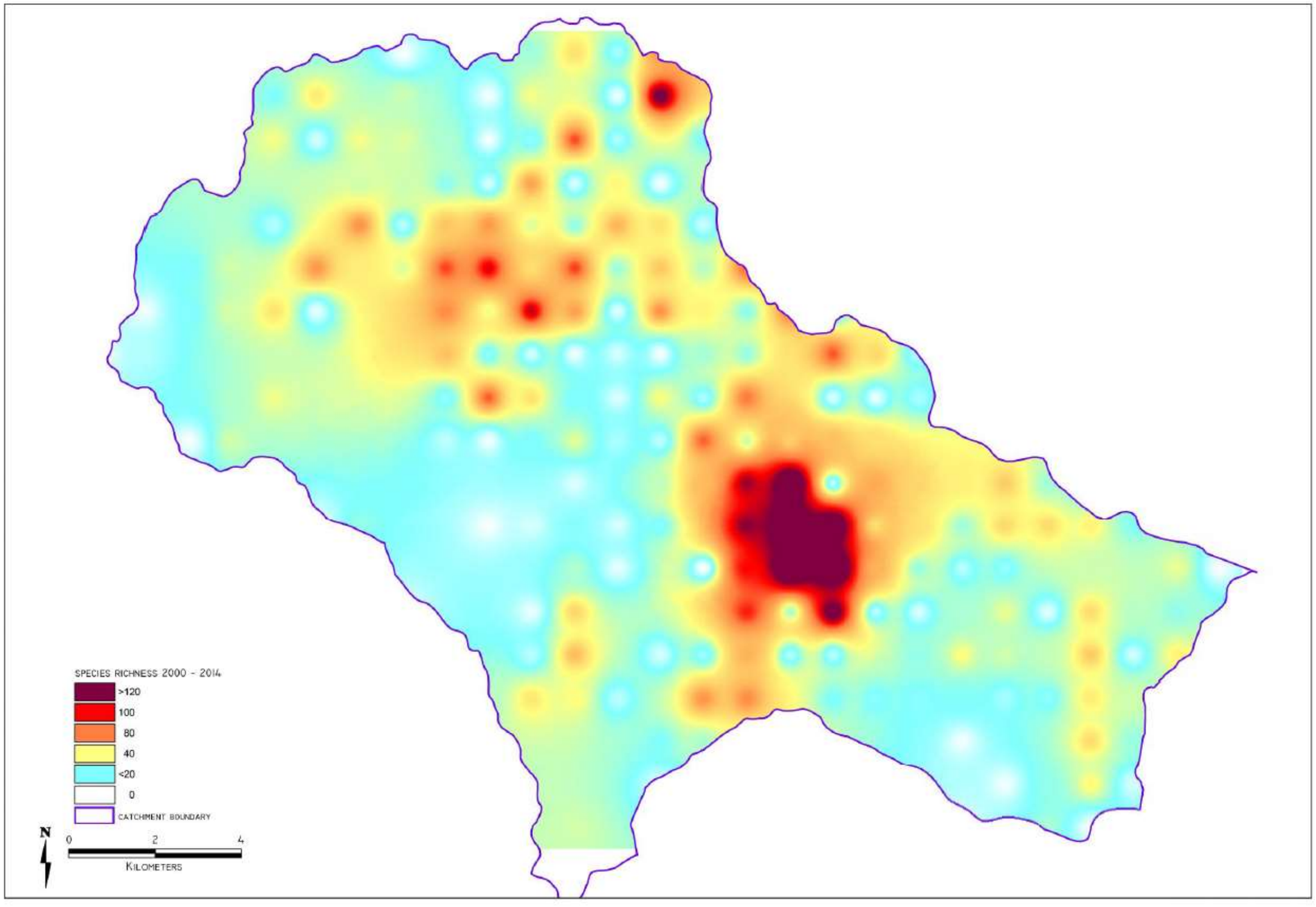


Figure 10 Species richness based on records from fauna databases from 2000-2014

SPECIES RICHNESS - POST 2000 RECORDS

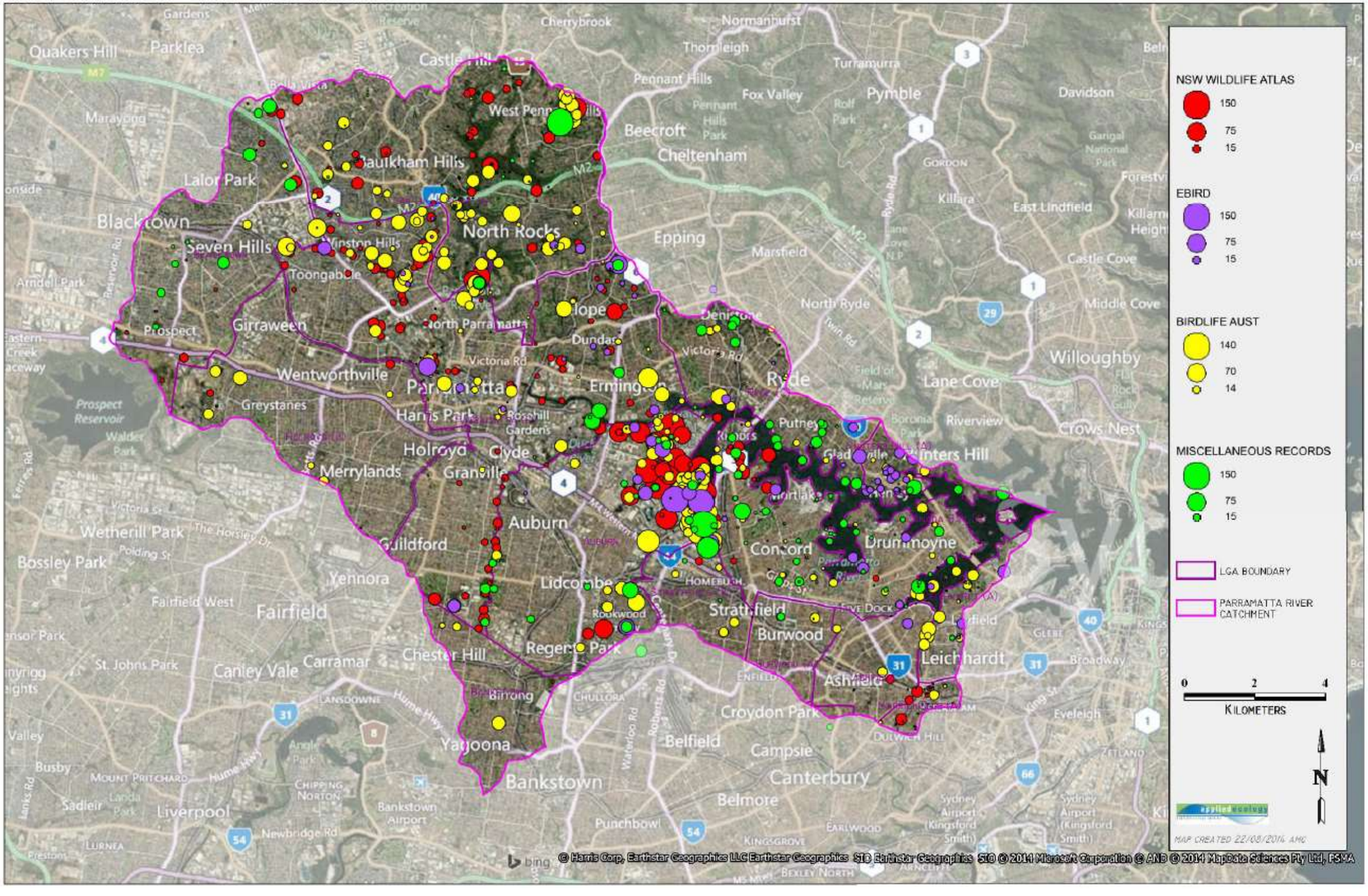


Figure 11 Species Richness (2000-2014) by data source for the Parramatta River Catchment

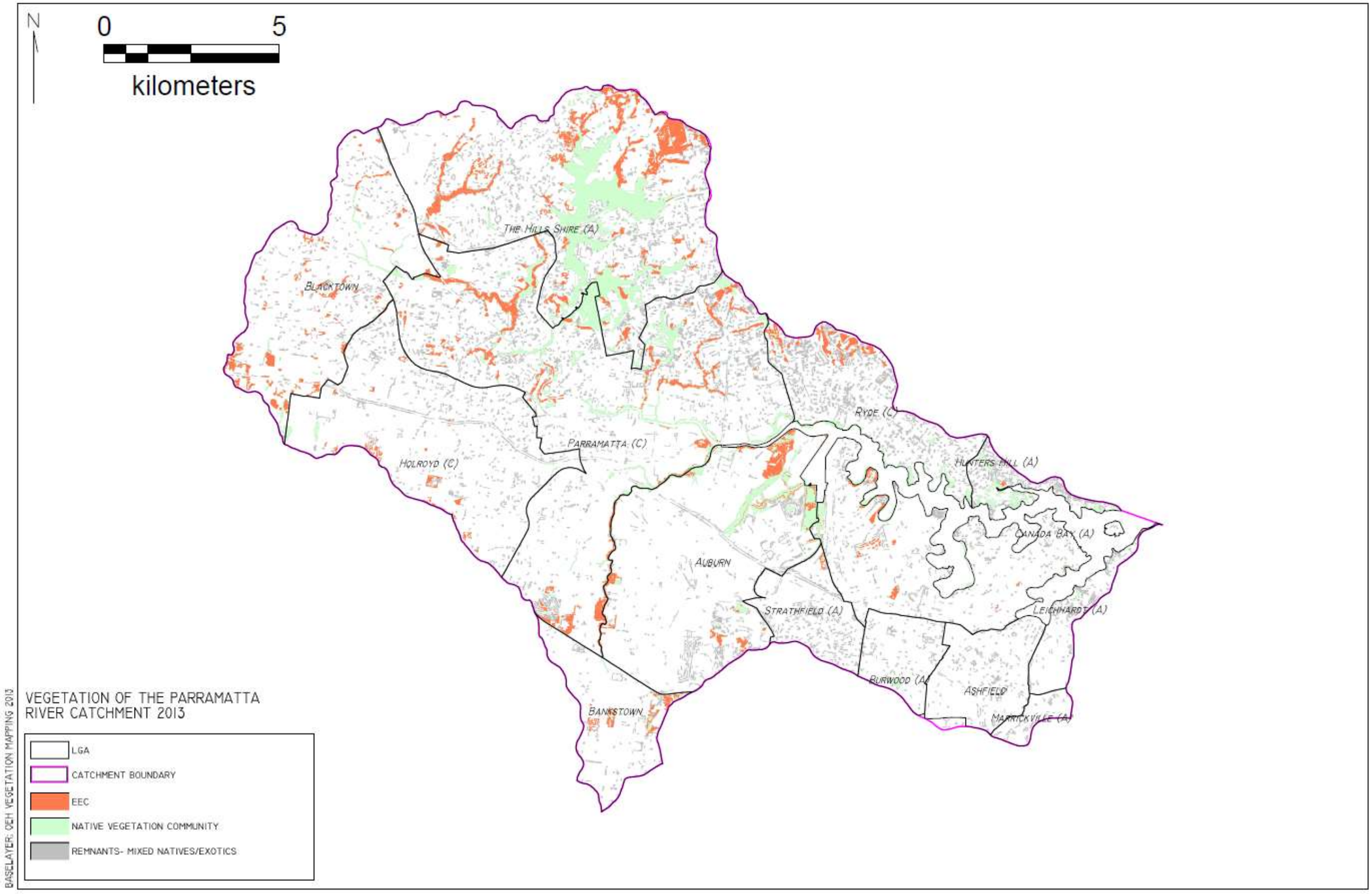


Figure 12 Vegetation of the Parramatta River Catchment

THREATENED BIRDS (NSW TSC ACT) (771 OBSERVATIONS)

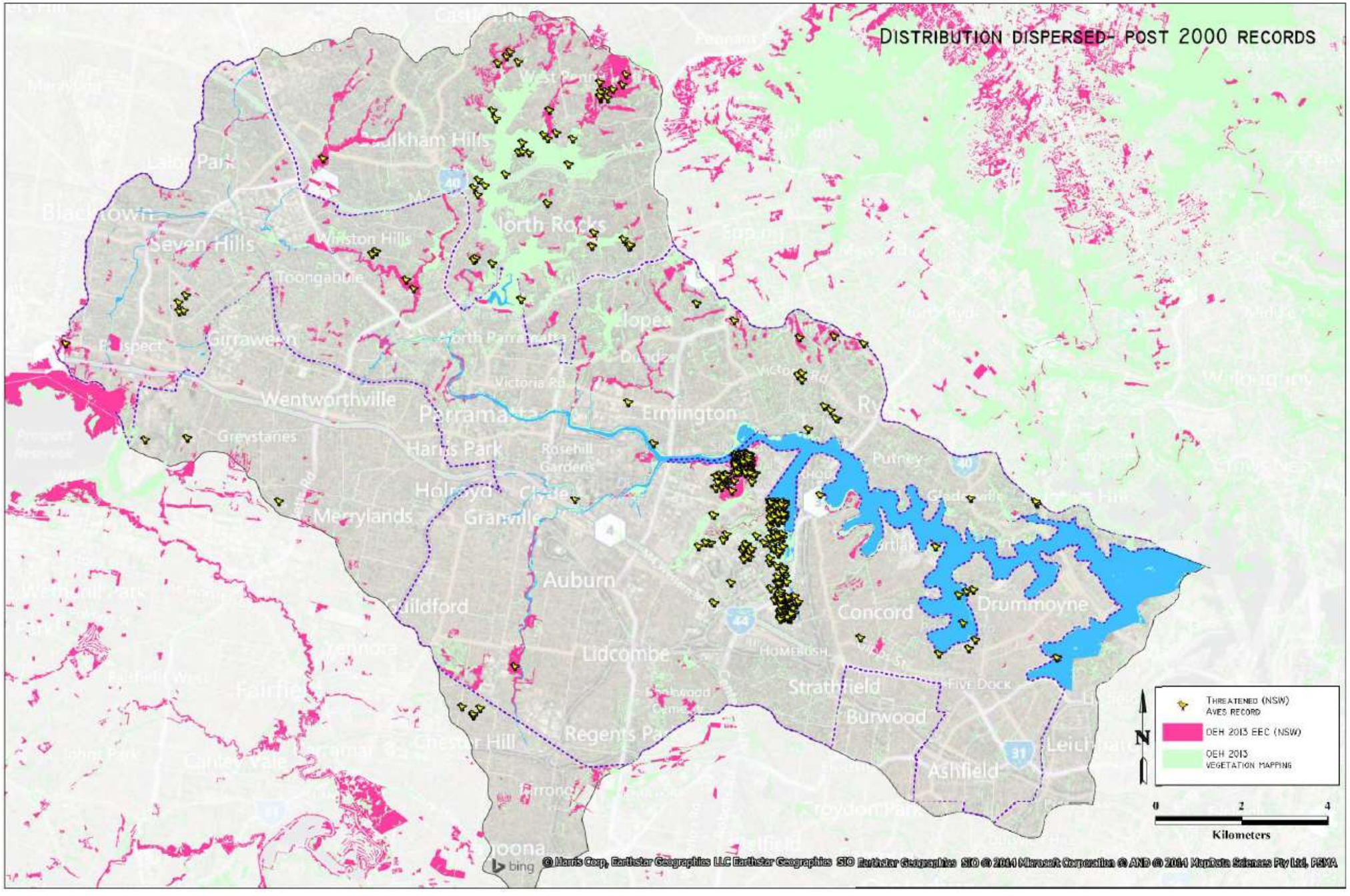


Figure 13 Threatened Aves

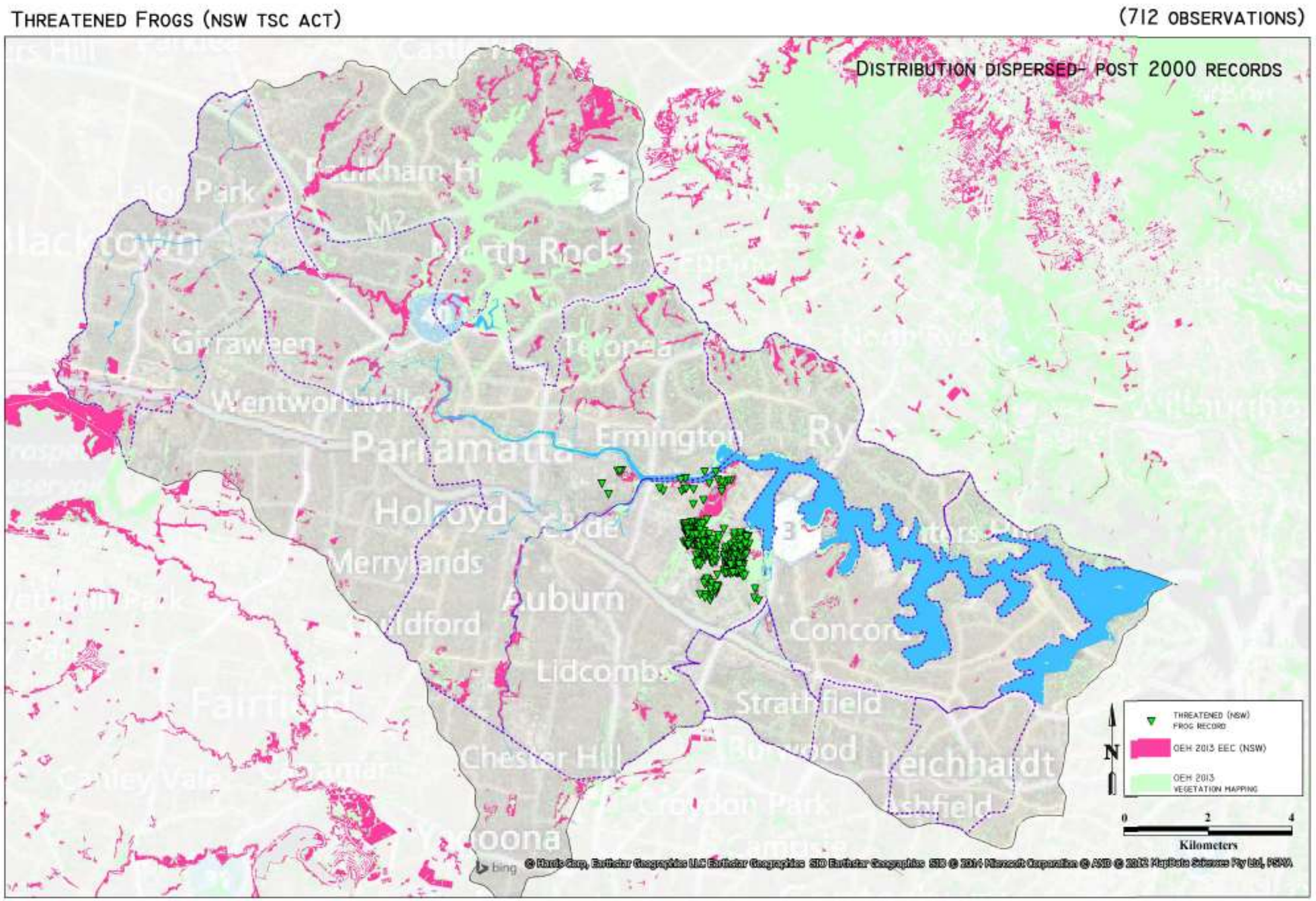


Figure 14 Threatened amphibians

ALL MAMMALS 2000 - 2014

(757 OBSERVATIONS)

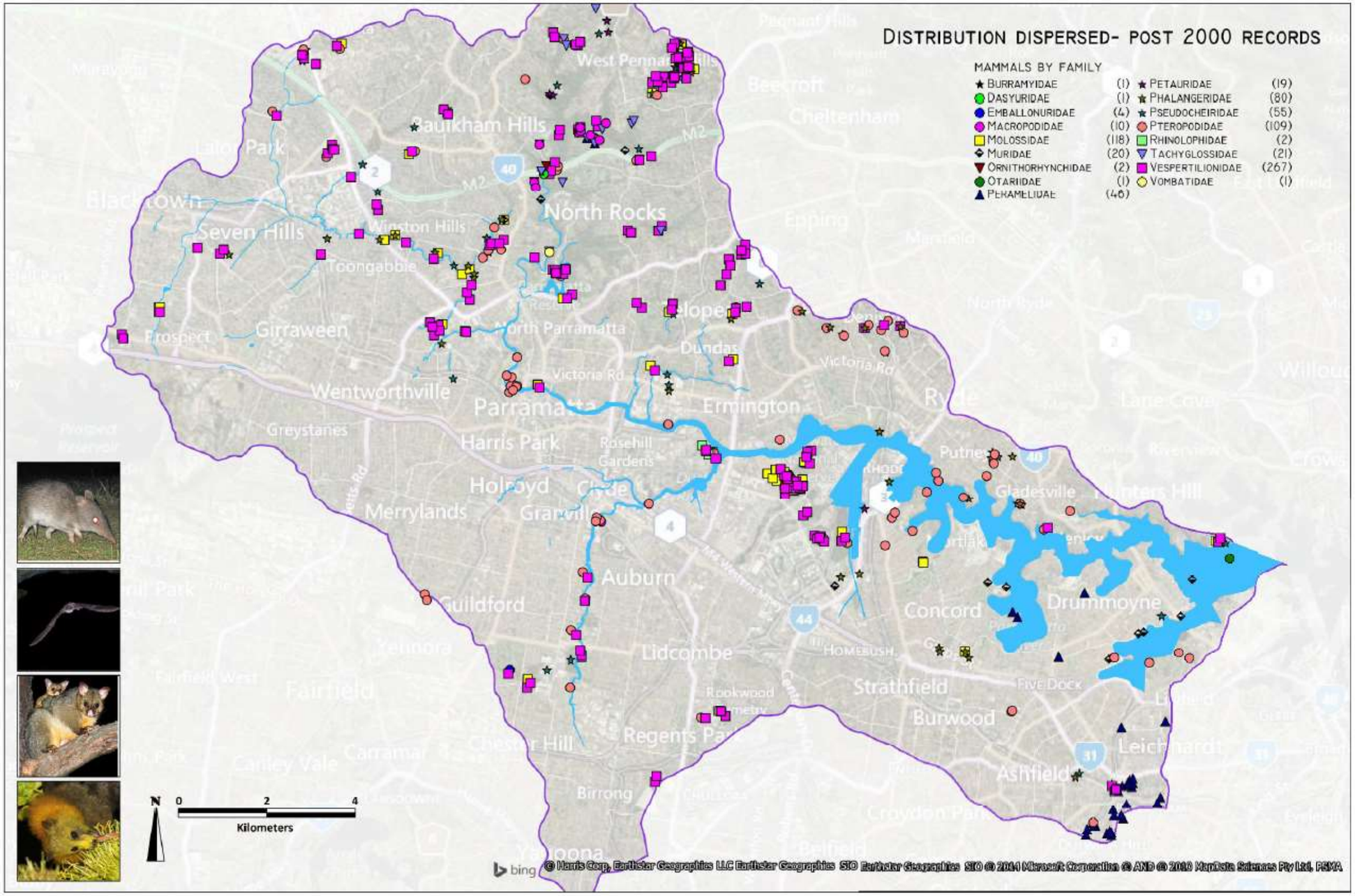


Figure 15 All Mammals

THREATENED MAMMALS (NSW TSC ACT)

(167 OBSERVATIONS)

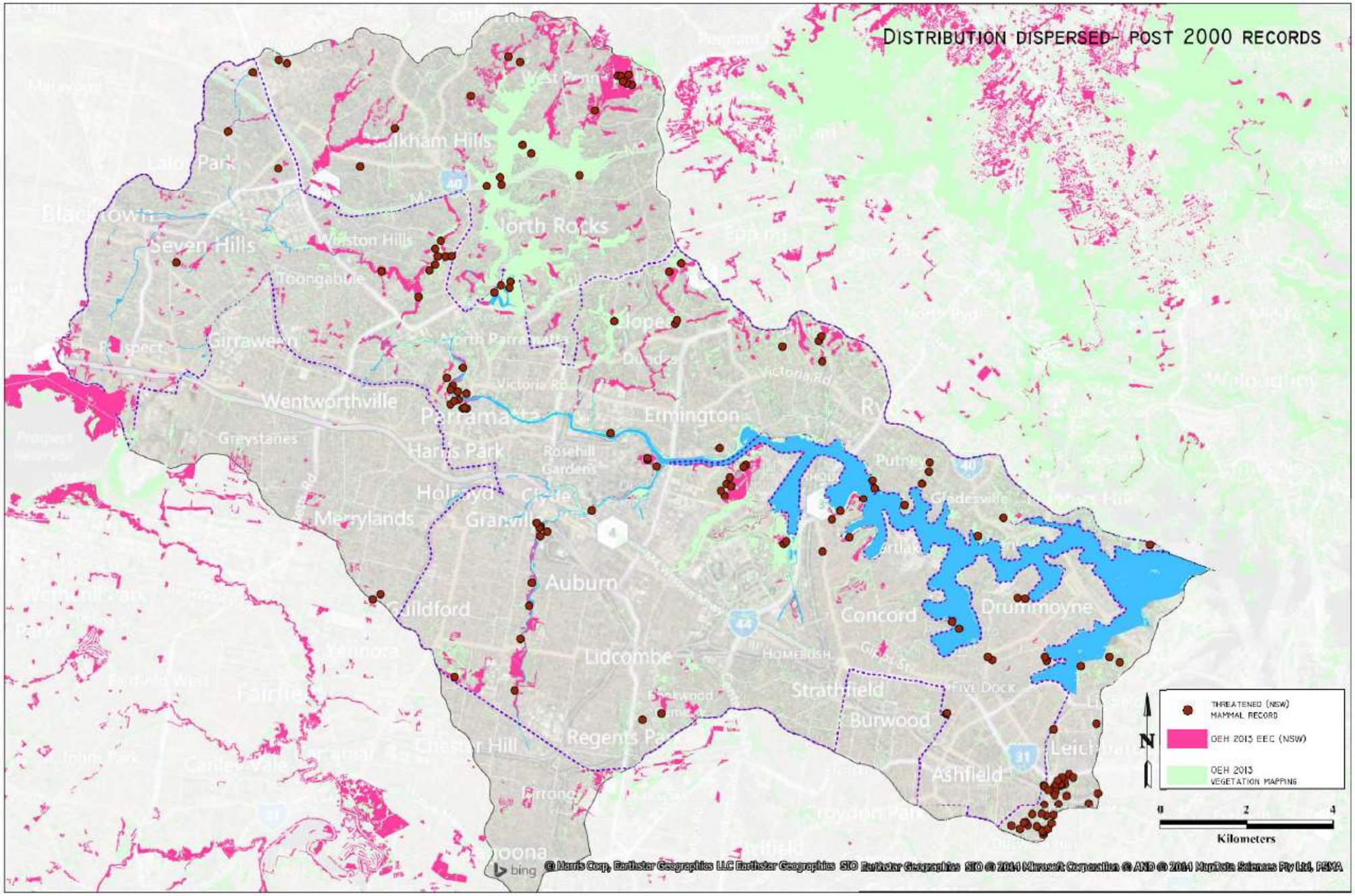


Figure 16 Threatened Mammals

SPECIES RICHNESS BY 1KM X 1KM GRID

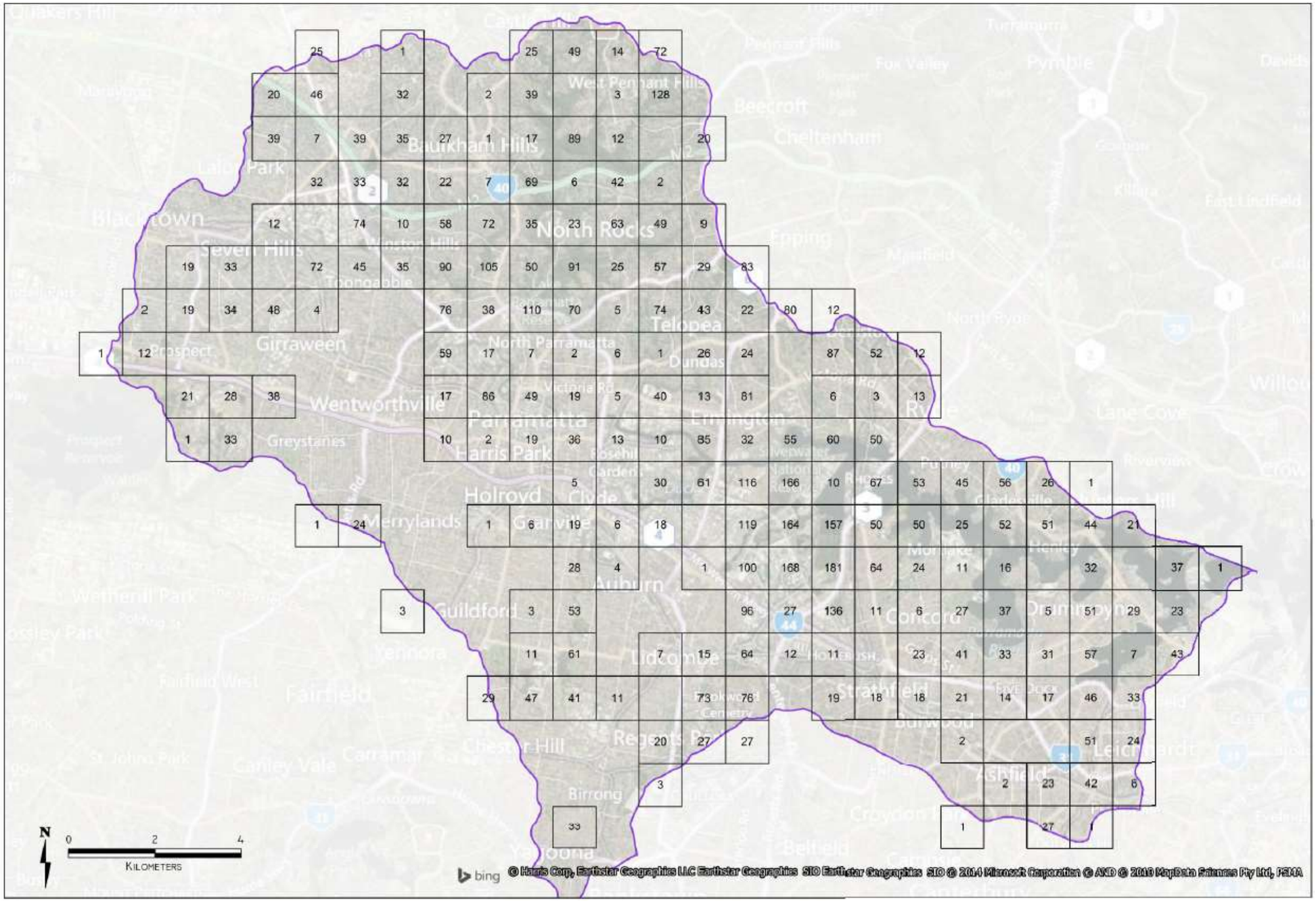


Figure 17 Species richness across Parramatta River catchment using a 1km2 grid (range: 1 to 168)

SURVEY DAYS (EFFORT) BY 1KM X 1KM GRID

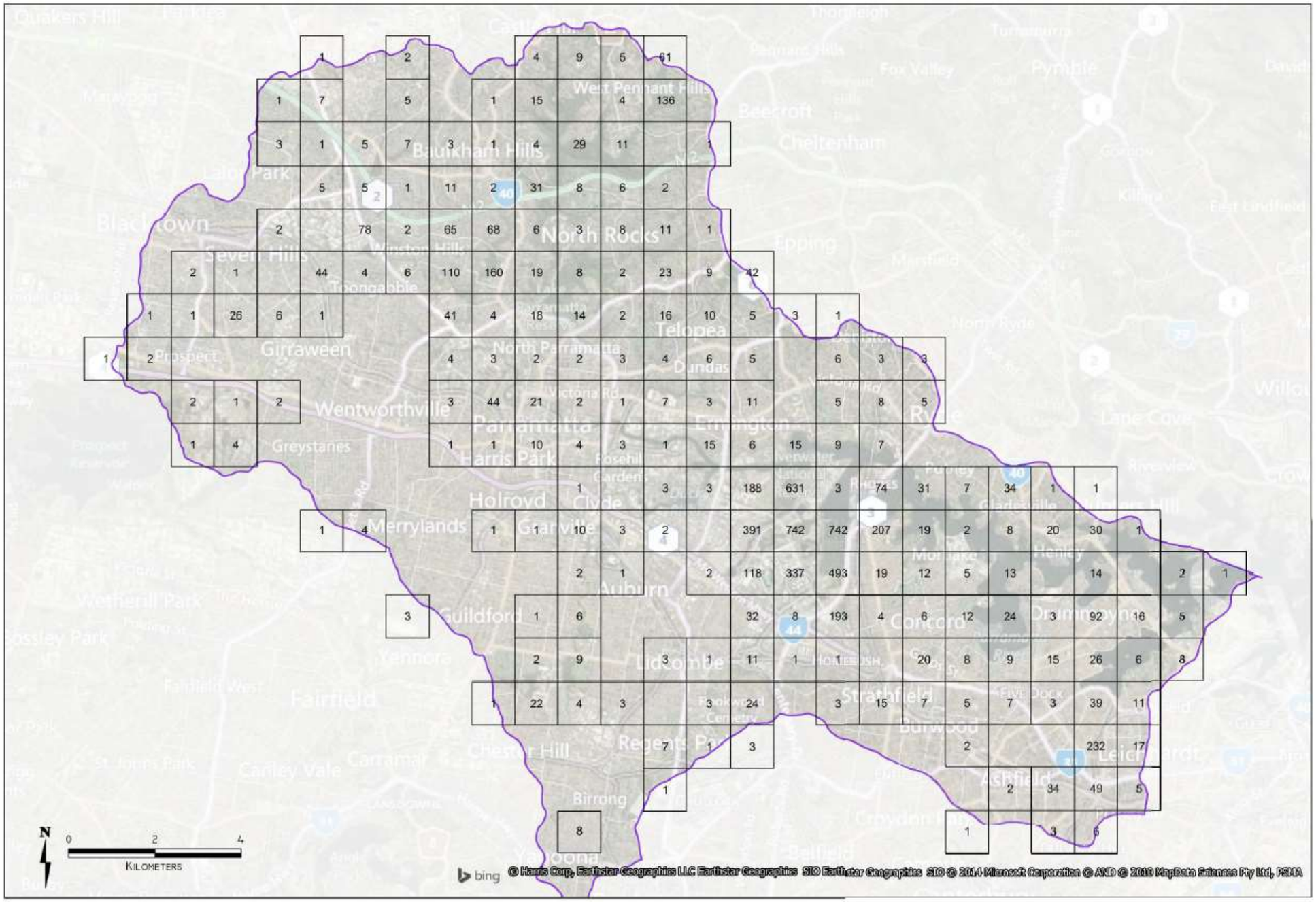


Figure 18 Survey effort for Parramatta River catchment using a 1km2 grid (range: 1 survey event to 742 survey events)

RECORD COUNTS BY 1KM X 1KM GRID

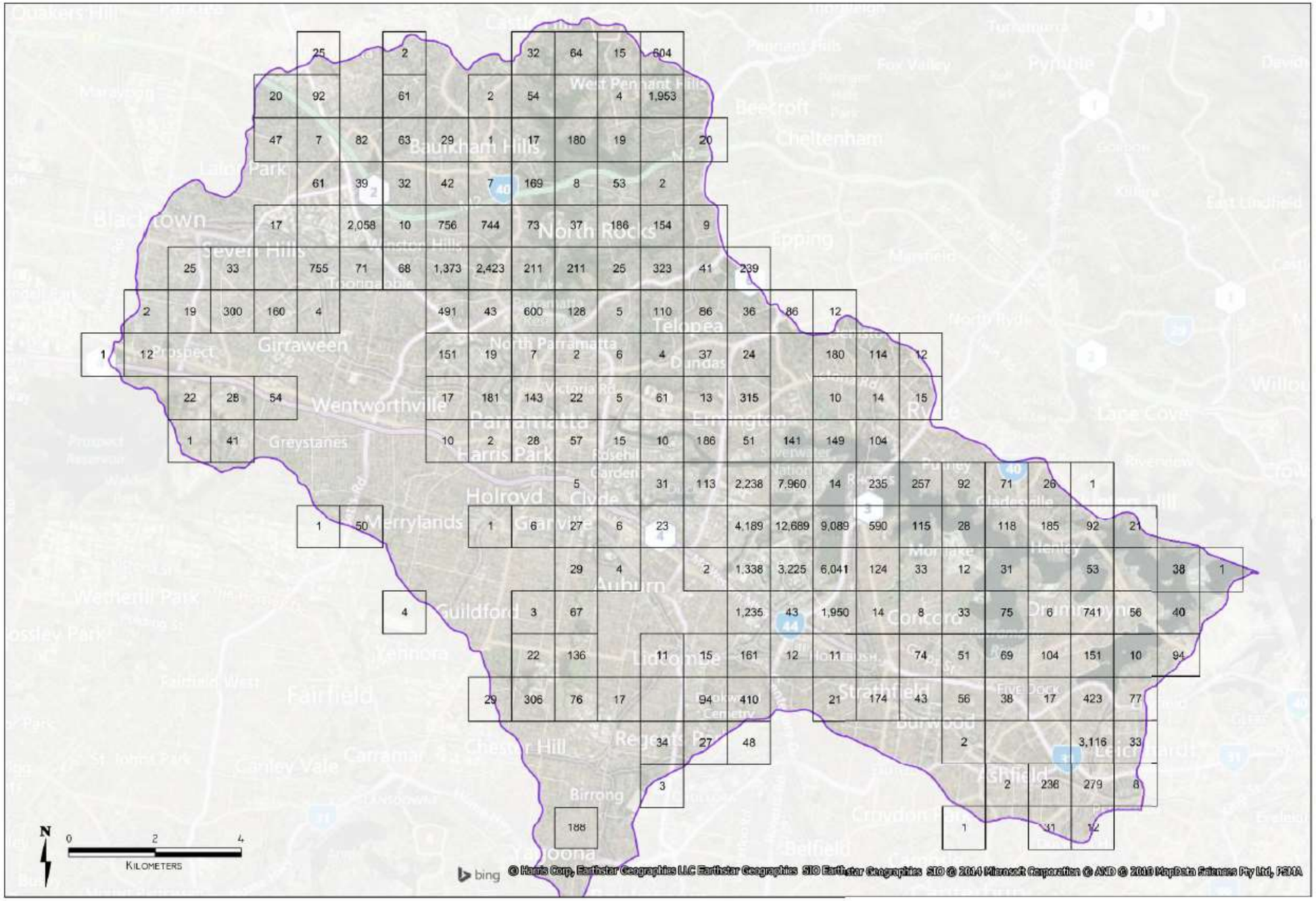


Figure 19 Distribution of fauna records across the Parramatta River catchment, based on number of species and number of observations (range: 1 record to 12,689 records)

FAMILIES:ARDEIDAE (2134 OBSERVATIONS)

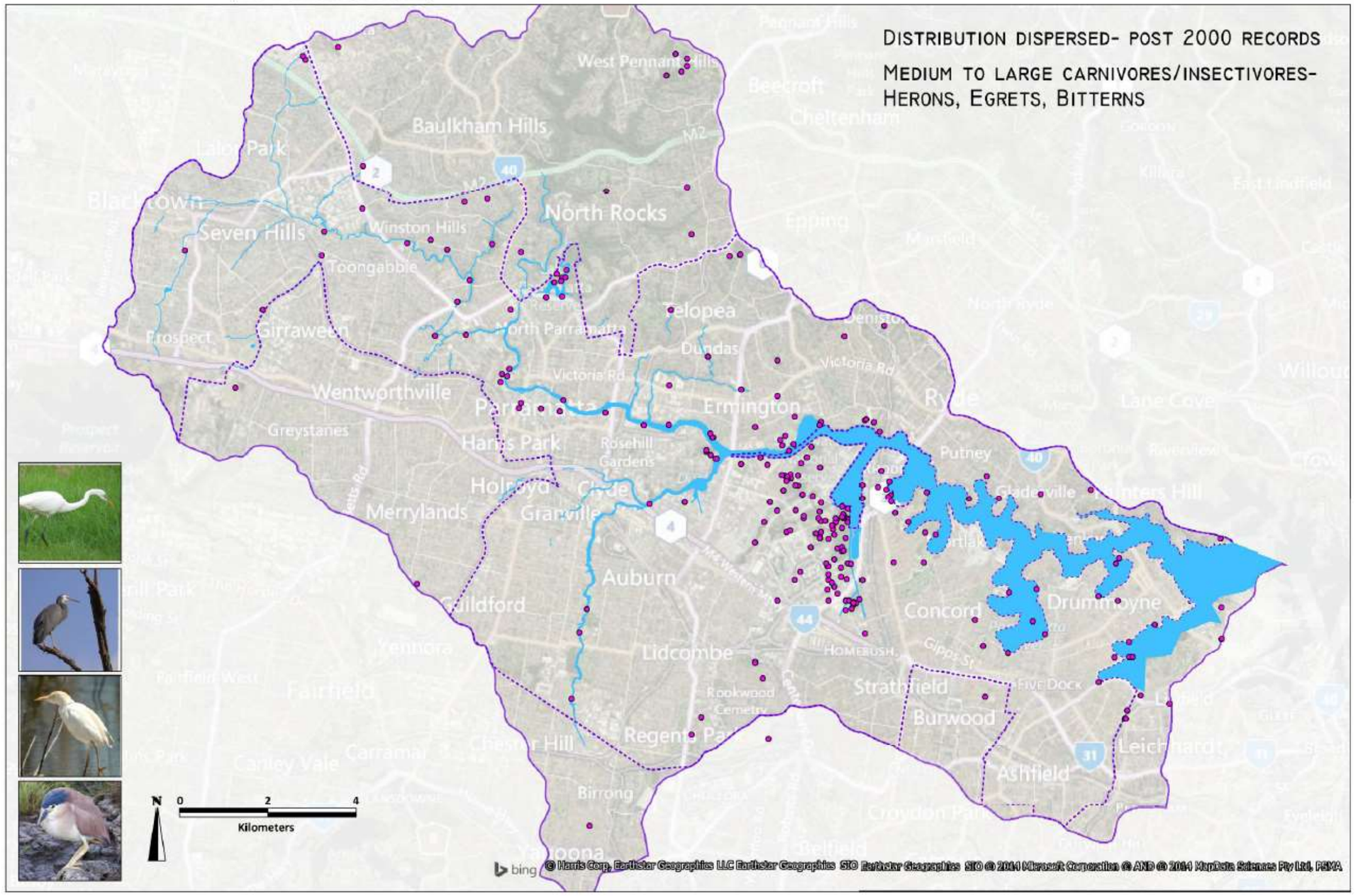


Figure 20 Guild maps – Herons, Egrets, Bitterns

FAMILIES:MELIPHAGIDAE

(7542 OBSERVATIONS)

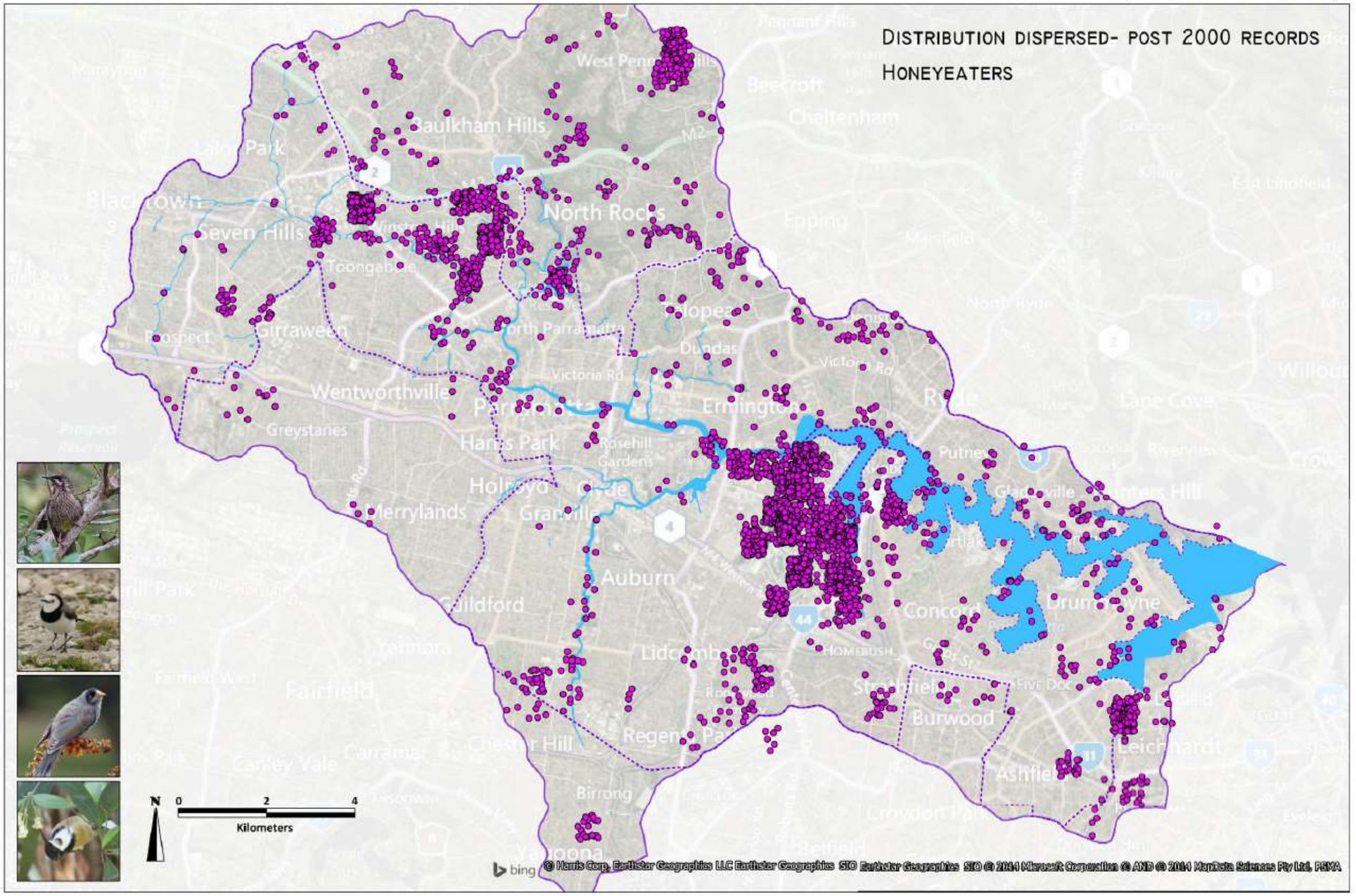


Figure 21 Guild maps- Honeyeaters

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

(4668 OBSERVATIONS)

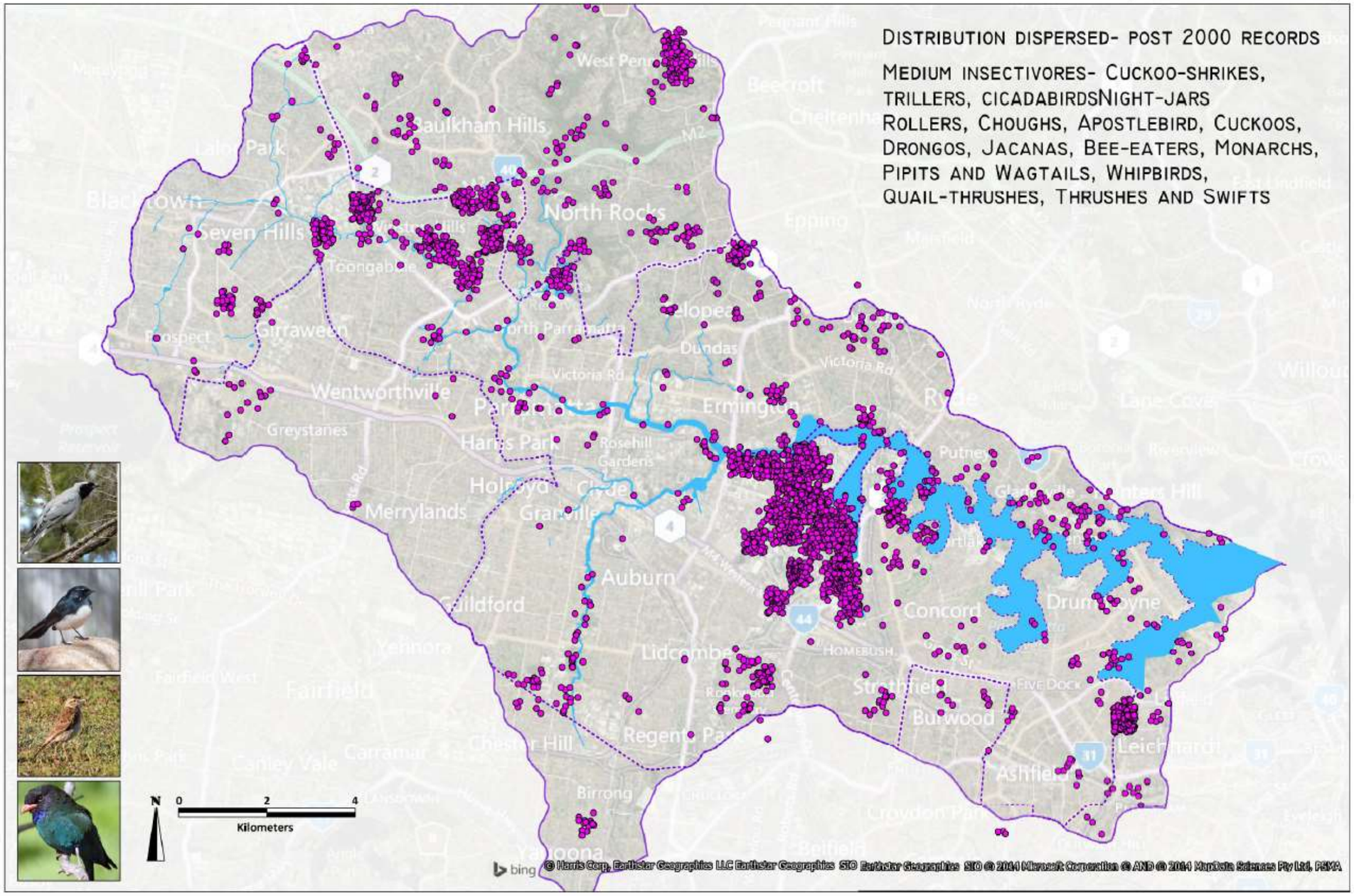


Figure 22 Guild maps- medium insectivores

FAMILIES: PODICIPEDIDAE, ALCEDINIDAE & CHARADRIIDAE

(4972 OBSERVATIONS)

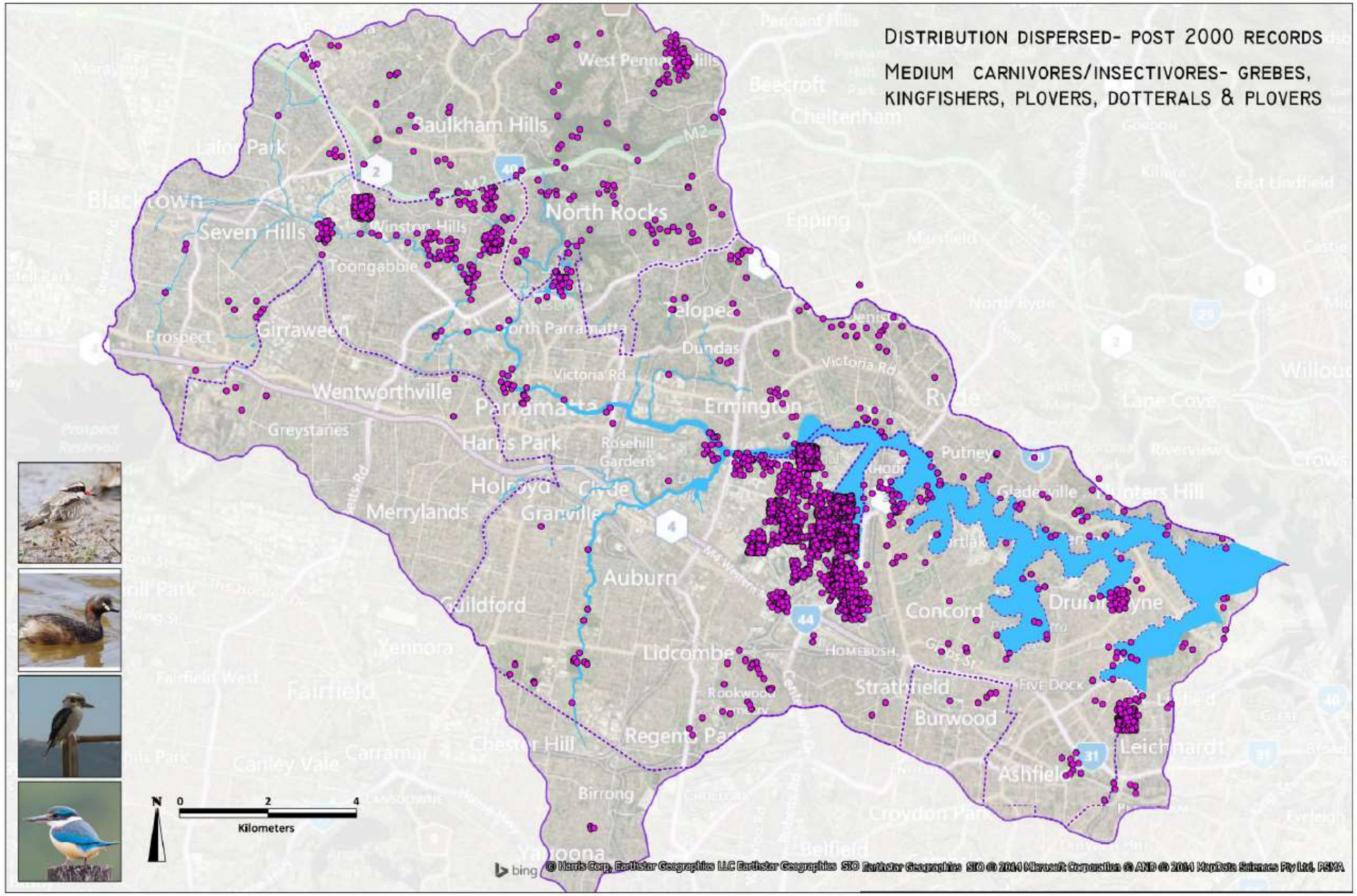


Figure 23 Guild maps- riparian zone medium insectivores

FAMILIES:ESTRILDIDAE, TURNICIDAE, ALAUDIDAE & PHASIANIDAE

(1230 OBSERVATIONS)

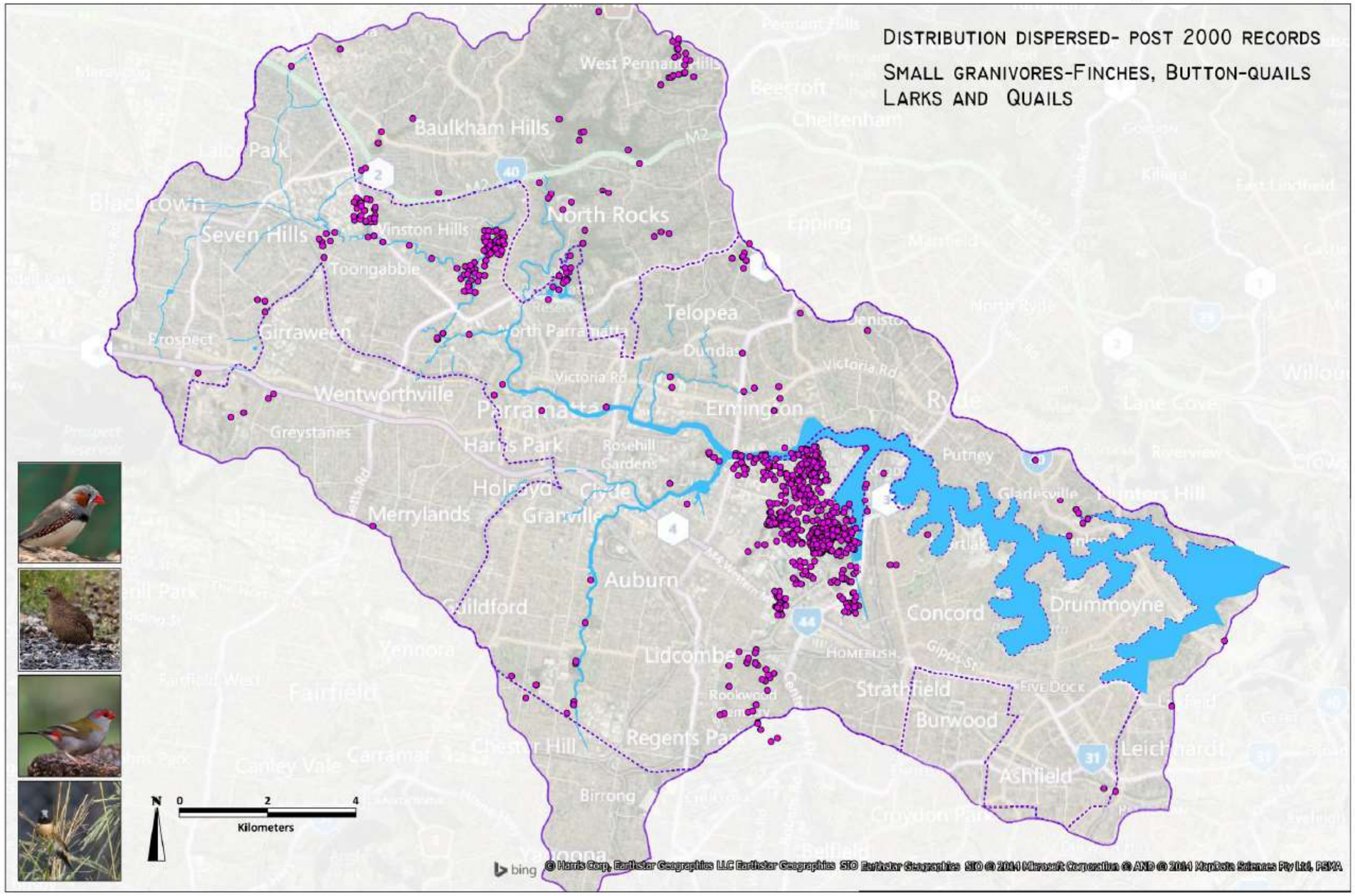


Figure 24 Guild maps- small granivores

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

(16142 OBSERVATIONS)

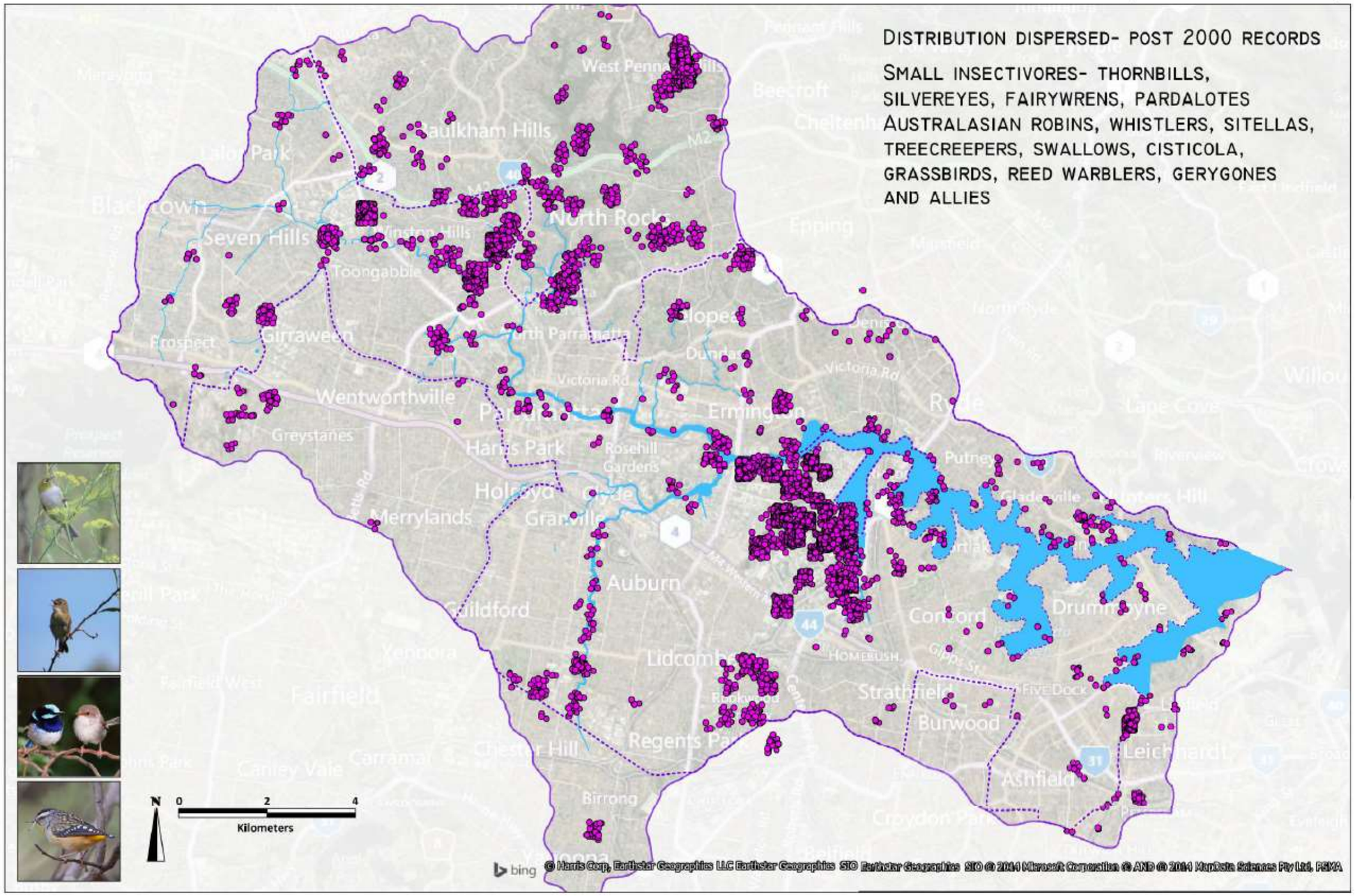


Figure 25 guild maps- small insectivores

FAMILIES:ARTAMIDAE, CORVIDAE & THRESKIORNITHIDAE

(10252 OBSERVATIONS)

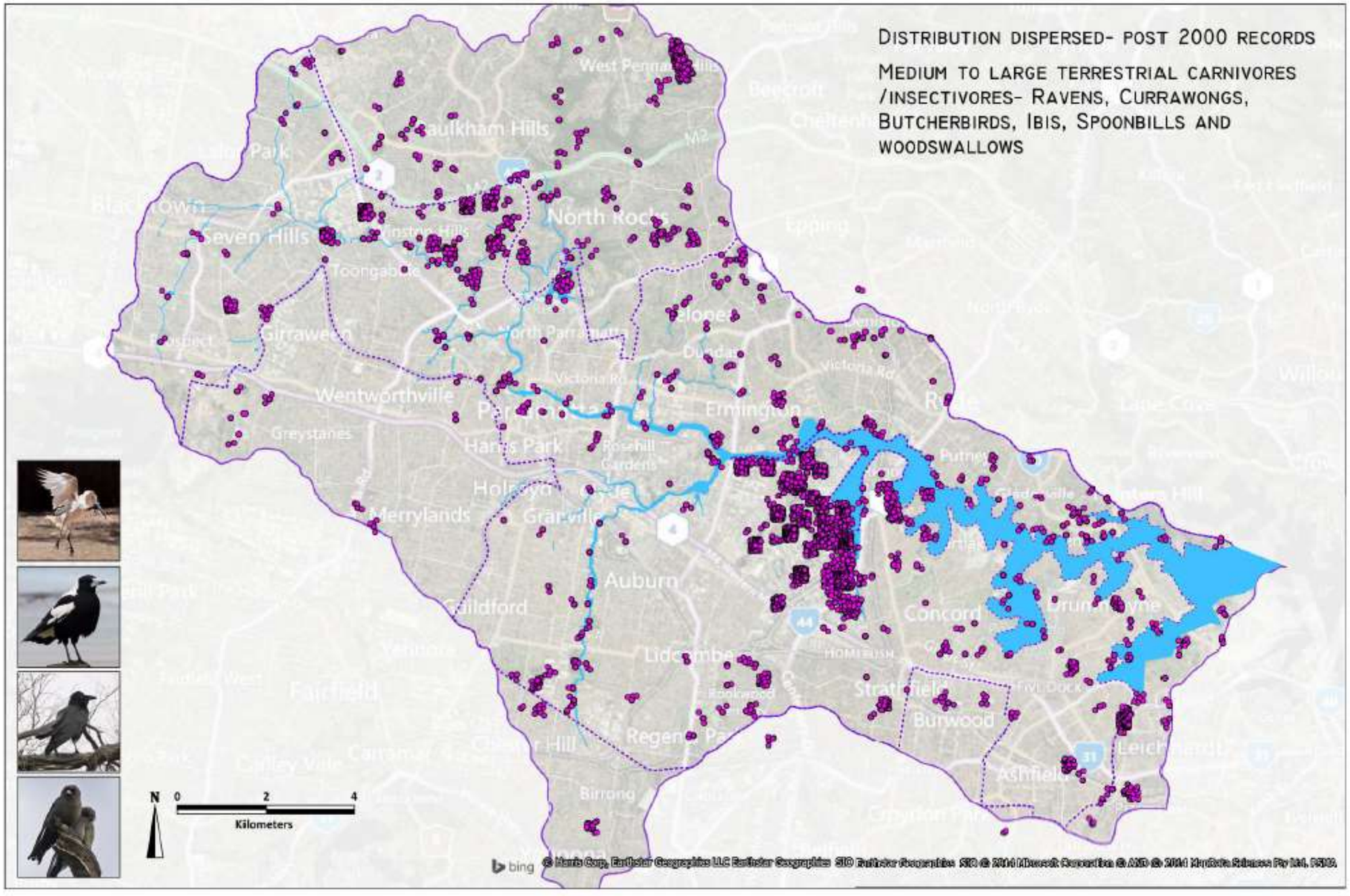


Figure 26 Guild maps- medium to large carnivores/insectivores (1)

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

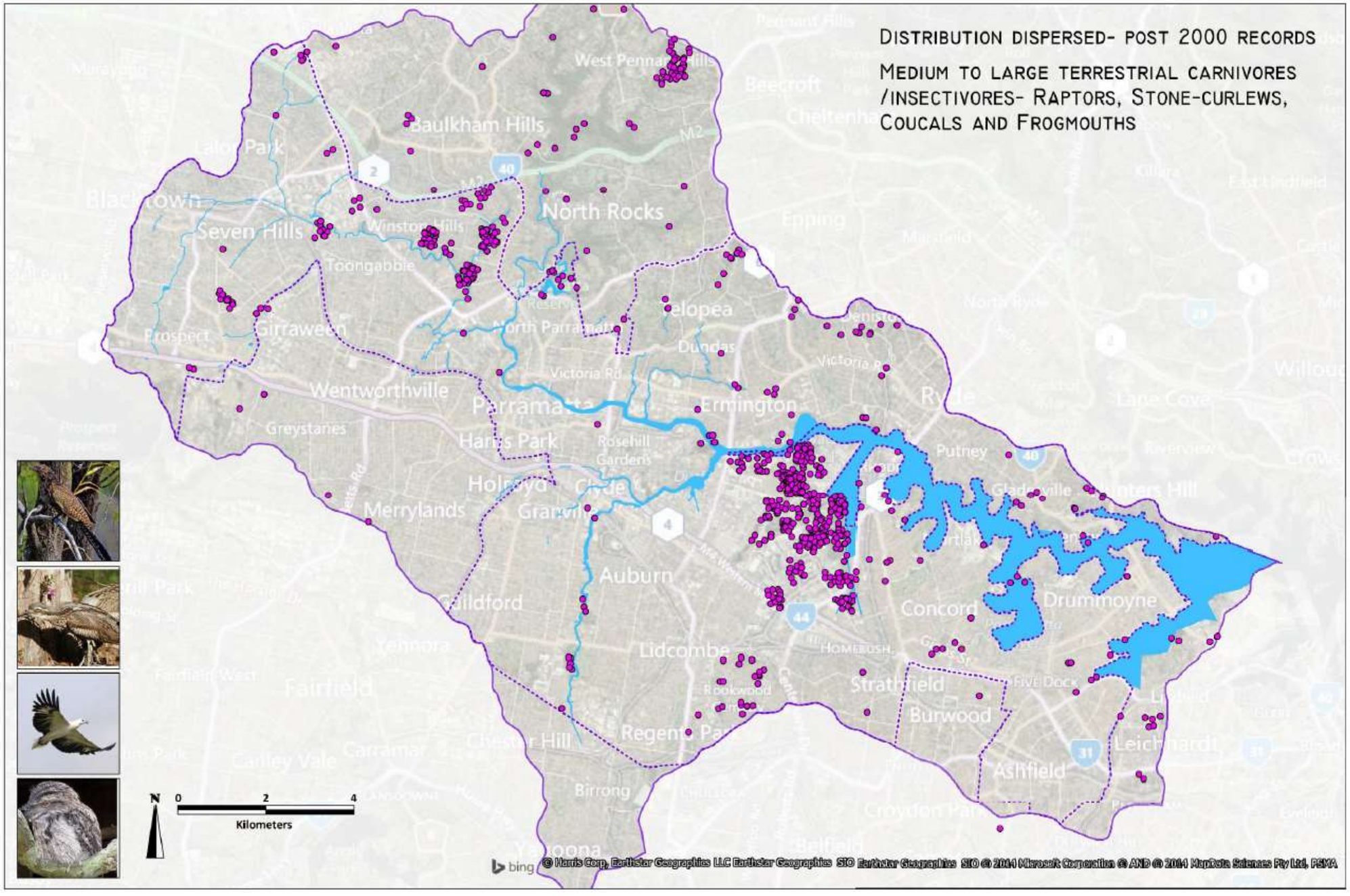


Figure 27 Guild maps- medium to large carnivores/insectivores (2)

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

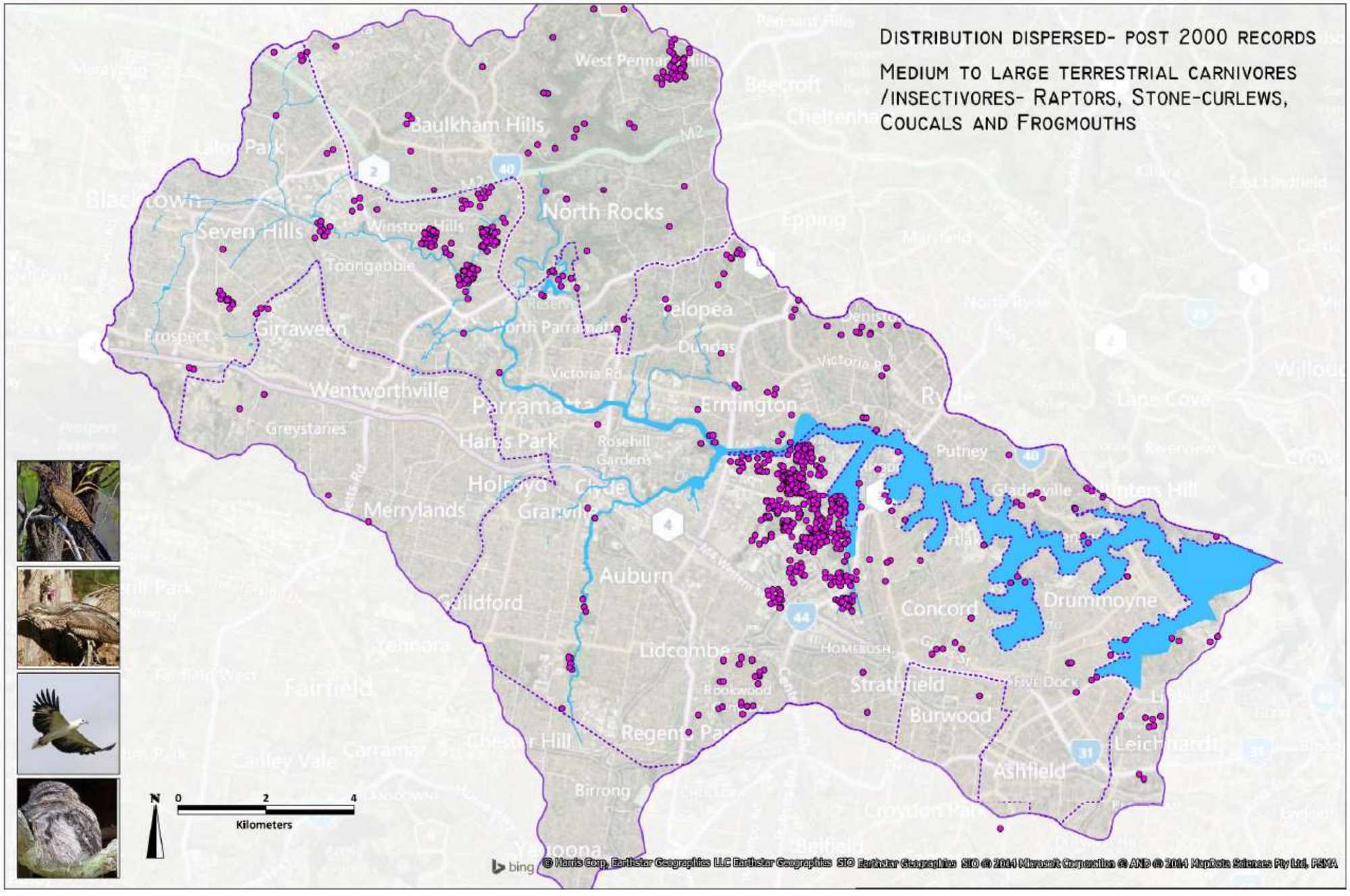


Figure 28 Guild maps- medium to large carnivores/insectivores (3)

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

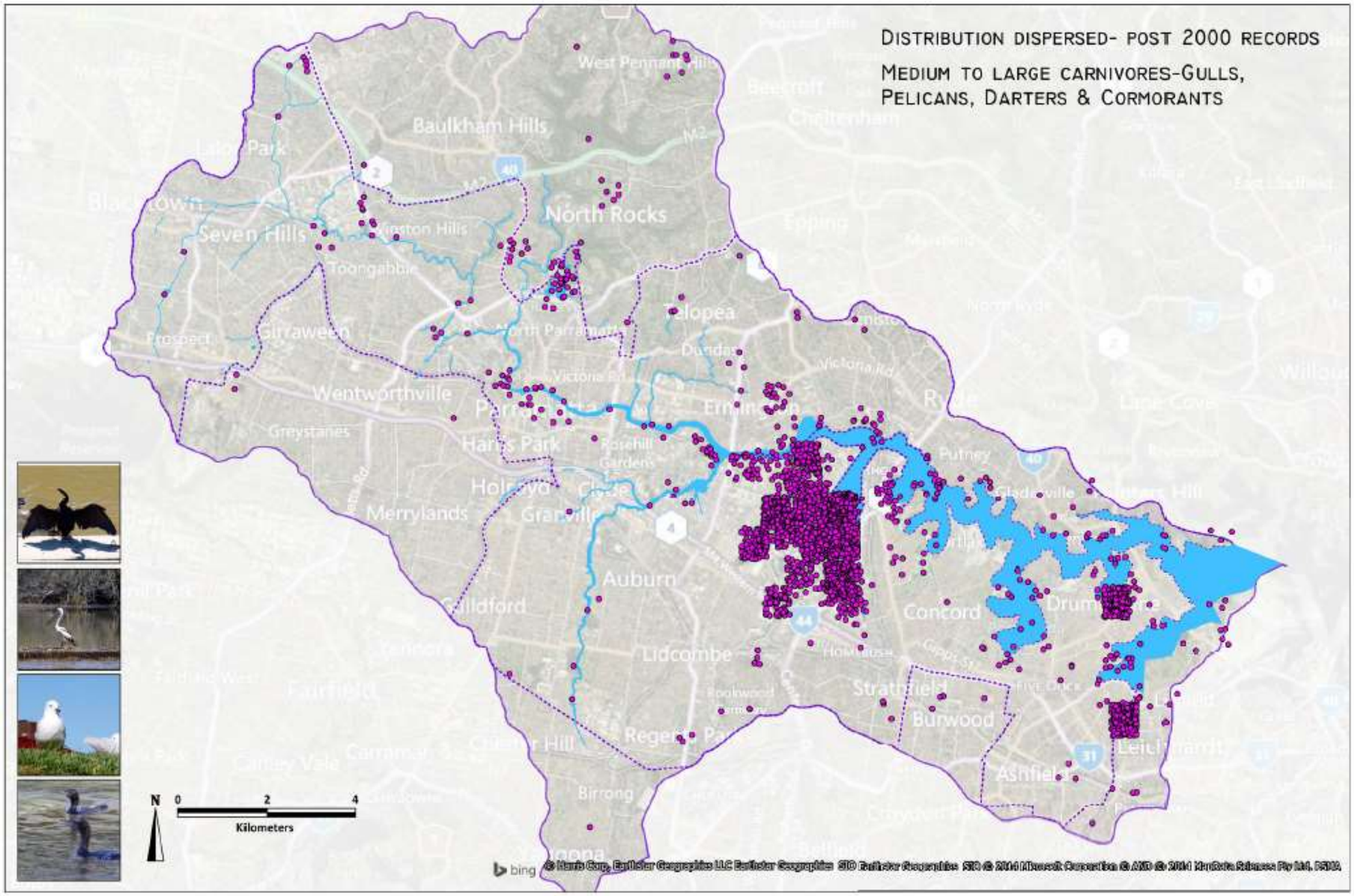


Figure 29 guild maps- Medium to large water birds

FAMILIES:RALLIDAE, RECURVIROSTRIDAE, ROSTRATULIDAE & SCOLOPACIDAE (6933 OBSERVATIONS)

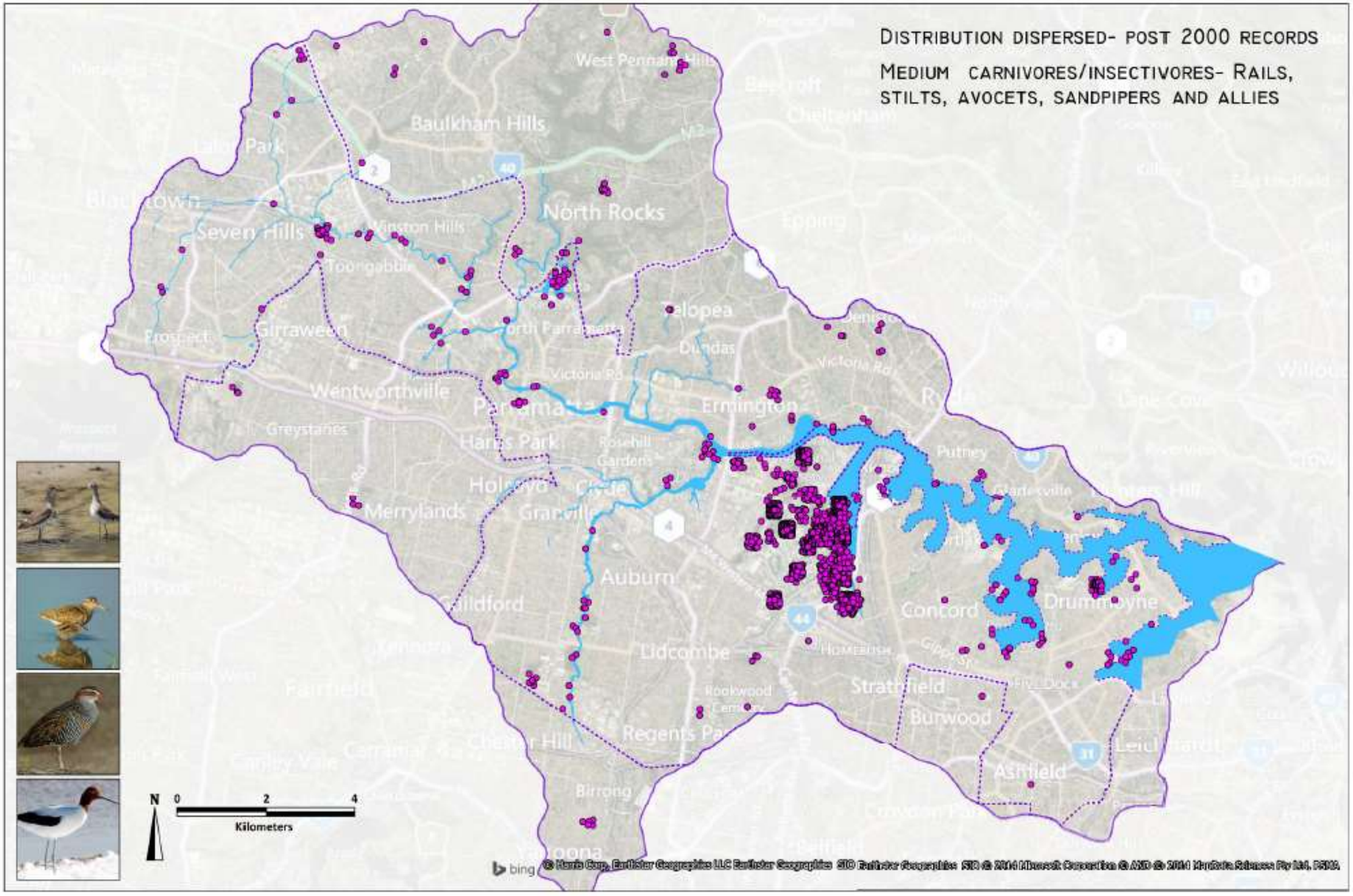


Figure 30 Guild maps - Waders/shorebirds

FAMILIES:COLUMBIDAE, CACATUIDAE & PSITTACIDAE

(9074 OBSERVATIONS)

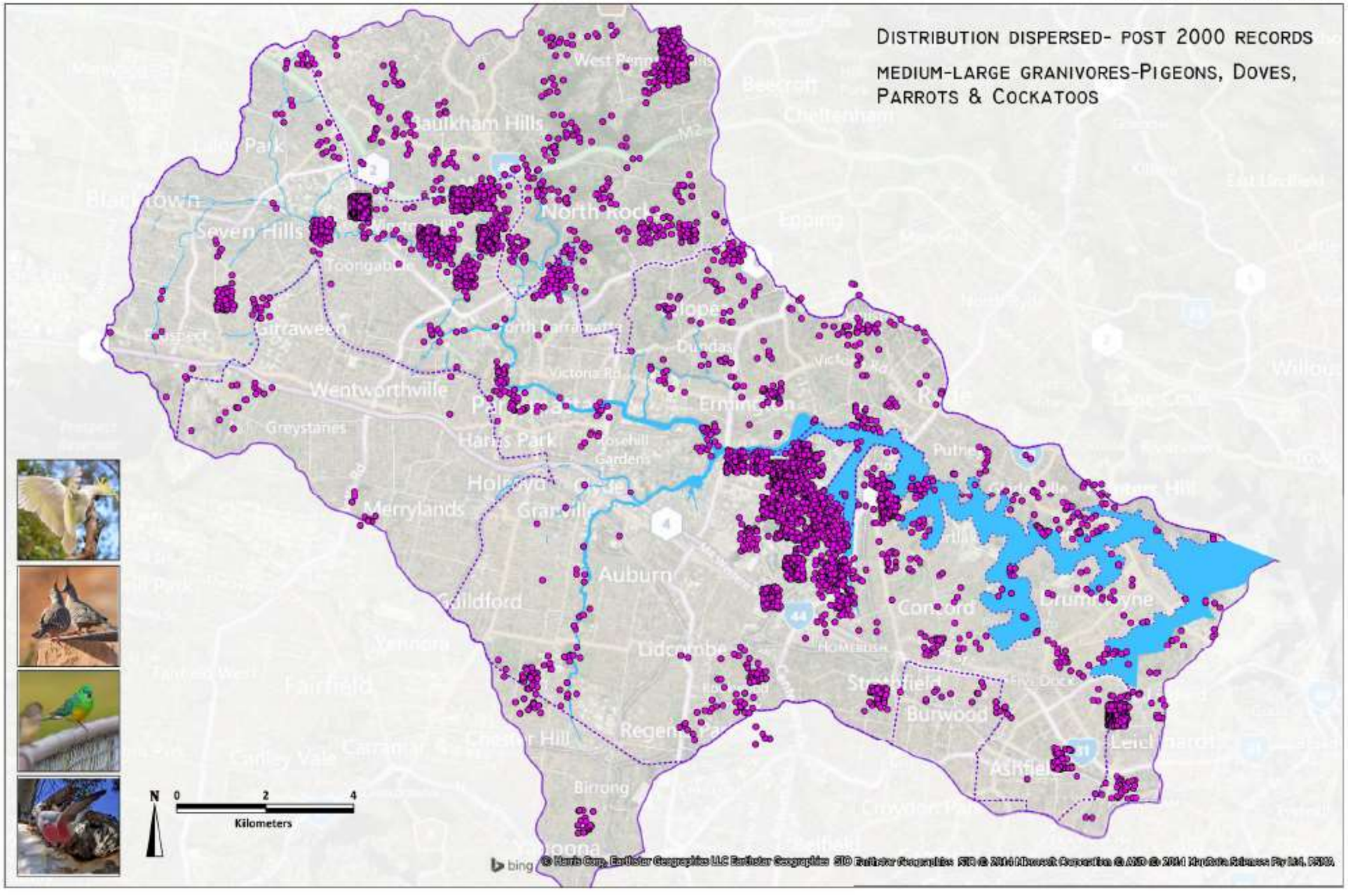


Figure 31 Guild maps- Large granivores

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.

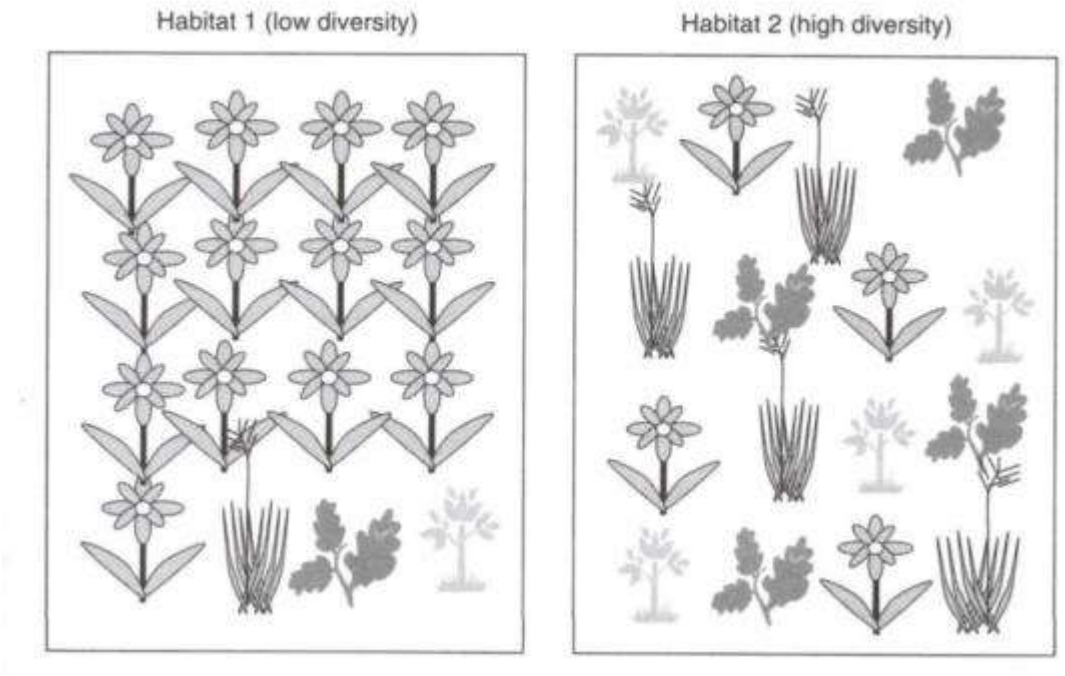


Figure 32 The difference between species richness and diversity – both have 4 species, so richness is equal, but the abundance of each species is different, so diversity is not equal (Shaw, 2003)

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).

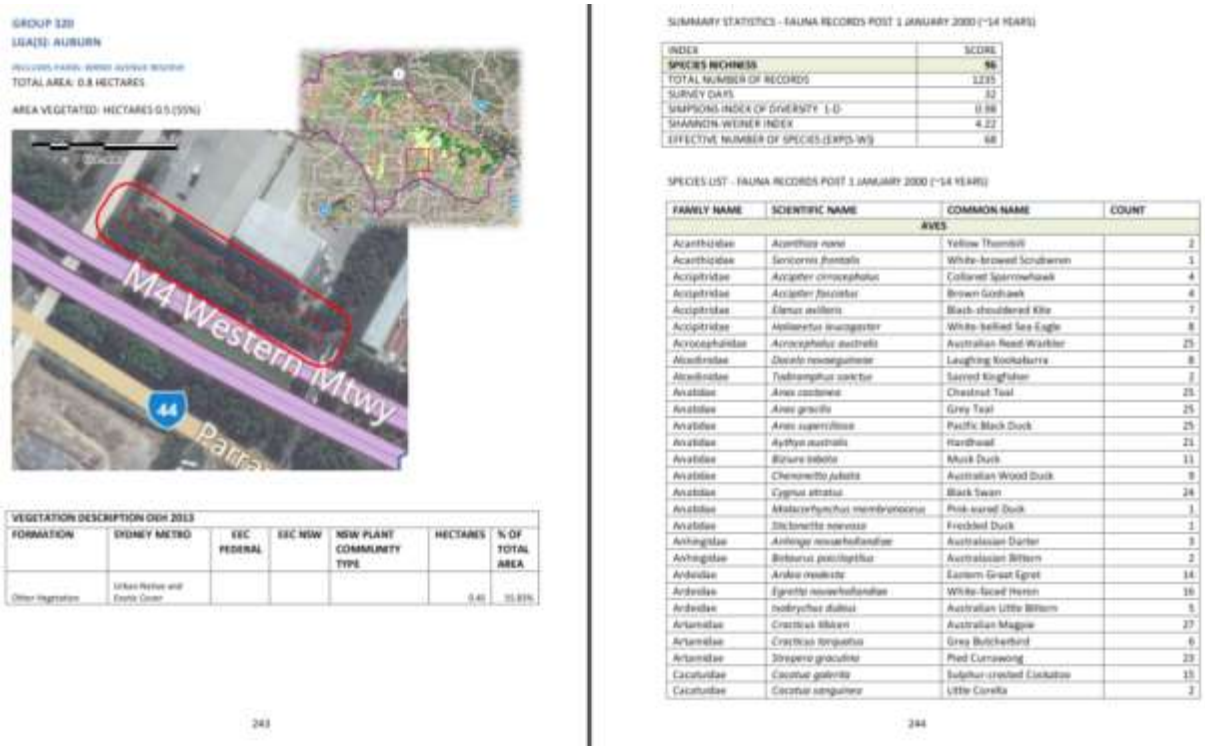


Figure 34 Excerpt from site summary data showing the current extent of the reserve, with high species diversity associated with the previous extent of the reserve

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).

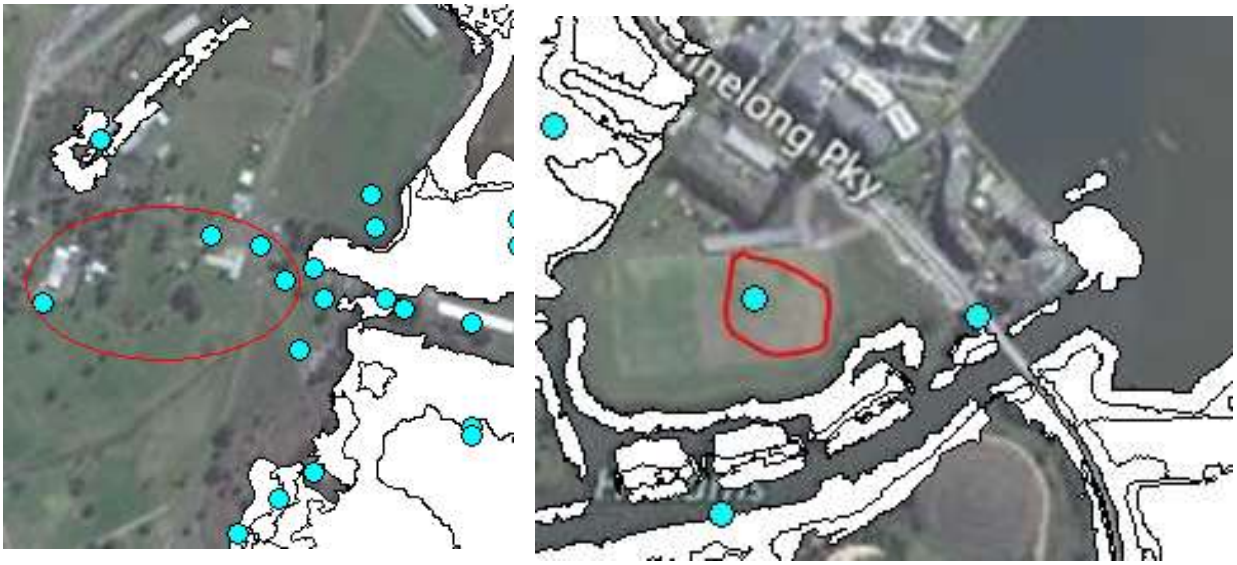


Figure 35 Blue dots indicate locations of fauna observations. Left: 165 records in unmapped veg (circled); Right: 690 records in unmapped veg (circled)

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).

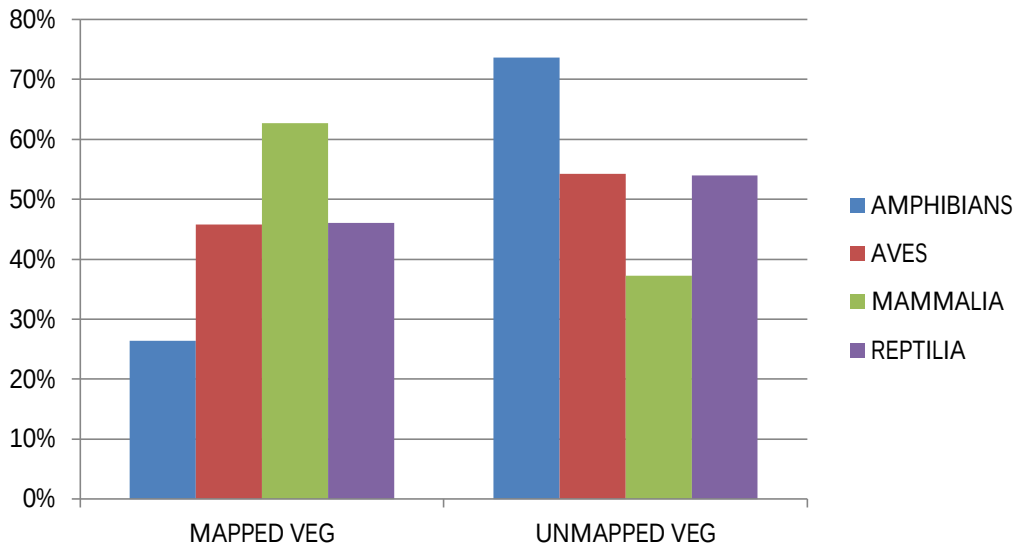


Figure 36 For amphibians, birds and reptiles, more species were recorded in unmapped vegetation areas

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.

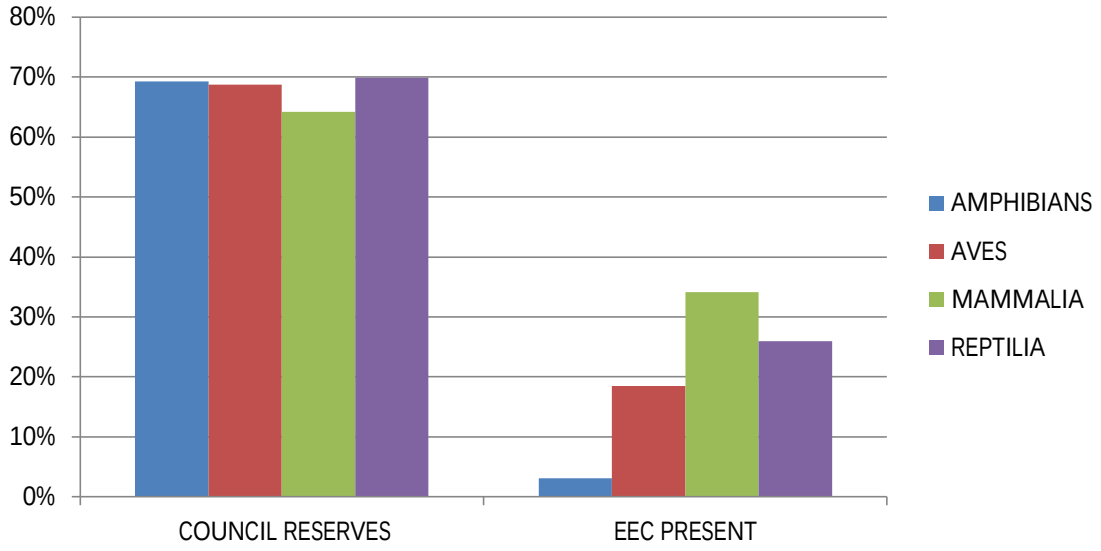


Figure 37 Number of fauna records reported for (left) council reserve areas, and (right) in Endangered Ecological Communities, expressed as a percentage of all observations

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).

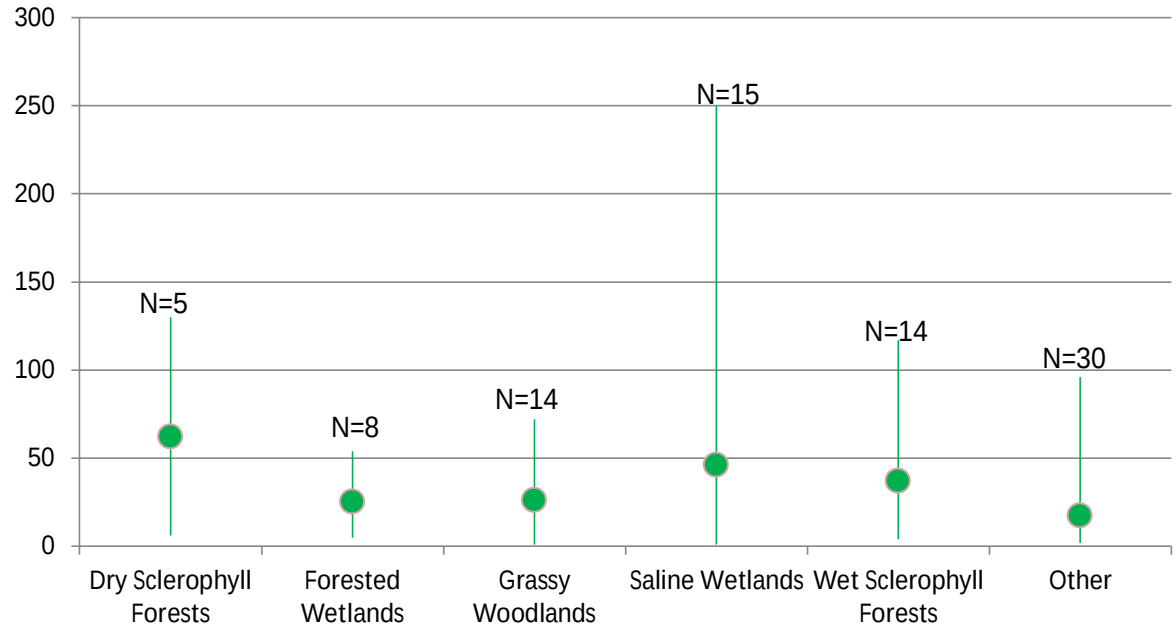


Figure 38 Mean number of species, with range of values, for reserves in each vegetation structure category (n= number of reserve groups in each structural category)

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.

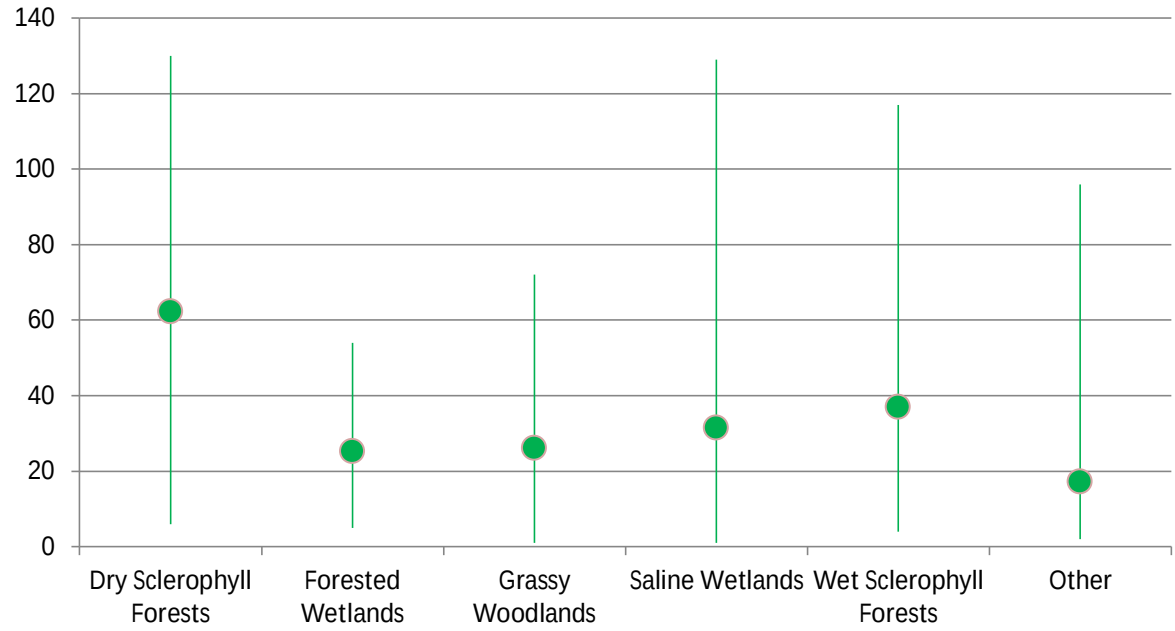


Figure 39 Mean number of species, with range of values, without SOPA site, for reserves in each vegetation structure category

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).

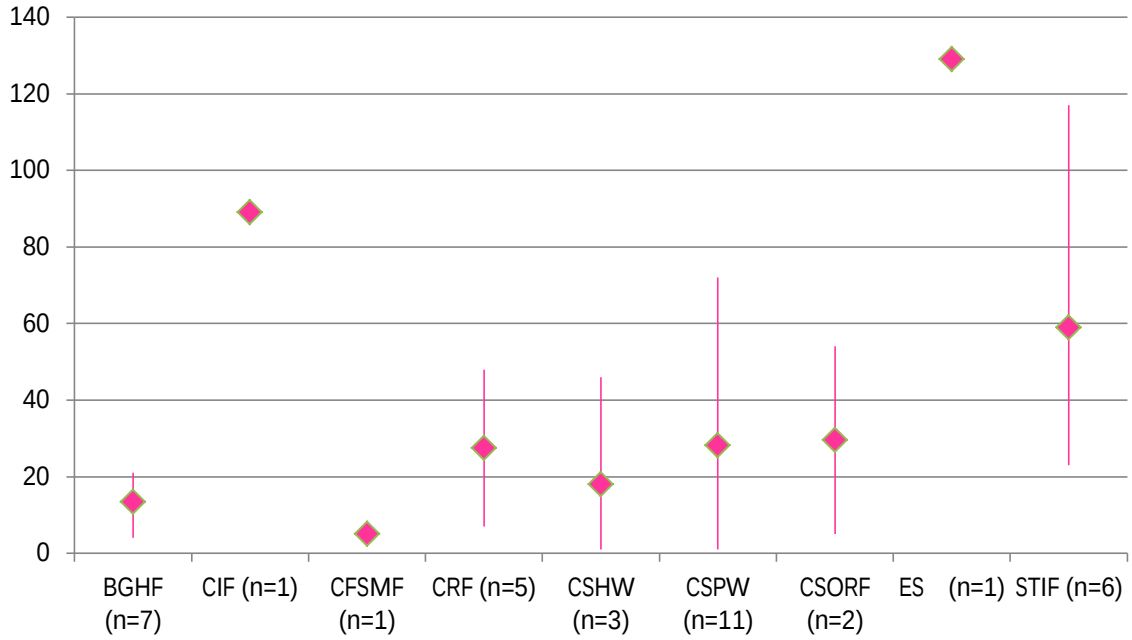


Figure 40 Mean number of species, with range of values, for reserves in each Endangered Ecological Community category (see Table 11 for an explanation of abbreviations; n = number of reserves/groups with that EEC present)

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).

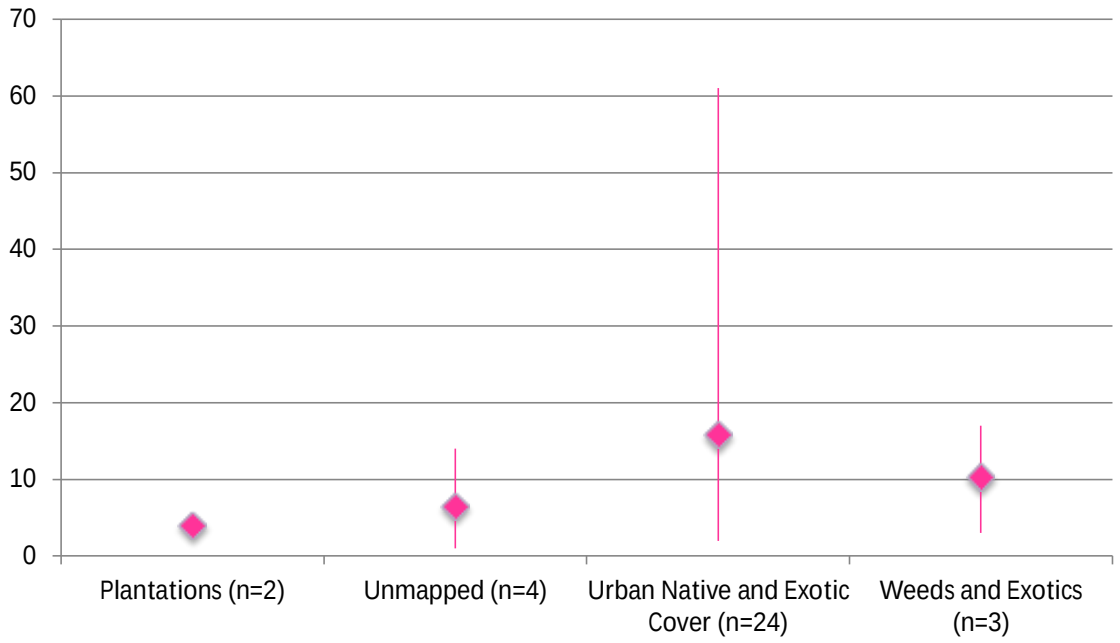


Figure 41 Species richness for reserves lacking mapped vegetation communities (n = number of reserves per category)

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