

WEST BELCONNEN PROJECT NSW LAND FLORA AND FAUNA STUDIES



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Photograph 1 (cover): Looking north across the ACT - NSW border and along the Murrumbidgee River corridor.

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Attached Map

Map of the subject land showing summary of investigations

Attached Reports

- 1. Butler (2009)*
- 2. Osborne and Wong (2013)*
- 3. Rowell (2013)*
- 4. Kevin Mills & Associates (2013).*

1 INTRODUCTION

The following summary contains the results of surveys and assessments undertaken in the NSW section of the land adjoining The Riverview Group controlled land in the ACT. The results presented here have been obtained from the reports prepared by several consultants, as follows:

Will Osborne – Pink-tailed Worm Lizard *Aprasia parapulchella*

Alison Rowell - Golden Sun Moth *Synemon plana*

Kevin Mills, general surveys, vegetation and fauna.

The attached reports document the findings of the above investigations and those reports should be read in conjunction with this report.

2 THE SUBJECT LAND

The subject land is that part of the West Belconnen area that is being investigated by The Riverview Group and that occurs in NSW; see **Figure 1**. This includes land owned by Riverview and other properties where the company has agreements with the land owners.

The NSW component of the lands being investigated cover four properties at the junction of the Murrumbidgee River and Ginninderra Creek, as shown in **Figure 1**. The land in question is north of the ACT-NSW border and between Ginninderra Creek and the Murrumbidgee River. The total area of investigation at West Belconnen extends south of the NSW-ACT border to Stockdrill Drive west of Holt; the area is approximately 595 hectares.

The following report sections address the key issues associated with or potentially associated with the subject land.

In addition to the work for The Riverview Group, KMA (2009a) carried out a flora and fauna survey of the land in the far north-western corner of the subject land; those results are also relevant here and used where appropriate.

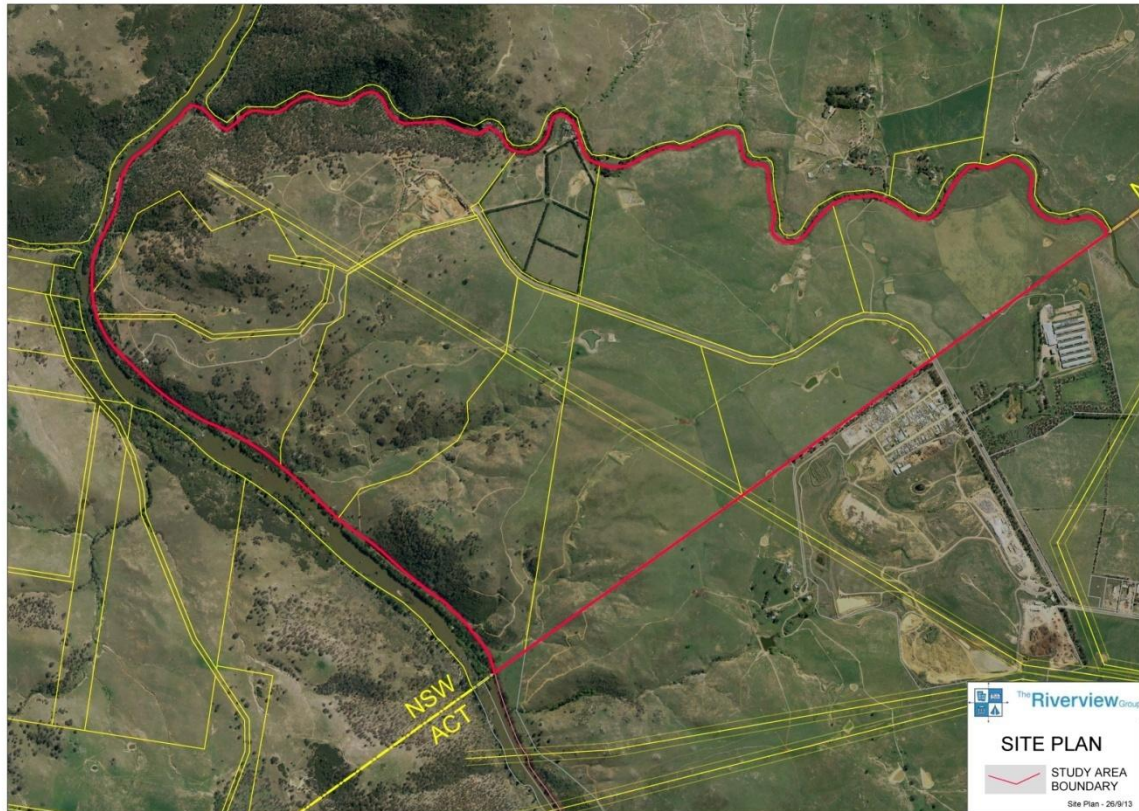


Figure 1. The Subject Land.

3 BIRD SURVEYS

Aim: To search for significant bird species, particularly species listed on the schedules in the TSC Act 1995 and assess the importance of the subject land for such species.

Since 2008, the subject land, as part of the wider Riverview land in the ACT, has been specifically surveyed for birds on 30 occasions; not all of these surveys include the NSW land, however the results provide a guide to the species found in the locality. During visits to the area in early to mid-2013, incidental observations were recorded and several area searches completed.

The project area has been specifically surveyed for birds on 31 occasions since 2008. The results provide a fairly comprehensive guide to the bird species found in the locality. During these surveys 75 native bird species and nine species of introduced bird were recorded. In all, 50.1 hours of targeted surveys was achieved, involving 3,650 individual bird observations. Most of the 31 surveys were carried out in the spring-summer seasons

in 2008 and 2012/13; see **Table 1**. The total number of bird species recorded in the area during all surveys since 2008 is 104, including the nine introduced species.

The amount of survey effort is considered adequate to identify the species that are present in the locality; see species accumulation curve below. A summary of the targeted bird surveys, including date, time, survey areas, method and results are summarised in **Appendix 1**. A complete list of the animal species recorded in the project area is provided in **Appendix 2**, within which those species observed in the ACT and NSW sections of the project area are identified separately.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008											2	8
2012									1	11	1	
2013	1	4						1	2			
All	1	4	0	0	0	0	0	1	3	11	3	8

The following figures pertain to each season for all years:

	No. of surveys	Percentage
Spring (Sep Oct Nov)	17	55%
Summer (Dec Jan Feb)	13	42%
Autumn (Mar Apr May)	0	-
Winter (Jun Jul Aug)	1	3%
Total	31	100%

Additional information on the fauna of the locality can be found in the report by KMA (2013) for the adjoining ACT land, which is attached.

4 SUPERB PARROT SURVEYS

Aim: To determine if the Superb Parrot occurs in the study area and particularly if it is breeding in the area.

The Superb Parrot is a key local threatened species just over the border in the ACT. The species was seen many times to the southwest of Belconnen in the 2012/13 season, near to its breeding area in the 2011/12 season (Davey 2012). Out of a total of 30 bird surveys, this species was observed four times (17%). An observation was made early in the 2013/14 season, when three birds were observed flying over Stockdrill Drive heading south on 2 September 2013. No Superb Parrots were observed in NSW and the lack of old woodland trees there probably exclude them from being there, except perhaps as passage birds. No

evidence of breeding was found during the bird surveys or the tree hollow surveys in the ACT.

5 OTHER SIGNIFICANT SPECIES

Aim: To identify significant animal species in the area, that is those listed under the NSW Threatened Species Conservation Act 1995.

Those species of threatened animal previously recorded in the locality are listed in **Table 1**.

Table 1
Threatened fauna species known to have occurred in the locality

Common name	Taxonomic Name	TSC Act ¹	EPBC Act ¹
Mammals			
Koala	<i>Phascolarctos cinereus</i>	V	-
Spotted-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	V	E
Birds			
Brown Treecreeper	<i>Climacteris picumnus</i>	V	-
Diamond Firetail	<i>Stagonopleura guttata</i>	V	-
Flame Robin	<i>Petroica phoenicea</i>	V	-
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	-
Hooded Robin	<i>Melanodryas cucullata</i>	V	-
Little Eagle	<i>Hieraaetus morphnoides</i>	V	-
Painted Honeyeater	<i>Grantiella picta</i>	V	-
Regent Honeyeater	<i>Xanthomyza phrygia</i>	E	E
Rosenberg Monitor	<i>Varanus rosenbergi</i>	V	-
Scarlet Robin	<i>Petroica boodang</i>	V	-
Speckled Warbler	<i>Chthonicola sagittata</i>	V	-
Spotted Harrier	<i>Circus assimilis</i>	V	-
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	-
White-browed Woodswallow	<i>Artamus superciliosus</i>	V	-
Reptiles			
Pink-tailed Worm Lizard	<i>Aprasia parapulchella</i>	V	V
Rosenberg's Goanna	<i>Varanus rosenbergi</i>	V	-
Frogs			
Green and Golden Bell Frog	<i>Litoria aurea</i>	E	V
Invertebrates			
Golden Sun Moth	<i>Synonymem plana</i>	E	CE

1. V = vulnerable, E = endangered; CE – critically endangered. - = not listed.

A few listed bird species were located in the wider West Belconnen study area over the 2008-2013 study period; see **Table 2**. These records were nearly all associated with treed areas, including the exotic trees around the homestead in the ACT, to the west of the old waste disposal area. The treed areas in NSW are associated with the steep slopes above the

Murrumbidgee River and Ginninderra Creek; the more level land forming the bulk of the NSW lands is almost totally treeless.

Table 2
Significant bird species recorded in the wider study area

Species/Date	Status/Notes	Location
Flame Robin	vulnerable	
25.06.09	several birds	in southwest of area
03.07.13	1 male	0679950 6102778 (NSW)
08.08.13	3 birds	0680853 6100149
Gang-gang Cockatoo	vulnerable	
06.05.13	1 bird	0678629 6101833 (NSW)
Scarlet Robin	vulnerable	
2009	1 male	NSW land
17.10.12	1 male	0679885 6101211
29.04.13	1 male	0680859 6098158
03.07.13	1 male	0679100 6101346
09.09.13	1 male	0677720 6102572
Specked Warbler	vulnerable	
28.11.08	1 bird	0680592 6098557
Spotted Harrier	vulnerable	
12.02.13	1 bird	0680591 6100315 (ACT)
20.02.13	1 bird	0678976 6102483 (NSW)
29.04.13	1 bird	0679740 6101063 (ACT)
Large Bent-wing Bat	vulnerable	
10.12.08	ANABAT	0686628 6100103
10.12.08	ANABAT	0681067 6099765
14.12.08	ANABAT	0680961 6099434
Rosenberg's Monitor	vulnerable	
"15 years ago"	W. Osborne, pers. comm.	Ginninderra Falls area

Other than *Aprasia parapulchella*, which is dealt with separately below, the species to be recorded in the NSW part of the wider study area were the Flame Robin, Scarlet Robin and Spotted Harrier. There is little doubt that some of the above species do occur in the NSW part of the area, but are unlikely away from the well treed gorges of the river than the creek. Alison Rowell, an expert on the Golden Sun Moth, has inspected the area and concluded that there is no grassland habitat present that is likely to contain this moth; most of the paddocks are heavily pasture improved. The closest population is near the suburb of Macgregor.

6 **PINK-TAILED WORM LIZARD**

Aim: To identify, assess and map the area of habitat for the Pink-tailed Worm Lizard.

The Pink-tailed Worm Lizard *Aprasia parapulchella* was found on the land in the far northwest by KMA (2009a). At around the same time, the species was located in the southwest near the ACT border by KMA (2009b). Most recently, Will Osborne and David Wong have undertaken a wide ranging study of the land along the Murrumbidgee River, including the land in the current subject land (Osborne & Wong 2013).

The Murrumbidgee River corridor has been found to contain an extensive area of *Aprasia* habitat and a large population of the lizard; this area is therefore of national conservation importance for this lizard. The extent of habitat in NSW is lower than in the ACT, although records of the lizard are almost contiguous along the river corridor.

The habitat of the lizard was determined in the field in May 2013 by recording GPS points along the boundary; this is more accurate than the method of aerial photographic interpretation. This map has been proved on the ground by Dr Osborne and by officers from the NSW OE&H. The resultant boundary is provided on the attached map.

7 **SURVEY OF HOLLOW-BEARING TREES**

Aim: To locate and assess hollow-bearing trees in those areas of potential development.

The surveys, carried out in October-November 2012, involved visiting most of the trees on the gentler topography on the subject land; in only 15 trees were located on the higher land that had hollows. Each tree, dead or alive, was inspected for hollows. If hollows were present, the following information was recorded.

- a unique number;
- tree species or dead tree;
- dch, trunk diameter at chest height, a measure of tree size;
- location as given by GPS instrument;
- the number of obvious hollows present;
- observed use by animals, native and exotic.

A summary of hollow-bearing trees recorded on the subject land is provided below, in **Table 3**; most trees recorded in the wider study were in the ACT and are not included here (see KMA 2013).

Table 3
Hollow-bearing trees

Tree Species	Hollows	GPS	dch (cm)
169 <i>Eucalyptus macrorhyncha</i>	7	0678913 6102566	97
170 <i>Eucalyptus melliodora</i>	4	0678485 6102704	166
171 <i>Eucalyptus macrorhyncha</i>	3	0678452 6102644	82
172 <i>Eucalyptus bridgesiana</i>	4	0678311 6102323	160
173 <i>Eucalyptus macrorhyncha</i>	4	0678350 6102300	72
174 <i>Eucalyptus macrorhyncha</i>	1	0678306 6102307	88
175 <i>Eucalyptus blakelyi</i>	4	0677662 6103051	157
176 <i>Eucalyptus macrorhyncha</i>	4	0677539 6102833	84
177 <i>Eucalyptus blakelyi</i>	2	0677517 6102925	130
178 dead tree	5	0677372 6102927	51
179 dead tree	4	0677371 6102922	71
180 <i>Eucalyptus blakelyi</i>	2	0678371 6102818	84
181 <i>Eucalyptus rossii</i>	1	0678395 6102749	110
182 <i>Eucalyptus blakelyi</i>	1	0678368 6102733	58
183 <i>Eucalyptus bridgesiana</i>	4	0678218 6102704	142

8 SIGNIFICANT PLANT SPECIES

Aim: To search for and assess the potential for occurrence of plant species listed under the NSW Threatened Species Conservation Act 1995.

The following species of listed plant are known to occur in the locality:

Pomaderris pallida

Lepidium ginninderrense

Swainsona sericea

None of the above three species have been found in the more level land likely to be developed, i.e. the area above the river gorge and east of the *Aprasia* habitat boundary.

9 VEGETATION SURVEYS

Aim: To carry out vegetation surveys in the NSW section of the subject land to identify significant features.

The endangered community Yellow Box – Blakely's Red Gum Woodland once occurred across most of the more level parts of the subject land. Today, there is almost none of this woodland vegetation remaining, even as native grassland. The area where the community once occurred is almost treeless and except for a few small patches near the edge of the river valley, no areas of Box-Gum Woodland grassland were found. A few small stands of

regrowth *Eucalyptus blakelyi* occur in the far northwest corner of the area, adjacent to the woodland above the gorge. These patches are within the delineated conservation reserve.

10 GINNINDERRA CREEK

Aim: To carry out surveys and assessments of the Ginninderra Creek corridor to identify significant features.

The far northern boundary of the study area in NSW follows the course of Ginninderra Creek; the majority of the creek is about 13 kilometres in length and was surveyed on 24 June 2009 and in February 2013 with the primary aim of identifying and mapping the key habitats associated with the creek corridor. In addition to this mapping work, all plant and animal species encountered were recorded, the numbers of wetland fauna recorded and photographs taken. The survey was undertaken with an aerial photograph in hand, onto which were marked relevant features.

The following key habitats were identified along Ginninderra Creek and marked onto the aerial photograph in the field:

- riparian habitat (stream channel and immediate low-lying flats);
- rock outcrops on adjacent slopes and flats;
- stands of River Oak *Casuarina cunninghamiana*.

The riparian habitats consist of alternating ponds and sand/gravel deposits, with occasional rock bars. The flora is a mix of native wetland plants and weeds. Reeds and sedges occur mainly around the ponds, particularly Common Reed *Phragmites australis* and River Club-rush *Schoenoplectus validus*.

Except for the River Oak discussed below, the trees and shrubs along the creek are almost entirely exotic, and include Willows *Salix* spp., Sweet Briar *Rosa rubiginosa*, Hawthorn *Crataegus monogyna* and, very rarely, the native Red-leaved Wattle *Acacia rubida*. The banks of the creek are almost entirely covered in exotic grassland, particularly the pasture grass *Phalaris* *Phalaris* sp. and various herbaceous weeds. In a very few locations, there are scattered native grasses such as Kangaroo Grass *Themeda australis*, Spear-grasses *Austrostipa* spp. and River Tussock *Poa labillardieri*.

The most extensive rock outcrops are found in the western half of the creek length surveyed. There are also extensive rock outcrops on the northern side of the creek, but these were not investigated as they are outside the subject land. The grassland associated with the rock outcrops is almost entirely exotic grassland, and in the west it is improved pasture. Outside the fenced paddock in the far western corner, there is a patch of Kangaroo Grass *Themeda australis* amongst the rocks, and a few other natives are present. Elsewhere,

Spear-grasses *Austrostipa* spp. are scattered and seldom account for more than about 20% of the ground cover.

In the far western part of the creek corridor, along a rocky section of creek, there is a stand of River Oak *Casuarina cunninghamiana*. There are large dead trees, caused by an unknown event, but saplings are present, the living trees are healthy and most of the trees are not ancient specimens.

Wetland Species

During the course of the survey in June 2009, wetland plants and animals observed along Ginninderra Creek were specifically recorded; the results are presented in **Table 4**. The number of species is generally depauperate when compared to a natural watercourse because of the highly modified character of the creek corridor.

Table 4
Wetland Flora and Fauna along Ginninderra Creek

Plant Species

Trees

<i>Casuarina cunninghamiana</i>	River Oak
* <i>Salix babylonica</i>	Weeping Willow
* <i>Salix</i> sp.	Willow

Other Species

<i>Juncus</i> sp.	Rush
<i>Ludwigia peploides</i>	Water Primrose
<i>Persicaria decipiens</i>	Slender Knotweed
<i>Phragmites australis</i>	Common Reed
<i>Schoenoplectus validus</i>	River Club-rush
<i>Typha orientalis</i>	Cumbungi
* <i>Cyperus eragrostis</i>	Umbrella Sedge
* <i>Rumex crispus</i>	Curled Dock

Fauna Species

	No.
Australian Wood Duck	24
Black-fronted Dotterel	1
Grey Teal	3
Pacific Black Duck	20
Smooth Toadlet	1
Water Rat	1
*Common Carp	2

* Introduced species.

Management of the Riparian Corridor

A report prepared by Butler (2009) sets out a management strategy for the Ginninderra Creek riparian corridor; this report is attached.

11 SPECIES RECORDED

As noted above, all plant and animal species recorded in the NSW section of the study area were recorded separately. **Appendix 1** lists the plant species for the subject land. **Appendix 2** provides a list of the vertebrate animals recorded.

The gorge of the Murrumbidgee River and lower Ginninderra Creek were not surveyed in detail as they are outside the potential development areas; i.e. the more gentle topography.

12 SUMMARY OF FINDINGS

The NSW land is largely cleared of its original woodland and has been pasture improved, at least across the land above the river and creek gorges. The relatively level land in the area of most development potential is almost devoid of trees and supports an exotic grassland. The areas of conservation importance are in the river and creek gorge and their upper edges. The following are the matters of most conservation importance.

1. The Murrumbidgee River and Ginninderra Creek corridors, containing the watercourses and adjacent riparian vegetation and habitats.
2. The woodland in the gorge and in some places on the edge of the more level land. The woodland is generally not a listed endangered community; tiny areas of regrowth Box-Gum Woodland occur in a few places on the edge of the gorge woodland. The woodland provides animal habitat, is part of a regional habitat corridor along the river and is habitat for several listed bird species. The extent of the lizard habitat was determined on the ground by a team of reptile/environmental specialist; see attached map.
3. The rocky habitat above the river and on the edge of the level land in the far west of the subject land is part of an extensive area of similar habitat for the listed Pink-tailed Worm Lizard extending into the ACT to the south. This habitat is of national importance for this lizard because of the large population of lizards found here.
4. Three threatened species were recorded, all of which inhabit open farming land in winter when they were recorded; these are the Flame Robin, Scarlet Robin and Spotted Harrier.
5. The following species, recorded in the locality, appear not to be present in the areas most likely to be able to be developed: Superb Parrot and Golden Sun Moth.
6. Only a handful of trees with hollows occur in the paddocks across the more level land in the far west. These trees have some value to native hollow-using animals,

but are few in number (13 live trees) and quite scattered and isolated across the landscape. Most are stringybarks where hollows have been created by wind thrown branches. Many more hollow-bearing trees are present in the gorges of the river and creek.

7. Development in the area should take into account the following matters:

- Retention and appropriate setbacks to the *Aprasia* habitat areas;
 - Retention of the woodland, with appropriate setbacks;
 - Retention of hollow-bearing trees where possible;
 - Designation of a habitat corridor along Ginninderra Creek;
 - Consideration of water quality in the river and the creek;
 - Revegetation along Ginninderra Creek with local vegetation, following the management plan prepared by Butler (2009).
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APPENDIX 1

LIST OF PLANT SPECIES FOR THE NSW SUBJECT LAND

N – Present in NSW section of wider study area.

Pteridophyta(Ferns)

Aspleniaceae

<i>Asplenium flabellifolium</i>	Necklace Fern	N
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Azollaceae

<i>Azolla filiculoides</i>	Pacific Azolla	N
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Sinopteridaceae

<i>Cheilanthes austrotenuifolia</i>	Rock Fern	N
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<i>Cheilanthes distans</i>	Bristly Cloak Fern	N
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<i>Cheilanthes sieberi</i>	Mulga Fern	N
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Gymnospermae (Conifers)

Cupressaceae

<i>Callitris endlicheri</i>	Black Cypress Pine	N
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Pinaceae

* <i>Pinus radiata</i>	Radiata Pine	N
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Angiospermae (Flowering Plants)

Amaranthaceae

* <i>Amaranthus</i> sp.	Amaranth	N
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Apiaceae

<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	N
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* <i>Foeniculum vulgare</i>	Fennel	N
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Asteraceae

<i>Bracteantha bracteata</i>	Paper Daisy	N
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<i>Cassinia longifolia</i>	Shiny Cassinia	N
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<i>Cassinia quinquefaria</i>	Rosemary Cassinia	N
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<i>Chrysocephalum apiculatum</i>	Common Everlasting	N
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<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	N
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<i>Cotula australis</i>	Common Cortula	N
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<i>Cymbonotus</i> sp.	Cymbonotus	N
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<i>Stuartina muelleri</i>	Spoon Cudweed	N
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<i>Triptilodiscus pygmaeus</i>	Austral Sunray	N
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<i>Vittadinia cuneata</i>	Fuzzweed	N
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<i>Vittadinia muelleri</i>	Narrow-leaf New Holland Daisy	N
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* <i>Arctotheca calendula</i>	Capeweed	N
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* <i>Aster subulatus</i>	Bushy Starwort	N
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* <i>Carthamus lanatus</i>	Saffron Thistle	N
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<i>*Chondrilla juncea</i>	Skeleton Weed	N
<i>*Cirsium vulgare</i>	Spear Thistle	N
<i>*Conyza</i> sp.	Fleabane	N
<i>*Gamochaeta</i> spp.	Cudweed	N
<i>*Hypochaeris radicata</i>	Flatweed	N
<i>*Onopordium acanthium</i>	Scotch Thistle	N
<i>*Silybum marianum</i>	Variegated Thistle	N
<i>*Tolpis umbellata</i>	Yellow Hawkweed	N
Boraginaceae		
<i>*Echium plantagineum</i>	Paterson's Curse	N
<i>*Echium vulgare</i>	Viper's Bugliss	N
<i>*Heliotropium amplexicaule</i>	Blue Heliotrope	N
Brassicaceae		
<i>*Capsella bursa-pastoris</i>	Shepherd's Purse	N
<i>*Hirschfeldia incana</i>	Buchan Weed	N
<i>*Lepidium</i> sp.	Peppercress	N
<i>*Rorippa nasturtium-aquaticum</i>	Watercress	N
Campanulaceae		
<i>Wahlenbergia luteola</i>	Yellowish Bluebell	N
Caryophyllaceae		
<i>Stellaria pungens</i>	Prickly Starwort	N
<i>*Cerastium glomeratum</i>	Mouse-ear Chickweed	N
<i>*Moenchia erecta</i>	Erect Chickweed	N
<i>*Petrorhagia nanteuillii</i>	Proliferous Pink	N
Casuarinaceae		
<i>Casuarina cunninghamiana</i>	River Oak	N
Chenopodiaceae		
<i>Chenopodium pumilio</i>	Clammy Goosefoot	N
<i>Einadia nutans</i>	Nodding Saltbush	N
<i>*Chenopodium album</i>	Fat Hen	N
Colchicaceae		
<i>Wurmbea dioica</i>	Early Nancy	N
Convolvulaceae		
<i>Convolvulus erubescens</i>	Australian Bindweed	N
<i>Dichondra repens</i>	Kidney Weed	N
Crassulaceae		
<i>Crassula sieberiana</i>	Stonecrop	N

Cyperaceae

<i>Eleocharis acuta</i>	Common Spikerush	N
<i>Schoenoplectus validus</i>	River Club-rush	N
* <i>Cyperus eragrostis</i>	Umbrella Sedge	N

Dilleniaceae

<i>Hibbertia obtusifolia</i>	Grey Guinea Flower	N
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Droseraceae

<i>Drosera peltata</i>	Pale Sundew	N
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Epacridaceae

<i>Brachyloma daphnoides</i>	Daphne Heath	N
<i>Melichrus urceolatus</i>	Urn Heath	N

Euphorbiaceae

<i>Chamaesyce drummondii</i>	Caustic Creeper	N
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Fabaceae**Faboideae (subfamily)**

<i>Desmodium varians</i>	Slender Tick-trefoil	N
<i>Glycine tabacina</i>	Vanilla Glycine	N
* <i>Trifolium arvense</i>	Haresfoot Clover	N
* <i>Trifolium augustifolium</i>	Narrow-leaf Clover	N
* <i>Trifolium subterraneum</i>	Subterranean Clover	N

Mimosoideae (subfamily)

<i>Acacia dealbata</i>	Silver Wattle	N
<i>Acacia rubida</i>	Red-leaved Wattle	N

Gentianaceae

* <i>Centaurium erythraea</i>	Common Centaury	N
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Geraniaceae

<i>Geranium solanderi</i>	Native Geranium	N
* <i>Erodium botrys</i>	Long Stork's-bill	N
* <i>Erodium cicutarium</i>	Common Stork's-bill	N

Hypericaceae

* <i>Hypericum perforatum</i>	St John's Wort	N
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Juncaceae

<i>Juncus usitatus</i>	Common Rush	N
<i>Luzula densiflora</i>	Dense Wood-rush	N

Lamiaceae

<i>Scutellaria humilis</i>	Dwarf Skullcap	
* <i>Salvia verbenaca</i>	Wild Sage	N

Lomandraceae

<i>Lomandra filiformis</i>	Wattle Mat-rush	N
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	N

Loranthaceae

<i>Amyema cabbagei</i>	Mistletoe	N
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Lythraceae

<i>Lythrum hyssopifolia</i>	Hyssop Loosestrife	N
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Malvaceae

* <i>Malva neglecta</i>	Dwarf Mallow	N
* <i>Modiola caroliniana</i>	Red-flowered Mallow	N

Myrtaceae

<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	N
<i>Eucalyptus bridgesiana</i>	Apple Box	N
<i>Eucalyptus dives</i>	Broad-leaved Peppermint	N
<i>Eucalyptus goniacalyx</i>	Bundy	N
<i>Eucalyptus macrorhyncha</i>	Red Stringybark	N
<i>Eucalyptus melliodora</i>	Yellow Box	N
<i>Eucalyptus pauciflora</i>	Snow Gum	N
<i>Eucalyptus rossii</i>	Inland Scribbly Gum	N
<i>Kunzea ericoides</i>	Burgan	N
<i>Leptospermum brevipes</i>	Slender Tea Tree	N

Onagraceae

* <i>Ludwigia peploides</i>	Water Primrose	N
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Oxalidaceae

<i>Oxalis perennans</i>	Grassland Wood Sorrel	N
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Papaveraceae

* <i>Eschshoizia californica</i>	Californian Poppy	N
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Pittosporaceae

<i>Bursaria lasiophylla</i>	Blackthorn	N
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Plantaginaceae

<i>Plantago varia</i>	Variable Plantain	N
* <i>Plantago lanceolata</i>	Ribbed Plantain	N

Poaceae

<i>Aristida ramosa</i>	Three-awned Speargrass	N
<i>Austrodanthonia racemosa</i>	Wallaby Grass	N
<i>Austrodanthonia carphoides</i>	Short Wallaby Grass	N
<i>Austrostipa bigeniculata</i>	Tall Speargrass	N

<i>Austrostipa scabra</i>	Corkscrew	N
<i>Bothriochloa macra</i>	Red-leg Grass	N
<i>Chloris truncata</i>	Windmill Grass	N
<i>Cynodon dactylon</i>	Couch Grass	N
<i>Eragrostis</i> sp.	Love-grass	N
<i>Microlaena stipoides</i>	Weeping Grass	N
<i>Panicum effusum</i>	Hairy Panic	N
<i>Phragmites australis</i>	Common Reed	N
<i>Poa labillardieri</i>	River Tussock	N
<i>Poa sieberiana</i>	Poa Tussock	N
<i>Themeda australis</i>	Kangaroo Grass	N
* <i>Avena</i> sp.	Oats	N
* <i>Bromus cartharticus</i>	Prairie Grass	N
* <i>Bromus diandrus</i>	Great Brome	N
* <i>Bromus hordeaceus</i>	Soft Brome	N
* <i>Eleusine tristachya</i>	Goosegrass	N
* <i>Eragrostis curvula</i>	African Lovegrass	N
* <i>Holcus lanatus</i>	Yorkshire Fog	N
* <i>Lolium</i> sp.	Ryegrass	N
* <i>Paspalum dilatatum</i>	Paspalum	N
* <i>Phalaris aquatica</i>	Phalaris	N
Polygonaceae		
<i>Persicaria decipiens</i>	Slender Knotweed	N
<i>Persicaria hydropiper</i>	Water Pepper	N
<i>Rumex brownii</i>	Swamp Dock	N
* <i>Acetosella vulgaris</i>	Sheep Sorrel	N
* <i>Polygonum aviculare</i>	Wireweed	
* <i>Rumex crispis</i>	Curled Dock	N
Portulacaceae		
<i>Portulaca oleracea</i>	Purslane	N
Proteaceae		
<i>Grevillea juniperina</i> subsp. <i>fortis</i>	Prickly Grevillea	N
Ranunculaceae		
<i>Clematis microphylla</i>	Small-leaved Clematis	N
Rosaceae		
<i>Acaena ovina</i>	Sheep's Burr	N
<i>Rubus parvifolius</i>	Native Raspberry	N
* <i>Crataegus monogyna</i>	Hawthorn	N
* <i>Rosa rubiginosa</i>	Sweet Briar	N
* <i>Rubus fruticosus</i> sp. agg.	Black berry	N

Rubiaceae

<i>Asperula conferta</i>	Common Woodruff	N
* <i>Sherardia arvensis</i>	Field Madder	N

Salicaceae

* <i>Salix babylonica</i>	Weeping Willow	N
* <i>Salix</i> sp.	Willow	N

Scrophulariaceae

* <i>Linaria pelisserana</i>	Pelisser's Toadflax	N
* <i>Verbascum thapsus</i>	Great Mullein	N

Solanaceae

* <i>Datura stromonium</i>	Common Thornapple	N
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Sterculiaceae

<i>Brachychiton populneus</i>	Kurrajong	N
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Typhaceae

<i>Typha orientalis</i>	Cumbungi	N
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Verbenaceae

* <i>Verbena bonariensis</i>	Purpletop	N
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APPENDIX 2

LIST OF ANIMAL SPECIES FOR THE SUBJECT LAND AND THE LOCALITY

1. Recorded in the NSW Wildlife Atlas within 5 km of the subject land (W).
2. Recorded in the subject land in 2008-2013: A - ACT; N - NSW.
3. ANABAT: DE - definite identification; PR - probable identification, PO - possible identification.
Introduced species are indicated by an asterisk (*).

MAMMAL SPECIES

FAMILY		NSW Wildlife	This
Species		Atlas ¹	Study ²
ORNITHORHYNCHIDAE			
Platypus	<i>Ornithorhynchus anatinus</i>	W	
TACHYGLOSSIDAE			
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	W	A,N
DASYURIDAE			
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	W	
PHASCOLARCTIDAE			
Koala	<i>Phascolarctos cinereus</i>	W	
VOMBATIDAE			
Common Wombat	<i>Vombatus ursinus</i>	W	A,N
PHALANGERIDAE			
Common Brushtail Possum	<i>Trichosurus vulpecula</i>		A,N
MACROPODIDAE			
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	W	A,N
Common Wallaroo	<i>Macropus robustus</i>	W	A,N
Red-necked Wallaby	<i>Macropus rufogriseus</i>	W	
Swamp Wallaby	<i>Wallabia bicolor</i>	W	
MOLOSSIDAE			
Eastern Freetail Bat	<i>Mormopterus species</i>		(PR) ³
White-striped Freetail Bat	<i>Nyctinomus australis</i>		(DE)
VESPERTILIONIDAE			
Eastern Bentwing Bat	<i>Miniopterus schreibersii</i>		(DE)
Long-eared Bat species	<i>Nyctophilus sp.</i>		(PR)
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>		(DE)
Chocolate Wattled Bat	<i>Chalinolobus morio</i>		(DE)
Large Forest Bat	<i>Vespadelus darlingtoni</i>		(PR)
Southern Forest Bat	<i>Vespadelus regulus</i>		(PR)
Little Forest Bat	<i>Vespadelus vulturnus</i>		(DE)

CANIDAE			
Fox*	<i>Vulpes vulpes</i>	W	A,N
LEPORIDAE			
Rabbit*	<i>Oryctolagus cuniculus</i>		A,N
Brown Hare*	<i>Lepus capensis</i>		A,N
MURIDAE			
Water Rat	<i>Hydromys chrysogaster</i>		N
BOVIDAE			
Cattle*	<i>Bos taurus</i>		A,N
CERVIDAE			
Fallow Deer*	<i>Dama dama</i>	W	A,N

BIRD SPECIES

FAMILY		COG	This
Species		(1990) ¹	Study ²

PHASIANIDAE

Stubble Quail	<i>Coturnix pectoralis</i>	W	A
Brown Quail	<i>Coturnix ypsilophora</i>	W	

ANATIDAE

Musk Duck	<i>Biziura lobata</i>	W	
Australian Wood Duck	<i>Chenonetta jubata</i>	W	A,N
Pacific Black Duck	<i>Anas superciliosa</i>	W	A,N
Grey Teal	<i>Anas gracilis</i>	W	A,N
Chestnut Teal	<i>Anas castanea</i>		N
Hardhead	<i>Aythya australis</i>	W	A,N

PODICIPEDIDAE

Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	W	A,N
Hoary-headed Grebe	<i>Poliocephalus poliocephalus</i>	W	N

PHALACROCORACIDAE

Little Pied Cormorant	<i>Microcarbo melanoleucos</i>	W	A,N
Great Cormorant	<i>Phalacrocorax carbo</i>	W	A,N

PELECANIDAE

Australian Pelican	<i>Pelecanus conspicillatus</i>	W	
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ARDEIDAE

White-faced Heron	<i>Egretta novaehollandiae</i>	W	A
White-necked Heron	<i>Ardea pacifica</i>	W	N

Eastern Great Egret	<i>Ardea modesta</i>	W	
Cattle Egret	<i>Ardea ibis</i>	W	
Nankeen Night Heron	<i>Nycticorax caledonicus</i>	W	
THRESKIORNITHIDAE			
Australian White Ibis	<i>Threskiornis molucca</i>	W	A
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	W	A
ACCIPITRIDAE			
Black Kite	<i>Milvus migrans</i>		A,N
Black-shouldered Kite	<i>Elanus axillaris</i>	W	A
Whistling Kite	<i>Haliastur sphenurus</i>	W	
Spotted Harrier	<i>Circus assimilis</i>		A,N
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	W	A
Variable Goshawk	<i>Accipiter hiogaster</i>	W	A
Grey Goshawk	<i>Accipiter novaehollandiae</i>	W	
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>		A
Wedge-tailed Eagle	<i>Aquila audax</i>	W	A,N
Little Eagle	<i>Hieraaetus morphnoides</i>	W	
FALCONIDAE			
Brown Falcon	<i>Falco berigora</i>	W	A
Australian Hobby	<i>Falco longipennis</i>	W	A
Peregrine Falcon	<i>Falco peregrinus</i>	W	A
Nankeen Kestrel	<i>Falco cenchroides</i>	W	A,N
RALLIDAE			
Purple Swamphen	<i>Porphyrio porphyrio</i>		A
Dusky Moorhen	<i>Gallinula tenebrosa</i>	W	A
Eurasian Coot	<i>Fulica atra</i>	W	A,N
SCOLOPACIDAE			
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	W	
CHARADRIIDAE			
Black-fronted Dotterel	<i>Elseyaornis melanops</i>	W	A,N
Red-kneed Dotterel	<i>Erythrogonys cinctus</i>	W	N
Banded Lapwing	<i>Vanellus tricolor</i>	W	
Masked Lapwing	<i>Vanellus miles</i>	W	A,N
COLUMBIDAE			
Rock Dove*	<i>Columba livia</i>		A
Common Bronzewing	<i>Phaps chalcoptera</i>	W	
Crested Pigeon	<i>Ocyphaps lophotes</i>	W	A,N
Diamond Dove	<i>Geopelia cuneata</i>	W	
Peaceful Dove	<i>Geopelia striata</i>	W	

CACATUIDAE

Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	W	A
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	W	N
Galah	<i>Eolophus roseicapillus</i>	W	A,N
Little Corella*	<i>Cacatua sanguinea</i>		A
Long-billed Corella*	<i>Cacatua tenuirostris</i>		A
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	W	A,N

PSITTACIDAE

Australian King-Parrot	<i>Alisterus scapularis</i>	W	A,N
Superb Parrot	<i>Polytelis swainsonii</i>		A
Crimson Rosella	<i>Platycercus elegans</i>	W	A,N
Eastern Rosella	<i>Platycercus eximius</i>	W	A,N
Red-rumped Parrot	<i>Psephotus haematonotus</i>	W	A,N

CUCULIDAE

Pallid Cuckoo	<i>Cacomantis pallidus</i>	W	A
Brush Cuckoo	<i>Cacomantis variolosus</i>	W	
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	W	N
Horsfield's Bronze-Cuckoo	<i>Chalcites basalis</i>	W	
Shining Bronze-Cuckoo	<i>Chalcites lucidus</i>	W	
Common Koel	<i>Eudynamys scolopacea</i>		A

STRIGIDAE

Southern Boobook	<i>Ninox novaeseelandiae</i>	W	A
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PODARGIDAE

Tawny Frogmouth	<i>Podargus strigoides</i>		A
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APODIDAE

White-throated Needletail	<i>Hirundapus caudacutus</i>	W	
Fork-tailed Swift	<i>Apus pacificus</i>	W	

HALCYONIDAE

Laughing Kookaburra	<i>Dacelo novaeguineae</i>	W	A,N
Sacred Kingfisher	<i>Todiramphus sanctus</i>	W	A

MEROPIIDAE

Rainbow Bee-eater	<i>Merops ornatus</i>	W	A
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CORACIIDAE

Dollarbird	<i>Eurystomus orientalis</i>	W	A
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MENURIDAE

Superb Lyrebird	<i>Menura novaehollandiae</i>	W	
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CLIMACTERIDAE

White-throated Treecreeper	<i>Cormobates leucophaea</i>	W	A,N
Brown Treecreeper	<i>Climacteris picumnus</i>	W	

MALURIDAE

Superb Fairy-wren	<i>Malurus cyaneus</i>	W	A,N
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PARDALOTIDAE

Spotted Pardalote	<i>Pardalotus punctatus</i>	W	
Striated Pardalote	<i>Pardalotus striatus</i>	W	A,N
White-browed Scrubwren	<i>Sericornis frontalis</i>	W	A,N
Speckled Warbler	<i>Chthonicola sagittata</i>	W	A
Weebill	<i>Smicrornis brevirostris</i>	W	A,N
Western Gerygone	<i>Gerygone fusca</i>	W	
White-throated Gerygone	<i>Gerygone albogularis</i>	W	A,N
Brown Thornbill	<i>Acanthiza pusilla</i>	W	A,N
Buff-rumped Thornbill	<i>Acanthiza reguloides</i>	W	A,N
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	W	A,N
Yellow Thornbill	<i>Acanthiza nana</i>	W	
Striated Thornbill	<i>Acanthiza lineata</i>	W	A
Southern Whiteface	<i>Aphelocephala leucopsis</i>	W	N

MELIPHAGIDAE

Red Wattlebird	<i>Anthochaera carunculata</i>	W	A,N
Noisy Friarbird	<i>Philemon corniculatus</i>	W	A,N
Noisy Miner	<i>Manorina melanocephala</i>	W	A
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	W	A,N
White-eared Honeyeater	<i>Lichenostomus leucotis</i>	W	
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	W	
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	W	A
White-naped Honeyeater	<i>Melithreptus lunatus</i>	W	
Crescent Honeyeater	<i>Phylidonyris pyrrhoptera</i>	W	
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>	W	
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	W	A
White-fronted Chat	<i>Epthianura albifrons</i>	W	
Orange Chat	<i>Epthianura aurifrons</i>		A

PETROICIDAE

Scarlet Robin	<i>Petroica boodang</i>	W	A,N
Flame Robin	<i>Petroica phoenicea</i>	W	A,N

CINCLOSOMATIDAE

Eastern Whipbird	<i>Psophodes olivaceus</i>	W	
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NEOSITTIDAE

Varied Sittella	<i>Daphoenositta chrysoptera</i>	W	
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PACHYCEPHALIDAE

Rufous Whistler	<i>Pachycephala rufiventris</i>		A,N
Grey Shrike-thrush	<i>Colluricincla harmonica</i>		A,N

DICRURIDAE

Leaden Flycatcher	<i>Myiagra rubecula</i>		N
Magpie-lark	<i>Grallina cyanoleuca</i>	W	A,N
Rufous Fantail	<i>Rhipidura rufifrons</i>	W	A
Grey Fantail	<i>Rhipidura albiscapa</i>	W	A,N
Willie Wagtail	<i>Rhipidura leucophrys</i>	W	A,N

CAMPEPHAGIDAE

Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	W	A,N
White-winged Triller	<i>Lalage sueurii</i>	W	A

ORIOLOIDAE

Olive-backed Oriole	<i>Oriolus sagittatus</i>	W	
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ARTAMIDAE

White-browed Woodswallow	<i>Artamus superciliosus</i>	W	
Dusky Woodswallow	<i>Artamus cyanopterus</i>	W	A
Grey Butcherbird	<i>Cracticus torquatus</i>	W	
Australian Magpie	<i>Cracticus tibicen</i>	W	A,N
Pied Currawong	<i>Strepera graculina</i>	W	A,N
Grey Currawong	<i>Strepera versicolor</i>	W	

CORVIDAE

Australian Raven	<i>Corvus coronoides</i>	W	A,N
Little Raven	<i>Corvus mellori</i>	W	

CORCORACIDAE

White-winged Chough	<i>Corcorax melanorhamphos</i>	W	A,N
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PTILONORHYNCHIDAE

Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>	W	
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ALAUDIDAE

Eurasian Skylark*	<i>Alauda arvensis</i>	W	A
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MOTACILLIDAE

Australasian Pipit	<i>Anthus novaeseelandiae</i>	W	A,N
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PASSERIDAE

House Sparrow*	<i>Passer domesticus</i>	W	A,N
Double-barred Finch	<i>Taeniopygia bichenovii</i>	W	A,N
Red-browed Finch	<i>Neochmia temporalis</i>	W	A,N
Diamond Firetail	<i>Stagonopleura guttata</i>	W	

FRINGILLIDAE

European Goldfinch*	<i>Carduelis carduelis</i>	W	A
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DICAEIDAE

Mistletoebird	<i>Dicaeum hirundinaceum</i>	W	
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HIRUNDINIDAE

Welcome Swallow	<i>Hirundo neoxena</i>	W	A,N
Tree Martin	<i>Petrochelidon nigricans</i>	W	A,N
Fairy Martin	<i>Petrochelidon ariel</i>	W	A

SYLVIIDAE

Australian Reed-Warbler	<i>Acrocephalus australis</i>	W	A
Rufous Songlark	<i>Cincloramphus mathewsi</i>	W	N
Brown Songlark	<i>Cincloramphus cruralis</i>	W	A
Golden-headed Cisticola	<i>Cisticola exilis</i>	W	

ZOSTEROPIDAE

Silvereye	<i>Zosterops lateralis</i>	W	A,N
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MUSCICAPIDAE

Common Blackbird*	<i>Turdus merula</i>	W	A,N
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STURNIDAE

Common Starling*	<i>Sturnus vulgaris</i>	W	A,N
Common Myna*	<i>Sturnus tristis</i>	W	A,N

FAMILY

Species	NSW Wildlife ¹ Atlas	This Study ²
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FROGS**MYOBATRACHIDAE**

Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>		A,N
Smooth Toadlet	<i>Uperoleia laevisgata</i>		A,N
Common Eastern Froglet	<i>Crinia signifera</i>		A,N

HYLIDAE

Green and Golden Bell Frog	<i>Litoria aurea</i>	W	
Peron's Tree Frog	<i>Litoria peronii</i>		A

REPTILES

CHELIDAE

Eastern Long-necked Tortoise	<i>Chelodina longicollis</i>	A
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SCINCIDAE

Striped Skink	<i>Ctenotus robustus</i>	A,N
Rainbow Skink	<i>Carlia tetradactyla</i>	A
Copper-tailed Skink	<i>Ctenotus taeniolatus</i>	A,N
Boulenger's Skink	<i>Morethia boulengeri</i>	A,N
Delicate Skink	<i>Lampropholis delicata</i>	N
Red-throated Skink	<i>Pseudemoia platynota</i>	A
Eastern Three-lined Skink	<i>Bassiana duperreyi</i>	N
Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>	A

PYGOPODIDAE

Olive Legless Lizard	<i>Delma inornata</i>	A
Pink-tailed Worm Lizard	<i>Aprasia parapulchella</i>	A,N

AGAMIDAE

Eastern Water Dragon	<i>Physignathus lesueurii</i>	N
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ELAPIDAE

Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>	N
Eastern Brown Snake	<i>Pseudonaja textilis</i>	A,N

FISH

CYPRINIDAE

Common Carp*	<i>Cyprinus carpio</i>	N
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POECILIIDAE

Mosquitofish/Gambusia*	<i>Gambusia holbrooki</i>	N
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APPENDIX 3**SUMMARY OF TARGETED BIRD SURVEYS**

No.	Date	Time (mins)	No. Species (No. Birds)	Area Surveyed¹
1	28.11.08	07.30 – 08.00 (30 mins)	22 (66)	north of Strathnairn
2	28.11.08	08.00 – 08.30 (30 mins)	17 (36)	south of Strathnairn
3	02.12.08	07.40 – 08.10 (30 mins)	10 (56)	planted treed area
4	02.12.08	07.05 – 07.35 (30 mins)	19 (45)	red gum regrowth area
5	02.12.08	06.30 – 07.00 (30 mins)	16 (40)	woodland gully area
6	11.12.08	07.09 -07.53 (44 mins)	22 (93)	woodland gully area
7	11.12.08	08.00 – 08.21 (21 mins)	21 (47)	southeast woodland
8	11.12.08	08.22 – 08.44 (22 mins)	21 (60)	southeast woodland
9	15.12.08	07.28 – 07.48 (20 mins)	17 (49)	woodland gully
10	15.12.08	07.52 – 08.27 (35 mins)	25 (67)	woodland gully
11	10.09.12	10.00 – 12.30 (50 mins)	26 (-)	property, incidental
12	17.10.12	16.20 – 17.30 (70 mins)	28 (140)	land south of farm buildings
13	18.10.12	08.00 – 09.45 (105 mins)	28 (141)	land south of farm buildings
14	18.10.12	11.30 – 15.30 (240 mins)	26 (142)	land south of farm buildings
15	23.10.12	11.30 – 15.30 (240 mins)	22 (98)	land south of farm buildings
16	24.10.12	07.30 – 08.40 (70 mins)	30 (126)	land south of farm buildings
17	24.10.12	14.30 – 15.30 (60 mins)	19 (117)	NSW land, incidental
18	24.10.12	15.30 – 16.45 (75 mins)	25 (210)	southern woodland
19	25.10.12	10.20 – 11.20 (60 mins)	25 (113)	southern woodland
20	25.10.12	12.30 – 13.30 (60 mins)	21 (47)	northern land
21	30.10.12	06.40 – 07.45 (75 mins)	28 (123)	southern woodland
22	31.10.12	15.45 – 17.45 (120 mins)	39 (244)	land south of farm buildings
23	28.11.12	06.50 -07.50 (60 mins)	30 (199)	land south of farm buildings
24	22.01.13	12.15 – 14.00 (105 mins)	32 (226)	whole site, particularly NSW
25	02.02.13	15.30 – 17.30 (120 mins)	29 (192)	ACT land
26	20.02.13	14.30 – 15.30 (60 mins)	23 (182)	NSW land
27	20.02.13	15.45 – 17.00 (75 mins)	32 (255)	ACT land
28	21.02.13	07.40 – 11.00 (200 mins)	32 (128)	NSW land
29	11.08.13	15.45-17.15 (90 mins)	30 (215)	ACT and NSW land
30	02.09.13	08.30 – 14.30 (420 mins)	25 (127)	ACT land
31	09.09.13	08.00 – 15.00 (420 mins)	31(66)	NSW land
Total		50.1 hours	75(3650)	-

1. Area or transect searches unless otherwise stated.