BIODIVERSITY SURVEYS, AUTUMN 2017

PREPARED FOR CITY OF RYDE BY APPLIED ECOLOGY P/L



INTRODUCTION

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OVERVIEW OF PRESENTATION

- Project background and context
- Survey methods
- Survey results
- Comparison with previous survey (Biosphere, 2007)
- Where to from here...

- BIODIVERSITY GROUPS:
 - Avian fauna
 - Mammals
 - Herpetofauna (reptiles & frogs)
 - Microbats
 - Invertebrates
 - Native flora
 - Introduced flora
 - Vegetation communities

PROJECT BACKGROUND

- Part of a series of flora and fauna studies for City of Ryde LGA
- Main aims are "standardised baseline information" about biodiversity of reserves
- Includes vertebrate and invertebrate fauna, endemic and introduced flora
- Stage 2 (2007) focused on [additional] water catchments in the LGA
- Information about species richness and abundance will inform management decisions for the reserves...



PROJECT CONTEXT

BIOSPHERE 2006

- Brush Farm Park, Darvall Park, Lambert Park, Field of Mars Reserve
- BIOSPHERE 2007
 - Terrys Creek reserves, Kittys Creek reserves, Buffalo Creek reserves, Memorial Park
- BIOSPHERE 2008
 - Other bushland reserves

- ANNE CLEMENTS & ASSOC 2016
 - Brush Farm Park, Darvall Park, Lambert Park, Field of Mars Reserve
 - APPLIED ECOLOGY 2017
 - Terrys Creek reserves, Kittys Creek reserves, Buffalo Creek reserves, Field of Mars additional quadrats



APPLIED ECOLOGY 2017

- Quadrat surveys (20m x 20m):
 - Timed searches for mammals, herps and invertebrates (2 per season, autumn and spring)
 - Detailed flora surveys including % cover classes (Braun-Blanquet)
- General surveys for reserves to develop species richness inventories

kilometers

Somerset Park

Pembroke Park - centre

Pembroke Park - Lerrys Creek

Pembroke Park - south

RESERVE AND QUADRAT LOCATIONS

Portius Park

Field of Mars - Strangers Creek

Burrows Park Pidding Park

SURVEY METHODOLOGIES

BASED ON METHODS DESCRIBED BY BIOSPHERE 2006 & 2007



DIURNAL BIRDS Listening, direct observation

MAJOR CORRIDOR NAME	20 MINUTE QUADRAT SESSIONS PER SEASON	ADDITIONAL 40 MINUTE SESSIONS PER SEASON	TOTAL MINUTES PER SEASON
Terrys Creek	8	8 <mark>(10)</mark>	480
Buffalo Creek	8	8 (9)	480
Kittys Creek	2	4 (5)	200

NOCTURNAL BIRDS

Spotlighting/listening Call playback

25W megaphone or speaker, smartphone, 50w spotlight

- Barking Owl (Ninox connivens)
- Eastern Barn Owl (Tyto delicatula),
- Masked Owl (Tyto novaehollandiae)
- Sooty Owl (Tyto tenebricosa tenebricosa)



OTHER METHODS - HAIRTUBES

MAMMAL SPECIFIC

	MINIMUM EFFORT
NAME	hairtube nights per season
Terrys Creek	200
Buffalo Creek	250
Kittys Creek	150







CAMERA TRAPPING

PRIMARILY MAMMALS

		MINIMUM EFFORT	TOTAL EFFORT
NAJOR NAME	CORRIDOR	REMOTE CAMERA NIGHTS PER SEASON	REMOTE CAMERA NIGHTS AUTUMN
Terrys Creek	c	21	GROUND 92; ARBOREAL 15
Buffalo Cree	ek	28	GROUND 108; ARBOREAL 44
Kittys Creek		14	GROUND 50; ARBOREAL 3





MICROBATS – SURVEY METHODS

MINIMUM ANABAT	ANABAT NIGHTS
NIGHTS PER SEASON	AUTUMN
7	14
7	20
7	16
	MINIMUM ANABAT NIGHTS PER SEASON 7 7 7 7

- Deployed at fixed locations in reserves for 5 to 7 nights per session (depending on weather)
- 2. Carried through the reserve during spotlighting surveys





"ANABAT" BAT DETECTOR



- Records high frequency sound wave cycles to produce accurate representation of bat calls
- Important information about shape, slope and characteristic frequency is used for identification
- Record and/or real time monitor





DOWNLOADING CALL DATA

1) Insect noise



3) Real time call



2) Chocolate Wattled Bat call + insect noise



4) Insect noise filtered out – ready for identification



SPOTLIGHTING

- MAMMALS
- HERPS
- NOCTURNAL BIRDS
- FISH
- INVERTS

MAJOR CORRIDOR	SPOTLIGHTING SESSIONS
NAME	PER SEASON
Terrys Creek	2
Buffalo Creek	2
Kittys Creek	2

Spotlighting was undertaken using 50-100 watt hand held spotlights as appropriate which were used to sweep surrounding vegetation in search of eye-shine or animal movements. Time was spent listening for calls at 10 minute intervals for 1 minute. Creeks, soaks, surface waters were inspected for fish and frogs.



QUAD 20 MINUTE TIME SEARCHES

Hand searching/listening

- Herps
- Inverts

OTHER SEARCHES

- Fish, tadpoles, macroinvertebrates
 20 minute dip netting + observations
- Inverts

ad hoc observations during other survey activities

Mammals +

searches for evidence – scats, diggings, nests etc.



2
2
2
2
3
1



INVERTEBRATE SURVEY METHODS

- Timed quadrat searches 2 x 20 minute search effort per season per quadrat
- We used a stratified approach:
 - Soil and leaf litter
 - Under bark on large trees
 - In foliage
 - Under rocks and logs
- Opportunistic searches, including:
 - Dip netting creeks
 - Searches of undergrowth for soft bodied organisms
 - Light trapping using night lights for two evenings

FLORA AND VEGETATION METHODS

SURVEY METHODOLOGY

- Random meander (Cropper, 1993) surveys to develop species inventory for native species and introduced species in Terrys, Kittys, and Buffalo Creeks reserves, and Field of Mars Reserve
- Ground truth vegetation mapping (OEH, 2013)
- Braun-Blanquet cover classes for species present in 9 quadrats, 20m x 20m (based on OEH's VIS survey methodology)
- Repeat surveys in autumn and spring 2017

- 20M X 20M QUADRATS AT:
 - Pembroke South
 - Pembroke Terrys Creek
 - Pembroke Centre
 - Somerset/Lucknow
 - Portius Park
 - Buffalo Park
 - Pidding Park
 - Strangers Creek (FoM)
 - Pimelea curviflora (FoM)



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utGuard

SAMPLE GEAR LOCATIONS



RESULTS FAUNA

BIRDS = 48 species

	TERRYS	TERRYS CREEK		BUFFALO CREEK		BUFFALO CREEK		KITTYS CREEK	
GROUP	2007	2017	2007	2017	2007	2017			
Day birds	56	33	30	40	28	19			
Night birds	2	2	1	3	0	1			

Survey period was too late to capture many seasonal migrants such as Dollarbirds, Leaden Flycatchers, some Honeyeaters



	TCR	BCR	KCR
Australian Brush-turkey	Х	Х	Х
Australian King-Parrot		Х	Х
Australian Magpie	Х	Х	Х
Australian Raven	Х	Х	
Australian Wood Duck		Х	
Black-faced Cuckoo-shrike	Х	Х	
Brown Gerygone	Х	Х	Х
Brown Goshawk		Х	
Brown Thornbill	Х	Х	
Common Myna			Х
Crested Pigeon	Х	Х	Х
Crimson Bosella		X	
Eastern Bosella	Х	X	X
Eastern Spinebill	X	X	
Eastern Whinhird	X	X	
Eastern Vellow Bobin	X	X	x
Golden Whistler	X	X	
Grev Eantail	X	X	
Grov Coshawk	X	~	
	X	Y	Y
	X	×	~
Little Corolla		~ 	
Little Colella	×	~	V
Masked Lapwing		~ 	~
Maskeu Lapwing		X	
Musk Lorikeet	×	X	V
Noisy Miner	×	~	~
Olive-backed Oriole	X	X	V
Pied Currawong	X	X	X
Powerful Owl	X	X	
Rainbow Lorikeet	X	X	X
Red Wattlebird	X	X	
Red-browed Finch	X	X	
Red-whiskered Bulbul	X	X	
Rufous Fantail			X
Satin Bowerbird		X	X
Silvereye	X	X	
Spotted Pardalote	Х	Х	
Spotted Turtle-Dove		Х	X
Sulphur-crested Cockatoo	X	Х	X
Superb Fairy-wren	X	Х	Х
Superb Lyrebird	X		
Tawny Frogmouth	Х	Х	Х
Welcome Swallow		Х	
White-browed Scrubwren	Х	Х	Х
White-faced Heron		Х	
White-throated Tree-creepe	Х	Х	
Willie Wagtail		Х	
Yellow Thornbill	X	X	
Yellow-faced Honeyeater	X		

Case study – Grey Shrike Thrush





	TERRYS	CREEK	BUFFA	LO CREEK	KITTYS	S CREEK	
GROUP	2007	2017	2007	2017	2007	2017	
Arboreal mammals	2	2	2	2	1	2	
Terrestrial mammals	3	7	2	6	1	3	
Bats (Micro & FF)	1	6	3	6	1	7	
TERRYS CREEK BUFFALO CREEK RESERVES KITTYS CREEK RE							
Red Fox	cameras, scat	, fur	саг	neras, scat, fu	r	cameras, sca	<mark>at,</mark> fu
Cat	observed	observed		cameras nil		nil	
Black Rat	camera, scats	, hairtube	саг	mera, observed		camera, scat	ts, h
Wild Dog	scat		Nil				





HERPETOFAUNA = 11 SPECIES

		TERRYS	CREEK	BUFFAL	O CREE	K	KITTYS	CREEK
GR	OUP	2007	2017	2007	201	7	2007	2017
Skii	nks	6	2	4		3	3	2
Geo	ckoes	1	1	0		1	0	0
Dra	igons	1	1	1		1	0	1
Tur	tles	0	0	0		0	0	0
Sna	kes	0	1	1		0	0	0
Fro	gs	3	4	2		3	2	2
						TCR	BCR	KCR
	Easter	n Water-skin	k	Eulamprus qu	oyii	Х	Х	
NKS	Dark-fle	ecked Garde	n Sunskink	Lampropholis	Lampropholis delicata		Х	Х
SKI	Pale-fle	ecked Garde	n Sunskink	Lampropholis	guichenoti	Х	Х	Х
	Three-	toed Skink		Saiphos equa	lis		Х	
GECKOES	Broad-	tailed gecko		Phyllurus plat	urus	х	x	
DIAGONS	Easteri	n Water Drag	jon	Intellagama le	esueurii	х	x	x
SNAKES	Red-be	ellied Black S	Snake	Pseudechis p	orphyriacus	х		
	Brown-	striped Frog		Limnodynaste	s peronii	Х	Х	
OGS	Common Eastern Froglet		Crinia signife	ra	Х	Х	X	
FR(Green	Stream Frog		Litoria phylloc	hroa	Х		X
	Peron's	s Tree Frog		Litoria peronii		Х		





BATS = 9 SPECIES

	TERRYS CREEK BUFFALO CREEK		BUFFALO CREEK		TERRYS CREEK BUFFAL		KITTYS	CREEK
GROUP	2007	2017	2007	2017	2007	2017		
Bats (Micro & FF)	1	6	3	6	1	7		

		TCR	BCR	KCR
Chocolate Wattled Bat	Chalinolobus morio			Х
Gould's wattled bat	Chalinolobus gouldi	Х	Х	X
Large Bent-winged Bat	Miniopterus orianae ocea	Х		X
Large-footed Myotis	Myotis macropus		Х	
Large Forest Bat	Vespadelus darlingtoni			Х
Long-eared Bat	Nyctophilus sp.	Х	Х	Х
Ride's free-tailed Bat	Mormopterus ridei	Х	Х	X
White-striped Free-tailed	Austronomus australis	Х	Х	Х
Grey-headed Fly-fox	Pteropus poliocephalus	Х	Х	

Note: an additional species, Vespadelus vulturnus - the Little Forest Bat, was recorded in FOM earlier this year by PhD student Joanna Haddock from Sydney University

Large Bentwing bats (Miniopteris orianae oceanensis)



- Live in caves, mines, bridges, tunnels, buildings
- Come together in spring to a maternity cave to raise their young
- Disperse into smaller groups, then
- Come together to "overwinter" in other caves
- Colonies can have up to 150,000 individuals
- Hunt in forested areas, catch moths and flying insects above the tree tops
- Listed as VULNERABLE under NSW Threatened Species Conservation Act



Figure 2 Known (solid) and potential (broken) movements of the Eastern Bent-wing Bat between maternity roosts and over wintering roosts.



Widespread through NSW and Australia 02

Roost under bark in trees, birds nests, ceilings, under floors D3 Forage for moths, beetles and flies

canopy

below the tree

Form small maternity colonies in springsummer

04

05

Often hibernate in winter

Gould's Wattled bat (Chalinolobus gouldii)



Little Forest bat (Vespadelus vulturnus)

- One of the smallest Australian microbats
- Lives in woodlands and forests as well as in rural, semi-rural and some urban areas
- Roosts in tree hollows and buildings in small colonies
- Still fairly common but affected by habitat loss (clearing, especially trees with hollows)
- Eats bugs, beeetles, flies, ants, moths, cockroaches, spiders, grasshoppers and lacewings.





MICROBATS - DID YOU KNOW?

- Range from 3.5 grams for Little Forest bat to 44 grams for Yellow-bellied Sheathtailed bat
- A single microbat can catch 1,200 mosquitos and small insects in just 1 hour!
- Drink water while flying
- Flap wings at 12 to 16 beats per second
- Heart rate 1200 beats per minute when flying, down to 200 bpm when resting
- Have good eyesight, but can fly in total darkness





Microbats are fascinating animals; it is the community who are "blind to bats"





INVERTEBRATE SURVEYS – TERRYS CREEK





ORDER	COMMON NAME	FAMILY	SPECIES
Araneae	Spiders	4	5
Acari	Ticks, mites	1	1
Collembolae	Springtails	1	2
Coleoptera	Beetles	2	2
Blatodea	Cockroaches	3	3
Diptera	True flies,	2	2
	mosquitos		
Hemiptera	Bugs	1	1
Hymenoptera	Ants, wasps, bees	4	10
Orthoptera	Crickets	2	2
Lepidoptera	Butterflies, moths	3	3
Isoptera	Termites	3	2
Megadrilacea	Earthworms	1	1
Isopoda	Woodlice, slaters		3
Diplopoda	Millipedes	2	2
Chilopoda	Centipedes	1	1
Nematodea	Roundworms	1	1
		34	41







INVERTEBRATE SURVEYS – KITTYS CREEK









ORDER	COMMON NAME	FAMILIES	SPECIES	
Araneae	Spiders	5	5	
Collembola	Springtails	1	1	
Blatodea	Cockroaches	1	1	
Coleoptera	Beetles	4	6	
Chilopoda	Centipedes	1	1	
Diplopoda	Millipedes	1	1	
Diptera	True flies, mosquitos	2	2	
Hemiptera	Bugs	2	2	
Hymenoptera	Ants, wasps, bees	3	5	
Isopoda	Woodlice, slaters	1	3	
Isoptera	Termites	1	1	
Lepidoptera	Butterflies, moths	1	1	
Odonata	Dragonflies,	1	1	
	damselflies			
Pseudoscorpionida	Pseudoscorpions	1	1	
		25	31	

INVERTEBRATE SURVEYS – BUFFALO CREEK









ORDER		FAMILIES	SPECIES
Diplopoda	Millipedes	2	2
Araneae	Spiders	4	9
Acari	Ticks, mites	2	2
Coleoptera	Beetles	1	1
Diptera	True flies, mosquitos	3	4
Ephemeroptera	Mayflies	1	1
Gastropoda	Snails	2	2
Hemiptera	Bugs	7	7
Hymenoptera	Ants, wasps, bees	3	4
Isopoda	Woodlice, slaters	1	1
Isoptera	Termites	1	1
Lepidoptera	Butterflies, moths	4	4
Megadrilacea	Earthworms	2	3
Odonata	Dragonflies,	5	6
	damselflies		
		38	47

FISH SURVEY RESULTS

		TCR	BCR	KCR
Gambusia holbrookii	Mosquito Fish	Х	Х	
Gobiomorphus australis	Striped Gudgeon	Х		
Anguilla australis	Short-finned Eel	Х		



Female (large) and male (small) Gambusia (NSW DPI), a Class 3 noxious species in the Sydney basin



The Striped Gudgeon is mostly found in slowflowing, often muddy water streams where it feeds on Gambusia and aquatic insects



The Short-finned Eel migrates to the Coral Sea every year to spawn, before returning to live in southeastern Australian rivers, lakes and dams



SEARCHES FOR EVIDENCE



FLORA SURVEYS: TERRYS CREEK RESERVES

- Totals of flora species recorded in Terrys Creek Reserves in Autumn 2017
 - Total native species = 210
 - Total introduced species
 = 137 (includes weeds and non-local natives – usually planted)







FLORA SURVEYS: KITTYS CREEK RESERVES

- Totals of flora species recorded in Kittys Creek Reserves in Autumn 2017
 - Total native species = 156
 - Total introduced species
 = 67 (includes weeds and non-local natives – usually planted)





KITTYS CREEK RESERVES



FLORA SURVEYS: BUFFALO CREEK RESERVES

- Totals of flora species recorded in Buffalo Creek Reserves in Autumn 2017
 - Total native species = 166
 - Total introduced species = 132 (includes weeds and non-local natives – usually planted)





BUFFALO CREEK RESERVES



FLORA SPECIES RICHNESS: AUTUMN 2017

FIELD OF MARS RESERVE:

- Totals of flora species recorded in Field of Mars Reserve in Autumn 2017
 - Total native species = 229
 - Total introduced species = 80 (includes weeds and non-local natives – usually planted)



COMPARISON OF SPECIES RICHNESS



Case Study: Macadamia tetraphylla (Rough-shelled Queensland Nut)

- Listed as VULNERABLE in NSW under Threatened Species Conservation Act
- Also ROTAP 2VC-
- Recorded in Portius Park, Burrows Park, Laurel Park, also recently recorded in City of Parramatta LGA in several bushland reserves
- Recent topic of discussion on NSW Native Plant Identification (Facebook)
 - 700km from documented range!
 - Escapee or climate change?
 - Still covered by TSC Act in Sydney?





Photos taken in Portius Park, Autumn 2017

COMPARISON OF SPECIES RICHNESS – 2007:2017





FACTORS CONTRIBUTING TO VARIATIONS IN SPECIES RICHNESS

- 2007 species lists include pooled data from spring and autumn surveys
- Some species are difficult to find except in spring, especially orchids
- Some species are difficult to identify except when flowering and/or fruiting – usually in spring (or summer)
- Changes in nomenclature?
- Mistakes in identification?





The Native Vegetation of the Sydney Metropolitan Area

Volume 2: Vegetation Community Profiles

Version 2.0



VEGETATION – GROUND TRUTHING

- Vegetation communities are defined by characteristic species, described in Vol.2
- Confirmation of community identity occurs when enough native species are present in a 0.04 hectare sample site, and enough of these are considered diagnostic for the community, for example:
- Sydney Turpentine Ironbark Forest, listed as an Endangered Ecological Community under NSW TSC Act and Critically Endangered Community under EPBC Act.
- A 0.04ha site should have 20+ diagnostic species, provided the total number of native species in the site is 35 or more.



VEGETATION COMMUNITIES

VEGETATION COMMUNITY LEGEND

COASTAL ENRICHED SANDSTONE SHELTERED FOREST COASTAL SANDSTONE SHELTERED PEPPERMINT-APPLE FOREST HORNSBY ENRICHED SANDSTONE EXPOSED WOODLAND ESTUARINE SWAMP OAK FOREST ESTUARINE REEDLAND COASTAL SANDSTONE GALLERY RAINFOREST ESTUARINE MANGROVE FOREST ESTUARINE SALTMARSH BLUE GUM HIGH FOREST COASTAL ENRICHED SANDSTONE MOIST FOREST COASTAL SHALE-SANDSTONE FOREST SYDNEY TURPENTINE-IRONBARK FOREST WEEDS/STREET PLANTINGS/GARDENS



VEGETATION COMMUNITIES – IVANHOE RESERVE

VEGETATION COMMUNITY LEGEND

COASTAL ENRICHED SANDSTONE SHELTERED FOREST COASTAL SANDSTONE SHELTERED PEPPERMINT-APPLE FOREST HORNSBY ENRICHED SANDSTONE EXPOSED WOODLAND WEEDS/STREET PLANTINGS/GARDENS

IVANHOE RESERVE VEGETATION

- 79 SPECIES OF NATIVE FLORA
- 49 SPECIES OF INTRODUCED FLORA
- 3 MAPPED VEGETATION COMMUNITIES ADJOINING OR NEARBY...

- DESCRIPTION OF CESDF (OEH, 2013)
- Common on upper slopes and dry gullies of Sydney urban areas.
- Tall open eucalypt forest with an understorey of dry sclerophyll shrubs with ferns and forbs amongst the ground cover.

VEGETATION COMMUNITY (as	Coastal Sandstone	Hornsby Enriched	Coastal Enriched	Typical Species
2013)	Guily roles	Exposed Woodland	Dry Forest	Angophora costata Corymbia gummifera, Eucalyptus piperita, Eucalyptus pilufaris, Eucalyptus umbra, Syncarpia glomulifera
MAP COLOUR	BLUE	ORANGE	RED	Allocasuarina littoralis, Banksia semata. Elaeocarpus reticulatus,
DIAGNOSTIC SPECIES	23	10	20	Pittosporum undulatum, Ceratopetalum gummillerum
MINIMUM REQUIRED	at least 32	at least 21	at least 21	Acacia ulicifolia, Leptospermum trinervium, Persoonia levis, Acacia susveniens, Acacia terminalis i omatia sitalipila, Dodonnea trinuetra
MINIMUM NATIVE	more than	more than	more than	Banksia spihulosa
SPECIES	45	38	38	Dianella caerulea, Entolasia stricta, Lomandra longifolia, Pteridium
QUALIFIES?	NO	NO	NEARLY!	esculentum, Xanthosia pilosa

Smilax glyciphylla, Billardiera scandens, Cassytha pubescens



VEGETATION COMMUNITY – JIM WALSH PARK

Typical Species

Eucalyptus saligna, Eucalyptus pilularis, Eucalyptus paniculata, Syncarpia glomulitera, Angophora costata

Pittosporum undulatum, Syncarpia glomulifera, Elaeocarpus reficulatus, Acacla impiexa.

Polyscias sambucifolia, Pittosporum undulatum, Pittosporum revolutum, Breynia oblongifolia, Leucopogon juniperinus, Ozothamnus diosmifolius, Notelaea longifolia, Clerodendrum tomentosum, Maytenus silvestris, Trema tomentosa

Entolasia marginata, Pseuderanthemum variabile, Oplismenus aemulus, Lomandra longifolia, Microlaena stipoides, Dianella caerulea, Dichondra repens, Poa atfinis, Oplismenus imbeciliis, Sigesbeckia orientalis, Adiantum aethiopicum, Pratla purpurascens

Eustrephus latifolius, Pandorea pandorana, Clematis glycinoides, Tylophora barbata, Cayratla clematidea, Glycine microphylla



VEGETATION COMMUNITY (as described by OEH, 2013)	Blue Gum High Forest CEEC
DIAGNOSTIC SPECIES	7
MINIMUM	at least 22
DIAGNOSTIC	
REQUIRED	
MINIMUM NATIVE	more than
SPECIES	34
QUALIFIES?	NO









LAST BUT NOT LEAST, FUNGI - CUP FUNGI







OTHER FUNGI GROUPS









WHAT'S MY NAME?



WHERE TO FROM HERE...

- Spring surveys to repeat autumn 2017 (and 2007) surveys
- Modify invertebrate surveys to target threatened snails?
- Intensive threatened flora searches for Pimelea curviflora, Epacris purpurascens in Field of Mars Reserve, and Melaleuca deanei in Somerset Park
- Targeted surveys for gliders and swamp wallabies in Field of Mars Reserve
- FUNGIMAP?