

# Fauna Inventory Report: Western Grassland Reserve – Wilsons Block

Melbourne Strategic Assessment



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#### **Front cover photo**

Brown Goshawk (*Accipiter fasciatus*) taken by remote camera.

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## Terms and abbreviations

BCS	Biodiversity Conservation Strategy for Melbourne's Growth Areas (DEPI, 2013)
CaLP Act	The Victorian Catchment and Land Protection Act 1994
DEPI	The former Victorian Department of Environment and Primary Industries (now DELWP)
DELWP	The Victorian Department of Environment, Land, Water and the Environment
DSE	The former Victorian Department of Sustainability and Environment (now DELWP)
EPBC Act	The Federal <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Class, the units used to describe vegetation type in Victoria
FFG Act	The Victorian <i>Flora and Fauna Guarantee Act 1988</i>
MNES	Matters of National Environmental Significance, as listed under the EPBC-Act.
NCR	Nature Conservation Reserve
WGR	Western Grassland Reserve



# Introduction

## The Western Grassland Reserve

The Victorian Government has committed to establish a series of Conservation Areas on the periphery of Melbourne for the conservation of threatened plants, animals and ecological communities (DEPI, 2013). They include a network of small areas within Melbourne's Urban Growth Boundary, as well as the larger Western Grassland Reserve (WGR, 15,000 ha) and the Grassy Eucalypt Woodland Reserve (approximately 1,200 ha).

The establishment of the reserves is the result of the Melbourne Strategic Assessment, which aims to mitigate environmental losses caused by the expansion of Melbourne's Urban Growth Boundary. This expansion will impact on 'Matters of National Environmental Significance' (MNES) listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A 'Strategic Impact Assessment' conducted by the Victorian Government recommended ways of mitigating environmental impacts. The mitigation measures agreed to by the Victorian and Australian governments are outlined in the 'Program Report' and the 'Biodiversity Conservation Strategy' (DSE, 2009; DEPI, 2013). The commitments include regular reporting on ecological outcomes. A Monitoring and Reporting Framework (MRF) provides the logic and basis for monitoring target species and communities (DELWP, 2015a). The MRF gives specific Key Performance Indicators (KPIs) for each listed species and vegetation community.

All Conservation Areas will be managed to achieve these management targets. The precise management strategy required to achieve the targets will, however, vary from place to place. Each area is different, and each supports a wide range of plant and animal species, has different vegetation patterns, management issues, and other features. Detailed information about the type and distribution of assets and threats is required for each property that is protected. Much of that information will be contained in Fauna Inventory and Vegetation Inventory documents for each property.

## Purpose and scope

This Fauna Inventory Report forms part of the basic information required to start managing protected land. It should serve as a useful reference for managers, and also the logical basis of management actions. The specific purpose of this document is to:

- Identify any EPBC-listed animal species that are the targets of conservation measures under the MSA
- Provide enough information about the distribution of animals on the land to allow management planning to proceed.
- Fulfil (for the survey area) DELWP's commitment to produce a detailed inventory of the fauna values within the WGR (DSE, 2011, p38)
- Provide a qualitative baseline describing the fauna when the survey area is brought into the WGR

This document does not:

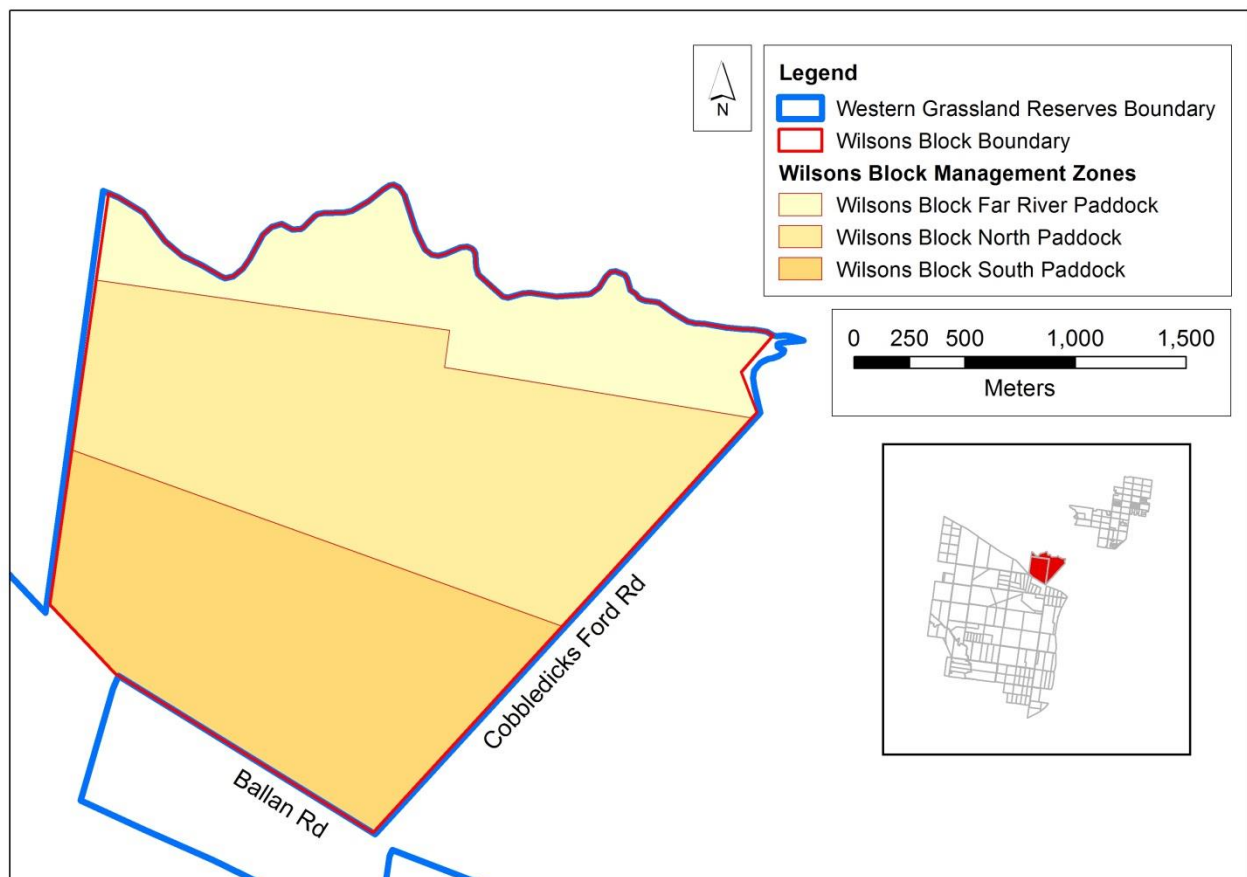
- constitute a management plan,
- describe the vegetation of the survey area (available in DELWP (2015b)),
- make any claims about the likely presence or absence of values not recorded.

## The Survey Area

This report covers the large block of land within the WGR, known as Wilsons Block (Figure 1).

Wilsons Block (564 ha) is divided into three paddocks known informally as Wilsons South (201 ha), Wilsons North (256 ha) and Far River (107 ha). Multiple parcels were selected to be covered by this report, as they form a cohesive management unit, and formerly constituted part of a single property. The paddocks do not correspond to the parcels, making the parcel boundaries inconspicuous on ground. The land is traversed by a road easement which has long been unfenced and managed as part of the paddocks. This land is treated as part of the property. The subject land is referred to collectively as 'Wilsons Block'.

The northern boundary of the property is defined by the southern bank of an ephemeral Creekline (known locally as Wild Dog Gully). The fence along this boundary deviates slightly from the actual boundary, given the steep, cliffed terrain and the winding course of the creek.



**Figure 1. The survey area – Wilsons Block. Insert shows the location of Wilsons block (red) within the Western Grassland Reserve.**

## Previous survey information

This area has been the subject of five known previous formal fauna surveys:

- Unpublished diurnal bird survey 2006 (ref VBA, Claire McCutcheon)
- Targeted Golden Sun Moth survey 2010 (ref VBA, Ecology Partners)
- Fauna survey, details unknown, 1988 (ref VBA, DNRE)

- General and targeted fauna surveys 2011 (Biosis Research, 2011)
- Targeted reptile surveys 2010 (Robertson et al., 2010)

The results of these surveys are included in this report if they took place since 2010 (inclusive). Alternatively, they may be referred to in the text where appropriate.



## Methods

The site was surveyed using the method described in DELWP (2015c). This document describes inventory guidelines for properties under the MSA program and the rationale for choosing particular survey techniques and targeting particular faunal groups on a property. In this case all techniques described in DELWP (2015c) were deemed suitable. The survey locations are shown in figure 2.

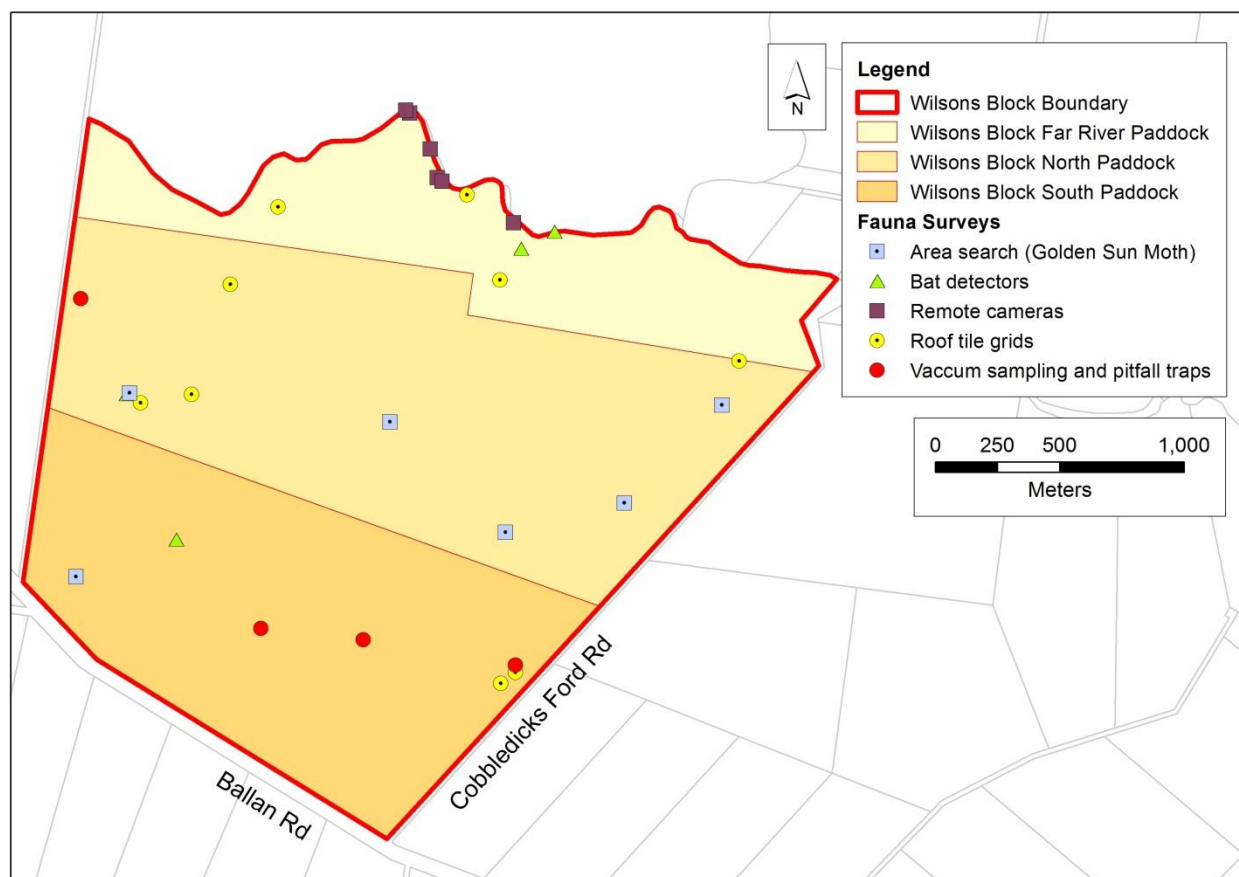


Figure 2. Survey locations on Wilsons block by survey type.

### Roof tile grids (general)

One relatively economical and effective technique for surveying terrestrial vertebrates, especially small reptiles and mammals, is artificial cover such as roof tiles. Studies that use such artificial cover have been employed across different habitats in Victoria (e.g. south-western Victoria, north-central Victoria, alpine region) (e.g. Schulz et al., 1995; Thompson, 2006; Homan, 2012; Michael et al., 2012; O'Shea, 2013). Terracotta roof tiles are commonly used; they can be checked quickly and can remain in situ for medium or long-term investigations.

At these sites, roof tile grids were installed at 9 locations during 9-11 September 2014 (Figure 2). Locations were chosen to represent the broad habitat types on the property (e.g. grassland, rocky rises, and escarpment) and the intensity of survey matched that prescribed in DELWP (2015c). Each grid of 50 roof tiles was configured as ten lines of five tiles, each five metres apart. These grids, principally targeting reptiles, were checked in spring 2014 and autumn 2015 (Table 1). Every grid was checked six times in the period 29 September 2014-22 April 2015 and any vertebrates encountered were recorded.

**Table 1. Details of roof tile grids (GDA 94, z55).**

Grid No.	Easting	Northing	First survey date	Final survey date
1	284391	5810849	14/10/14	22/04/2015
2	284188	5810811	14/10/14	22/04/2015
3	284538	5811296	14/10/14	22/04/2015
4	285622	5811335	14/10/14	22/04/2015
5	286589	5811031	14/10/14	22/04/2015
6	285660	5809715	14/10/14	22/04/2015
7	285718	5809761	14/10/14	22/04/2015
8	285439	5811675	29/09/14	22/04/2015
9	284724	5811611	14/10/14	22/04/2015

## Roof tile grids (Striped Legless Lizard)

Targeted roof tile grids were set up at nine locations on the parcel. Each grid was a rectangle of 10 x 5 ceramic roof tiles spaced 5 m apart, 50 tiles per grid in total (Table 2). The tile grids were established two months prior to commencing the survey. In line with the optional conditions for detecting the Striped Legless Lizard, surveys were conducted between 10am and 4pm, when the tile temperature was 18-40°C and the ambient air temperature was between 15-30°C. At each tile grid the sheltered area underneath the tiles was inspected for evidence of lizard presence, including sloughed skins. Six repeat tile checks of each grid were conducted at least one week apart. Tile checks occurred at different times of the day on each occasion for any given tile grid during the survey period (i.e. randomly allocate daily site check order).

**Table 2. Details of roof tile grids for Striped Legless Lizard (GDA 94, z55).**

Grid No.	Easting	Northing	First survey date	Final survey date
1	285191	5810941	11/09/2015	5/11/2015
2	284778	5810770	11/09/2015	28/10/2015
3	283761	5810224	11/09/2015	28/10/2015
4	284743	5809681	11/09/2015	4/11/2015
5	285132	5809662	11/09/2015	29/10/2015
6	285014	5809284	11/09/2015	29/10/2015
7	285809	5809846	11/09/2015	29/10/2015
8	285024	5810197	11/09/2015	29/10/2015
9	286117	5810744	11/09/2015	5/11/2015

## Remote cameras

Automated cameras were installed at six locations in Wilsons Block (Figure 2) and were left in situ for four weeks. The cameras use heat and motion sensing to detect the presence of animals. Photographs are taken when an animal is detected within a camera's field of vision. Reconyx HC600 cameras were used with infrared illumination. Each camera was focused on a bait station, positioned 2-3 m in front of the camera, containing bait composed of rolled oats, peanut butter and golden syrup. Vegetation in an area of 2-3 m<sup>2</sup> in front of the camera was reduced in height to minimize triggering of the camera and to aid visual identification of species. Camera locations were chosen to represent the broad habitat types on the property (e.g. rocky rises, escarpment).

## Call recognition and spotlighting (Frogs)

Water-bodies were primarily surveyed for frogs. The water-bodies surveyed included those along the Werribee Gorge/Wild Dog Gully area of the Wilsons block.

The water-bodies were surveyed on three occasions, considered to be the minimum number of spotlight searches necessary to detect with an acceptable level of certainty that the Growling Grass Frog is present (Heard et al., 2006; Department of the Environment Water Heritage and the Arts, 2010). Each survey comprised an aural and visual search; a 5-minute listening period was employed upon arrival, followed by a visual search using a white light (Lenser LED P14 torch) to locate animals in and close to the water-body.

## Diurnal survey (reptiles)

Surveys for reptiles were conducted at several locations across the Block which were considered likely to yield records. Surveys were conducted by experienced observers who slowly traversed potentially suitable reptile habitat, pausing to record active individuals or searching for sheltering or fossorial species by overturning rocks and logs. Surveys were conducted between November 2014 and February 2015 and only undertaken in sunny weather and above an ambient temperature of 18° C.

## Diurnal survey (birds)

Surveys for diurnal birds were conducted across all three paddocks (north, south and far river; Figure 2) by one experienced observer on September 29<sup>th</sup> 2014 between 08:30-16:30. The north and south sections were walked in transects ~50 m apart and the length of Wild Dog Gorge & Werribee River was walked along the portion that bounds the property. All birds seen or heard were identified and the number of individuals counted. Incidental observations of other vertebrates encountered during the bird surveys were also recorded.

## Spotlighting (Plains-wanderer)

Spotlighting, targeting the threatened Plains-wanderer, was conducted on the Wilsons Block (south paddock) on November 28<sup>th</sup> 2014, between 20:30 and 23:30. During the day, seven transects (~150 m apart and ~1000 m long, running roughly east-west) in potentially suitable Plains-wanderer habitat were established using a GPS. Poles with reflective tape were placed at the end of each transect. Only the south-eastern side corner of the property was surveyed (an area of ~120 ha) and transects did not go within 300 m of a group of trees on the western end of the survey area of the paddock because the Plains-wanderer has not been recorded within 300 m of trees c.10 m tall (Baker-Gabb, 2014). During the survey ten people walked each transect line abreast, using powerful LED torches to scan the area for three hours, for a total survey effort of 30 hours. All birds detected were counted and recorded.

## Bat detectors

Computerised bat echolocation call detector units (AnaBat™ SD2, Titley Scientific) were installed at four (Figure 2). The units were employed during fine weather for 14-16 consecutive nights and programmed to record bat calls between dusk and dawn. Ultrasonic bat calls were subsequently downloaded to a computer and species (or species complexes where individual species could not reliably be distinguished)

subsequently identified electronically using *AnaScheme*, call recognition software that recognises individual bat calls by their sonic characteristics. *AnaScheme* reads sound files recorded by Anabat detectors and models individual bat search-phase pulses using regression analysis (Adams et al., 2010). Pulses are identified using a regional identification key. This is followed by visual inspection of questionable calls.

## Call playback (nocturnal birds)

Call-playback sessions were conducted on June 24, 2015 by an experienced observer. During the call-playback session a selection of nocturnal bird calls was played to elicit a response, either from the bird in question or from nocturnal mammals. The calls of the following nocturnal bird species were played: Powerful Owl *Ninox strenua*, Masked Owl *Tyto novaehollandiae*, Barn Owl *T. alba*, Southern Boobook *N. novaeseelandiae*, Australian Owlet-nightjar *Aegotheles cristatus*, and Tawny Frogmouth *Podargus strigoides*.

Call playback sessions include periods of 2-5 minutes of continuous calls broadcast at ~110% of natural volume interspersed with periods (2 minutes) of silence to listen and watch for a response from a nocturnal bird. Listening is continued after playback whilst a spotlighting search is conducted to search for birds that have responded by flying quietly to the playback site. Call playback approximately doubles the chance of detecting an owl at night, compared with passive listening (Loyn et al., 2011).

## Spotlighting (arboreal mammals)

Targeted spotlight surveys for arboreal mammals were conducted in two treed locations along the Werribee Gorge/Wild Dog Gully area on the northern periphery of Wilsons Block. Each treed areas was surveyed on two occasions. Observers used a white light (LENSER LED P14 torch) to locate animals and facilitate identification.

## Area search (Golden Sun Moth)

Surveys were conducted according to the protocol described in the MRF (DELWP, 2015a). Six 400 x 400 m plots, each comprising 20 transects (oriented north-south) 20 m apart, were established across both blocks (Table 3; Figure 2). Each plot was searched for flying male moths under suitable environmental conditions. Searching continued until an individual was detected or the whole plot searched. The time to first detection or the total time taken to survey the plot (in the absence of detection) was recorded.

Table 3. 2014 Golden Sun Moth plot locations (GDA 94, z55).

Plot	Easting	Northing	Survey date
W1	286525	5810853	04/12/2014
W2	286140	5810451	04/12/2014
W3	285665	5810322	04/12/2014
W4	285192	5810757	04/12/2014
W5	283943	5810107	04/12/2014
W6	284143	5810851	04/12/2014

## Vacuum sampling and invertebrate pitfall traps

Terrestrial arachnids were surveyed using pitfall traps and vacuum transects, at four locations, a sub-set of those locations selected for vegetation monitoring (DEWLP, 2015b) (Table 4, Figure 2).

### *Pitfall traps*

At each location 30 traps were established in two lines of five (traps 4 m apart) and two lines of ten (traps 2 m apart), one metre outside of the plot (Figure 3). Traps comprised two disposable plastic drinking cups (one placed inside the other, 200 ml volume, 65 mm diameter, and 90 mm deep). The preservative propylene glycol was added to the cups to a depth of approximately 10 mm. Traps were left in place for four nights, after which the contents of each trap were collected and placed in a separate vial.

### *Vacuum sampling*

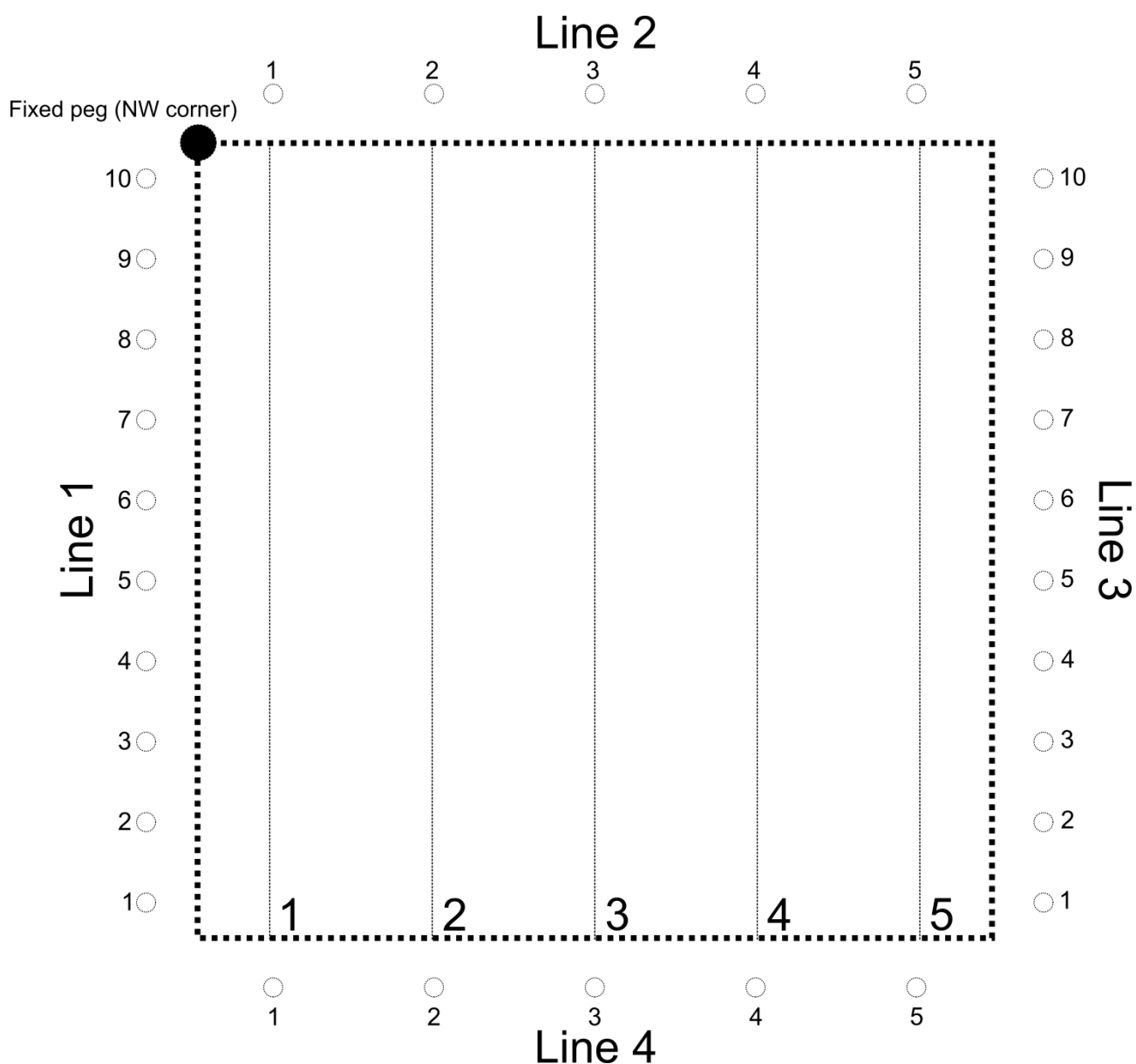
Within each of the plots, five 20 m transects were established, running north-south, 4 m apart and 2 m from the edge of the plot (Figure 3). Specimens were collected using a hand-held vacuum sampler (Doxon et al., 2011), the opening covered by a mesh bag that retained the sample. Each transect was walked at a slow pace and samples were taken to ~50 cm either side of the transect. Samples from each transect were placed in a separate bag.

### *Sample identification*

Arachnid samples were sorted from other material and preserved in vials containing 70% ethanol. Any vertebrates captured were also recorded and retained. For this report spiders were identified to family according to the taxonomy in Davies (1986) and Raven et al. (2002). Common names of spider families follow Framenau et al. (2014). Specimens that were difficult to identify were identified by taxon experts at Museum Victoria.

**Table 4. Details of Arachnid sampling sites (GDA 94, z55). Site numbers correspond to the vegetation monitoring plots for this property (DELWP, 2015b).**

Site	NTG State	Easting	Northing	Pitfall start	Pitfall end	Vacuum
9	C3G/NG	283938	5811225	14/11/2014	18/11/2014	18/11/2014
11	C3G/NG	284691	5809916	14/11/2014	18/11/2014	18/11/2014
22	TG	285717	5809790	27/11/2014	01/12/2014	01/12/2014
27	NG	285103	5809878	27/11/2014	01/12/2014	01/12/2014



**Figure 3. Arrangement of arachnid pitfall traps and vacuum sampling transects. Lines (1 to 4) indicate lines of pitfall traps (open circles), the solid lines (1 to 5) are the vacuum transects and the dashed lines are the 20 m x 20 m perimeter of the vegetation monitoring plot.**

### Incidental records

Incidental records of vertebrates were collected from the Wilsons Block during the survey season, usually while staff were in transit or outside of the times dedicated to standardised surveys.



# Results

## Roof tile grids

Five vertebrate species were recorded during the roof tile grid survey, all of which were reptiles or amphibians species (Table 5). The count is dominated by the Tussock Skink, which provided 87% of all records for the Wilsons Block. All species recorded are considered common in grassland habitats of the WGR.

**Table 5. Vertebrate records from roof tile grids for Wilsons Block.**

Common name	Scientific name	No. of records
Common Eastern Froglet	<i>Crinia signifera</i>	1
Bougainville's Skink	<i>Lerista bougainvillii</i>	6
Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>	1
Tussock Skink	<i>Pseudemoia pagenstecheri</i>	62
Little Whip Snake	<i>Rhinoplocephalus flagellum</i>	1

## Roof tile grids (Striped Legless Lizard)

No Striped Legless Lizards were found during the targeted Striped Legless Lizard tile grid survey.

## Remote cameras

Eight vertebrate species were identified from camera images (Table 6). These comprised four mammal species, three bird species and one reptile species. Three of these species are introduced mammal species (\*), including the Cat (Figure 4a). All are relatively common or wide-ranging species, except for the localised and rock-dwelling Cunningham's Skink, recorded amongst boulders in Wild Dog Gully (Figure 4b).

**Table 6. Occurrence of vertebrates for Wilsons Block derived from the camera survey.**

Common name	Scientific name
Brown Goshawk	<i>Accipiter fasciatus</i>
Cunningham's Skink	<i>Egernia cunninghami</i>
Cat*	<i>Felis catus</i>
Eastern Grey Kangaroo	<i>Macropus giganteus</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
European Rabbit*	<i>Oryctolagus cuniculus</i>
White-browed Scrubwren	<i>Sericornis frontalis</i>
Red Fox*	<i>Vulpes vulpes</i>
Black Wallaby	<i>Wallabia bicolor</i>

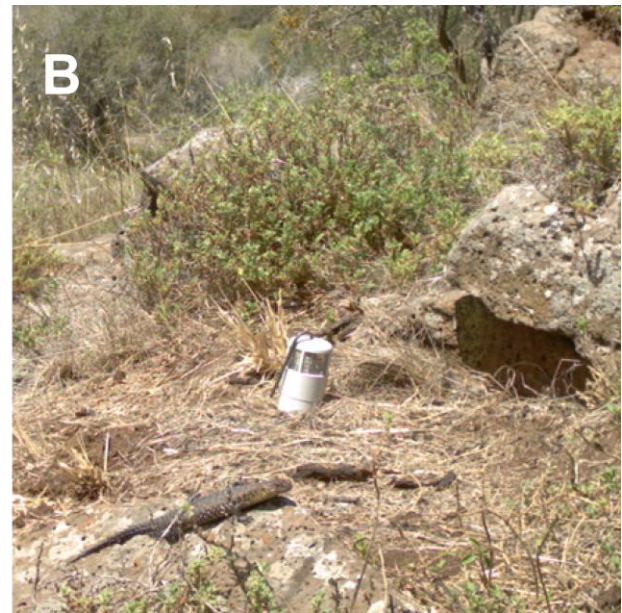


Figure 4. (A) Cat and (B) Cunningham's Skink, captured on automated camera at Wild Dog Gully, Wilsons Block.

## Call recognition and spotlighting (Frogs)

Spotlighting of water-bodies yielded a single frog species, the Pobblebonk *Limnodynastes dumerilii*, a common and widespread species in south-eastern Australia.

## Diurnal survey (reptiles)

Surveys for reptiles were conducted along transects at several locations across Wilsons Block which were considered likely to yield reptile records. These transects totalled 5.86 km and 11 person-hours were spent navigating them. Five reptile species were recorded, four terrestrial skinks and a snake-necked turtle from the genus *Chelodina*, most likely Eastern Long-necked Turtle (*C. longicollis*) this species (Table 7).

Table 7. Reptile species detected during diurnal surveys in Wilsons Block.

Common name	Scientific name	No. of records
Turtle	<i>Chelodina sp.</i>	1
Large Striped Skink	<i>Ctenotus robustus</i>	1
Cunningham Skink	<i>Egernia cunninghami</i>	2
Garden Skink	<i>Lampropholis guichenoti</i>	1
Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>	1

## Diurnal survey (birds)

Thirty bird species (including five introduced species) were detected during diurnal bird surveys (Table 8), the most common being the introduced Common Skylark (40% of all bird survey records). The Little Raven was the most commonly detected native species (13%). Records of two mammal species and one reptile species were also collected incidentally during these surveys.

**Table 8. Bird species detected in Wilsons Block on September 29th 2014. \*Indicates introduced species.**

Common name	Scientific name	No. of records
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	4
Common Myna*	<i>Acridotheres tristis</i>	6
Common Skylark*	<i>Alauda arvensis</i>	235
Richard's Pipit	<i>Anthus richardi</i>	17
Wedge-tailed Eagle	<i>Aquila audax</i>	1
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	1
European Goldfinch*	<i>Carduelis carduelis</i>	12
Golden-headed Cisticola	<i>Cisticola exilis</i>	2
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	2
Little Raven	<i>Corvus mellori</i>	75
Stubble Quail	<i>Coturnix pectoralis</i>	5
Australian Magpie	<i>Cracticus tibicen</i>	23
Black-shouldered Kite	<i>Elanus axillaris</i>	1
Galah	<i>Eolophus roseicapilla</i>	9
White-fronted Chat	<i>Epthianura albifrons</i>	2
Brown Falcon	<i>Falco berigora</i>	1
Nankeen Kestrel	<i>Falco cenchroides</i>	1
Dusky Moorhen	<i>Gallinula tenebrosa</i>	2
Magpie Lark	<i>Grallina cyanoleuca</i>	1
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	6
Superb Fairy-wren	<i>Malurus cyaneus</i>	6
Singing Bushlark	<i>Mirafrja javanica</i>	1
House Sparrow*	<i>Passer domesticus</i>	79
Fairy Martin	<i>Petrochelidon ariel</i>	1
Yellow Billed Spoonbill	<i>Platalea flavipes</i>	3
Common Starling*	<i>Sturnus vulgaris</i>	80
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	1
Banded Lapwing	<i>Vanellus tricolor</i>	6
Silvereye	<i>Zosterops lateralis</i>	4

## Spotlighting (Plains-wanderer)

Three bird species were detected during nocturnal bird surveys, including the Brown Songlark which was not detected during diurnal surveys (8). The target species, Plains-wanderer, was not detected.

**Table 9. Nocturnal birds recorded from Wilsons Block on November 28th 2014. \*Indicates introduced species.**

Common name	Scientific name	No. of records
Common Skylark*	<i>Alauda arvensis</i>	6
Stubble Quail	<i>Coturnix pectoralis</i>	2
Brown Songlark	<i>Megalurus cruralis</i>	1

## Bat detectors

AnaBat detectors recorded 11 insectivorous bat species across the Wilsons Block (Table 10). With the exception of the Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis* all are relatively common and exhibit broad continental or Victorian distributions (Menkhorst and Knight, 2011).

The Eastern Bent-wing Bat, which is listed in Victoria as Vulnerable and also listed under the Victorian *Flora and Fauna Guarantee Act 1988* (Victorian Department of Sustainability and Environment, 2013), was recorded at the Werribee River escarpment, the northern boundary of the Wilsons Block.

**Table 10. Occurrence of insectivorous bats derived from the AnaBat detectors. The habitat at each detector location was; W1: patch of trees, W2: grassland, W3: swampy area along drainage line and W4: top of escarpment. ^The calls of three species of Long-eared Bat (*Nyctophilus*) cannot be distinguished from each other.**

Common name	Scientific name	W1	W2	W3	W4
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	✓	✓	✓	✓
Chocolate Wattled Bat	<i>Chalinolobus morio</i>	✓		✓	✓
Southern Freetail Bat	<i>Mormopterus planiceps (lp)</i>	✓	✓	✓	✓
Eastern Freetail Bat	<i>Mormopterus ridei</i>			✓	
Eastern Bent-wing Bat	<i>Miniopterus schreibersii oceanensis</i>				✓
Long-eared Bats^	<i>Nyctophilus geoffroyi/gouldi/timoriensis</i>	✓	✓	✓	✓
Inland Broad-nosed Bat	<i>Scotorepens balstoni</i>	✓	✓	✓	✓
White-striped Freetail Bat	<i>Tadarida australis</i>	✓	✓	✓	✓
Large Forest Bat	<i>Vespadelus darlingtoni</i>	✓	✓	✓	✓
Southern Forest Bat	<i>Vespadelus regulus</i>		✓		✓
Little Forest Bat	<i>Vespadelus vulturnus</i>	✓	✓	✓	✓

## Call playback (nocturnal birds)

A call-playback session was conducted on June 24th, 2015 at the Werribee River Gorge on the northern periphery of the Wilsons Block. This location was the only one in the block with mature trees. The call-playback session failed to elicit any birds. However, three mammal species were recorded, two of which are introduced (\*) (Table 11).

**Table 11. Vertebrates recorded during the call-playback session in Wilsons Block on 24<sup>th</sup>, 2015.**

Common name	Scientific name	No. of records
Cat*	<i>Felis catus</i>	2
Common Brushtail Possum	<i>Trichosurus vulpecula</i>	1
Red Fox*	<i>Vulpes vulpes</i>	1

## Spotlighting (arboreal mammals)

Three spotlight surveys of treed areas in the Wilsons Block yielded three species: Australian Magpie, Eastern Grey Kangaroo and Red Fox (Table 12). Nocturnal searches of water-bodies yielded a single frog species, the common Pobblebonk, and two introduced mammal species (\*), the Cat and European Rabbit (Table 12).

**Table 12. Combined vertebrate records from the nocturnal searches and spotlight surveys of the Wilsons Block.**

Common name	Scientific name	No. of records
Australian Magpie	<i>Cracticus tibicen</i>	4
Cat*	<i>Felis catus</i>	1
Pobblebonk	<i>Limnodynastes dumerilii</i>	2
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	2
European Rabbit*	<i>Oryctolagus cuniculus</i>	1
Red Fox*	<i>Vulpes vulpes</i>	1

## Area search (Golden Sun Moth)

Flying male Golden Sun Moths were detected at all six search plots. Time to detection at these sites ranged from 1 to 2 minutes, with a mean of 1.5 ( $\pm 0.22$  SE) minutes (Table 13). Moths were seen flying at most of these plots before arrival at the plots, and at every plot multiple moths were observed.

**Table 13. Results of area search for Golden Sun Moth (GDA 94, z55).**

Plot	Easting	Northing	Moth detected	Time to detection (min.)
W1	286696	5810856	✓	2
W2	286097	5810595	✓	2
W3	285819	5810377	✓	1
W4	285265	5810583	✓	1
W5	283797	5810042	✓	1
W6	284153	5810705	✓	2

## Vacuum sampling and invertebrate pitfall traps

Spider surveys yielded 951 specimens from 11 families, 77 (8%) specimens were not identified to family level (Table 14). Unidentified spiders were mostly juveniles with features that were not developed enough for identification. This was particularly the case for the vacuum sample from which only 9% of specimens could be identified. No families were identified from the vacuum samples that were not found in the pitfall samples. Two families, Lycosidae (Wolf Spiders) and Miturgidae (Prowling Spiders), were very common and collected from most pitfall traplines at each sampling site. Four families other families, Prodidomidae (Long Spinneret Ground Spiders), Pholcidae (Daddy Long-legs Spiders), Amaurobiidae (Hackled-mesh Weavers) and Mimetidae (Pirate Spiders) were uncommon and represented by single specimens.

**Table 14. Spider families recorded from pitfall and vacuum sampling at Wilsons Block during 2014.**

Common name	Scientific name	Pitfall	Vacuum	Total
Hackled-mesh Weavers	Amaurobiidae	1		1
Ground Spiders	Gnaphosidae	9		9
Sheet-web Spiders	Linyphidae	3		3
Wolf Spiders	Lycosidae	651	1	652
Pirate Spiders	Mimetidae	1		1
Prowling Spiders	Miturgidae	163		163
Goblin Spiders	Oonopidae	2		2

Common name	Scientific name	Pitfall	Vacuum	Total
Daddy Long-legs Spiders	Pholcidae	1		1
Long Spinneret Ground Spiders	Prodidomidae	1		1
Jumping Spiders	Salticidae	20	4	24
Ant Spiders	Zodariidae	17		17
Unidentified		28	49	77
Total		897	54	951

## Incidental observations

Five additional vertebrate species and one spider family were recorded incidentally during fauna and flora surveys of Wilsons Block, comprising generally widespread and common species (Table 15).

**Table 15. Additional species recorded incidentally from the Wilsons Block during visits September 2014-June 2015.**

Common name	Scientific name
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Little Raven	<i>Corvus mellori</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Eastern Brown Snake	<i>Pseudonaja textilis</i>
Tiger Snake	<i>Notechis scutatus</i>
Redback Spider	<i>Latrodectus hasseltii</i> (Family: Theridiidae)

## Threatened species

Two threatened species were recorded from the Wilsons Block during this study: Eastern Bent-wing Bat and the Golden Sun Moth.



## Conclusion

Fifty-six terrestrial vertebrate species were recorded during the 2014-2015 survey of Wilsons Block in the WGR, comprising 17 mammal species (including at least 11 bat species), 25 bird species, ten reptile species and four frog species. In all, seven introduced vertebrate species were recorded, comprising three mammal species and four bird species. Most of the species identified from the Wilsons Block during this study are common and widespread and considered habitat generalists. However, during the surveys the wetlands on the property were dry, during wet periods they may be inhabited by additional species, particularly frogs, turtles and water birds.

In addition to the vertebrate species, 12 spider families were recorded on Wilson's Block. These families represent a diverse range of foraging modes, including ground-hunting groups such as Gnaphosidae, Lycosidae and Miturgidae. Other families such as Amaurobiidae and Linyphidae are web builders. More specialised groups such as the Mimetidae who prey on other spiders by invading their webs and the Zodariidae, who specialise on ants and termites, were also found.

A list of all recorded vertebrate species from Wilsons Block, derived from this and other recent studies is provided in Appendix 1 and a list of species by survey method is provided in Appendix 2.

## Threatened species

There are very few recent records of threatened taxa in the Wilsons Block: Eastern Bent-wing Bat, Golden Sun Moth from this study, and Fat-tailed Dunnart from surveys conducted in 2010 (Robertson et al., 2010).

The Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) is listed as Critically Endangered in Victoria (Victorian Department of Sustainability and Environment, 2013). It is a small, fast-flying bat, and a cave-dweller, although it may also use man-made structures like road culverts (Churchill, 2008). It was recorded at the Werribee River escarpment along the northern boundary of the Wilson Block, possibly roosting in rock crevices. It has an extensive distribution along the eastern and south-eastern seaboard of Australia; the Western Grassland Reserve is close to the southern limit of this broad continental distribution (Victorian Biodiversity Atlas; Churchill, 2008).

The Fat-tailed Dunnart (*Sminthopsis crassicaudata*) was recorded in the Wilson Block in 2010 (Robertson et al., 2010). It is a small carnivorous marsupial that is found in a wide variety of habitats, including open grasslands and low shrublands, in southern and central Australia (van Dyke and Strahan, 2008). It is listed in Victoria as Near Threatened (Victorian Department of Sustainability and Environment, 2013).

The Golden Sun Moth (*Synemon plana*) is a medium-sized day-flying moth restricted to Victoria, the Australian Capital Territory and adjacent areas of southern New South Wales (Victorian Department of Sustainability and Environment, 2004; Department of the Environment Water Heritage and the Arts, 2009). It inhabits grassy areas, including native grasslands and grassy woodlands as well as areas of introduced (non-native) grasses (pastures) and weeds. It is listed as Critically Endangered under the Commonwealth EPBC Act 1999 and is also listed as a threatened species under the Victorian FFG Act 1988 (Department of Sustainability and Environment 2008). An open tussock structure with sparse inter-tussock spaces and/or much bare ground is presumed to be an important attribute of a site supporting the species (Gilmore et al., 2008; Brown et al., 2012; New, 2012; Richter et al., 2013). The Golden Sun Moth has previously been recorded from the block and the general area during targeted surveys (Biosis Research, 2011).

Although few threatened taxa were recorded in the Wilsons Block during this study, the block is likely to support other threatened taxa. The Victorian Biodiversity Atlas (DELWP) reveals the current or historical occurrence of at least 48 threatened Victorian species for an area 10 km x 10 km centred on the Wilsons Block, although most of those species typically occur in woodland or wetland environments and are likely to be irregular users of the grassland habitats that characterize the block. Nevertheless, there are historical

records of the following threatened species from the Wilsons Block or its surrounds: Plains-wanderer (*Pedionomus torquatus*), Brolga (*Grus rubicundus*), Australian Snipe (*Gallinago hardwickii*), Swift Parrot *Lathamus discolor*, Striped Legless Lizard (*Delma impar*), Grassland Earless Dragon (*Tympanocryptis pinguicolla*) and Growling Grass Frog (*Litoria raniformis*).

## Introduced species

Two introduced predators were detected during this study, Red Fox (*Vulpes vulpes*) and Cat (*Felis catus*). Other introduced species detected include European Rabbit (*Oryctolagus cuniculus*) and five species of bird.

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## Appendix 1: List of taxa recorded on Wilsons Block

The list below presents species of terrestrial vertebrates, ordered alphabetically by genus then species within each vertebrate Class, recorded from the Wilsons Block during this study and other recent surveys. Introduced species are indicated with an asterisk (\*).

The national and state conservation status or significance of each threatened species is presented along with listing under the Victorian *Flora and Fauna Guarantee Act 1988*.

- EPBC: listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999*
- Advis: Listed on the Advisory List of Threatened Vertebrate Fauna in Victoria (Victorian Department of Sustainability and Environment, 2013)
- FFG Listed in Victoria under the *Flora and Fauna Guarantee Act 1988*

Common name	Scientific name	EPBC Status	Advis	FFG	Additional taxa from other studies
<b>Mammals</b>					
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>				
Chocolate Wattled Bat	<i>Chalinolobus morio</i>				
Cat*	<i>Felis catus</i>				
Eastern Grey Kangaroo	<i>Macropus giganteus</i>				
Eastern Bent-wing Bat	<i>Miniopterus schreibersii oceanensis</i>		V	L	
Southern Freetail Bat	<i>Mormopterus planiceps (lp)</i>				
Eastern Freetail Bat	<i>Mormopterus ridei</i>				
House Mouse*	<i>Mus musculus</i>				✓
Long-eared Bats	<i>Nyctophilus geoffroyi/gouldi/timoriensis</i>				
European Rabbit*	<i>Oryctolagus cuniculus</i>				
Inland Broad-nosed Bat	<i>Scotorepens balstoni</i>				
Fat-tailed Dunnart	<i>Sminthopsis crassicaudata</i>		NT		✓
White-striped Freetail Bat	<i>Tadarida australis</i>				
Common Brushtail Possum	<i>Trichosurus vulpecula</i>				
Large Forest Bat	<i>Vespadelus darlingtoni</i>				
Southern Forest Bat	<i>Vespadelus regulus</i>				
Little Forest Bat	<i>Vespadelus vulturnus</i>				
Red Fox*	<i>Vulpes vulpes</i>				
Black Wallaby	<i>Wallabia bicolor</i>				
<b>Birds</b>					
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>				
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>				
Brown Goshawk	<i>Accipiter fasciatus</i>				
Common Myna*	<i>Acridotheres tristis</i>				
Common Skylark (I)	<i>Alauda arvensis</i>				
Pacific Duck	<i>Anas superciliosa</i>				
Richards Pipit	<i>Anthus richardi</i>				
Wedge-tailed Eagle	<i>Aquila audax</i>				

Common name	Scientific name	EPBC Status	Advis	FFG	Additional taxa from other studies
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>				
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>				
European Goldfinch*	<i>Carduelis carduelis</i>				
Horsefields Cuckoo	<i>Chrysococcyx basalis</i>				
Golden-headed Cisticola	<i>Cisticola exilis</i>				
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>				
Australian Raven	<i>Corvus coronoides</i>				
Little Raven	<i>Corvus mellori</i>				
Stubble Quail	<i>Coturnix pectoralis</i>				
Australian Magpie	<i>Cracticus tibicen</i>				
Laughing Kookaburra	<i>Dacelo novaeguineae</i>				
Black-shouldered Kite	<i>Elanus axillaris</i>				
Galah	<i>Eolophus roseicapilla</i>				
White-fronted Chat	<i>Epthianura albifrons</i>				
Brown Falcon	<i>Falco berigora</i>				
Nankeen Kestrel	<i>Falco cenchroides</i>				
Dusky Moorhen	<i>Gallinula tenebrosa</i>				
Magpie Lark	<i>Grallina cyanoleuca</i>				
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>				
Superb Fairy-wren	<i>Malurus cyaneus</i>				
Singing Bushlark	<i>Mirafrja javanica</i>				
House Sparrow*	<i>Passer domesticus</i>				
Australian Pelican	<i>Pelecanus conspicillatus</i>				
Fairy Martin	<i>Petrochelidon ariel</i>				
Yellow Billed Spoonbill	<i>Platalea flavipes</i>				
Grey Fantail	<i>Rhipidura albiscapa</i>				
Willy Wagtail	<i>Rhipidura leucophrys</i>				
White-browed Scrubwren	<i>Sericornis frontalis</i>				
Common Starling*	<i>Sturnus vulgaris</i>				
Straw-necked Ibis	<i>Threskiornis spinicollis</i>				
Banded Lapwing	<i>Vanellus tricolor</i>				
Silvereye	<i>Zosterops lateralis</i>				
<b>Reptiles</b>					
Snake-necked Turtle	<i>Chelodina sp.</i>			DD^	
Large Striped Skink	<i>Ctenotus robustus</i>				
Cunningham's Skink	<i>Egernia cunninghami</i>				
Garden Skink	<i>Lampropholis guichenoti</i>				
Bougainville's Skink	<i>Lerista bougainvillii</i>				
Tiger Snake	<i>Notechis scutatus</i>				
Eastern Brown Snake	<i>Pseudonaja textilis</i>				
Tussock Skink	<i>Pseudemoia pagenstecheri</i>				
Little Whip Snake	<i>Rhinoplocephalus flagellum</i>				
Common Blue-tongued Lizard	<i>Tiliqua scincoides</i>				



Common name	Scientific name	EPBC Status	Advis	FFG	Additional taxa from other studies
<b>Frogs</b>					
Common Eastern Froglet	<i>Crinia signifera</i>				
Pobblebonk	<i>Limnodynastes dumerilii</i>				
Striped Marsh Frog	<i>Limnodynastes peronii</i>				
Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>				
<b>Insects</b>					
Golden Sun Moth	<i>Synemon plana</i>	CR	CR	L	
<b>Spiders</b>					
Hackled-mesh Weavers	Amaurobiidae				
Ground Spiders	Gnaphosidae				
Sheet-web Spiders	Linyphidae				
Wolf Spiders	Lycosidae				
Pirate Spiders	Mimetidae				
Prowling Spiders	Miturgidae				
Goblin Spiders	Oonopidae				
Daddy Long-legs Spiders	Pholcidae				
Long Spinneret Ground Spiders	Prodidomidae				
Jumping Spiders	Salticidae				
Redback Spider	Theridiidae ( <i>Latrodectus hasseltii</i> )				
Ant Spiders	Zodariidae				

^ Most likely Eastern Long-necked Turtle *Chelodina longicollis*

## Appendix 2: List of taxa recorded by the different survey methods

The list below presents species of terrestrial vertebrates, ordered alphabetically by genus then species within each vertebrate Class, recorded from the Wilsons Block during this study and other recent surveys. Introduced species are indicated with an asterisk (\*).

Common name	Scientific name	Roof tile grids	Remote cameras	Call recognition and spotlighting (frogs)	Diurnal survey (reptiles)	Diurnal survey (birds)	Spotlighting – Plains Wanderer	Call playback – Noc. Birds	Bat detectors	Spotlighting – arboreal mammals	Area search - GSM	Spider surveys – pitfall and/or vacuum	Additional species from Incidental Records	Other surveys
<b>Mammals</b>														
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>								✓					
Chocolate Wattled Bat	<i>Chalinolobus morio</i>								✓					
Cat*	<i>Felis catus</i>			✓				✓	✓					
Eastern Grey Kangaroo	<i>Macropus giganteus</i>								✓					
Eastern Bent-wing Bat	<i>Miniopterus schreibersii oceanensis</i>								✓					
Southern Freetail Bat	<i>Mormopterus planiceps</i> (lp)								✓					
Eastern Freetail Bat	<i>Mormopterus ridei</i>								✓					
House Mouse*	<i>Mus musculus</i>													✓
Long-eared Bats	<i>Nyctophilus geoffroyi/gouldi/timoriensis</i>								✓					
European Rabbit*	<i>Oryctolagus cuniculus</i>		✓	✓	✓	✓	✓							
Inland Broad-nosed Bat	<i>Scotorepens balstoni</i>								✓					
Fat-tailed Dunnart	<i>Sminthopsis crassicaudata</i>													✓
White-striped Freetail Bat	<i>Tadarida australis</i>								✓					
Common Brushtail Possum	<i>Trichosurus vulpecula</i>							✓						
Large Forest Bat	<i>Vespadelus darlingtoni</i>								✓					
Southern Forest Bat	<i>Vespadelus regulus</i>								✓					
Little Forest Bat	<i>Vespadelus vulturnus</i>								✓					

Common name	Scientific name	Roof tile grids	Remote cameras	Call recognition and spotlighting (frogs)	Diurnal survey (reptiles)	Diurnal survey (birds)	Spotlighting – Plains Wanderer	Call playback – Noc. Birds	Bat detectors	Spotlighting – arboreal mammals	Area search - GSM	Spider surveys – pitfall and/or vacuum	Additional species from Incidental Records	Other surveys
Red Fox*	<i>Vulpes vulpes</i>		✓	✓	✓			✓		✓				
Black Wallaby	<i>Wallabia bicolor</i>		✓	✓										
<b>Birds</b>														
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>												✓	
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>					✓								
Brown Goshawk	<i>Accipiter fasciatus</i>		✓											
Common Myna*	<i>Acridotheres tristis</i>				✓	✓								
Common Skylark (I)	<i>Alauda arvensis</i>					✓								
Pacific Duck	<i>Anas superciliosa</i>				✓									
Richards Pipit	<i>Anthus richardi</i>					✓								
Wedge-tailed Eagle	<i>Aquila audax</i>					✓								
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>				✓									
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>					✓								
European Goldfinch*	<i>Carduelis carduelis</i>					✓								
Horsefields Cuckoo	<i>Chrysococcyx basalus</i>												✓	
Golden-headed Cisticola	<i>Cisticola exilis</i>					✓								
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>					✓								
Australian Raven	<i>Corvus coronoides</i>				✓									
Little Raven	<i>Corvus mellori</i>					✓								
Stubble Quail	<i>Coturnix pectoralis</i>					✓	✓							
Australian Magpie	<i>Cracticus tibicen</i>					✓				✓				
Laughing Kookaburra	<i>Dacelo novaeguineae</i>				✓									
Black-shouldered Kite	<i>Elanus axillaris</i>				✓	✓								
Galah	<i>Eolophus roseicapilla</i>				✓									
White-fronted Chat	<i>Epthianura albifrons</i>					✓								
Brown Falcon	<i>Falco berigora</i>					✓								
Nankeen Kestrel	<i>Falco cenchroides</i>					✓								
Dusky Moorhen	<i>Gallinula tenebrosa</i>				✓									
Magpie Lark	<i>Grallina cyanoleuca</i>					✓								

Common name	Scientific name	Roof tile grids	Remote cameras	Call recognition and spotlighting (frogs)	Diurnal survey (reptiles)	Diurnal survey (birds)	Spotlighting – Plains Wanderer	Call playback – Noc. Birds	Bat detectors	Spotlighting – arboreal mammals	Area search - GSM	Spider surveys – pitfall and/or vacuum	Additional species from Incidental Records	Other surveys
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>					✓								
Superb Fairy-wren	<i>Malurus cyaneus</i>		✓		✓	✓								
Singing Bushlark	<i>Mirafrja javanica</i>					✓								
House Sparrow*	<i>Passer domesticus</i>					✓								
Australian Pelican	<i>Pelecanus conspicillatus</i>												✓	
Fairy Martin	<i>Petrochelidon ariel</i>					✓								
Yellow Billed Spoonbill	<i>Platalea flavipes</i>					✓								
Grey Fantail	<i>Rhipidura albiscapa</i>					✓								
Willy Wagtail	<i>Rhipidura leucophrys</i>					✓								
White-browed Scrubwren	<i>Sericornis frontalis</i>		✓											
Common Starling*	<i>Sturnus vulgaris</i>					✓								
Straw-necked Ibis	<i>Threskiornis spinicollis</i>					✓								
Banded Lapwing	<i>Vanellus tricolor</i>					✓								
Silvereye	<i>Zosterops lateralis</i>					✓								
<b>Reptiles</b>														
Long-necked Turtle	<i>Chelodina sp.</i>				✓									
Large Striped Skink	<i>Ctenotus robustus</i>				✓									
Cunningham's Skink	<i>Egernia cunninghami</i>		✓		✓	✓								
Garden Skink	<i>Lampropholis guichenoti</i>					✓								
Bougainville's Skink	<i>Lerista bougainvillii</i>	✓												
Tiger Snake	<i>Notechis scutatus</i>												✓	
Eastern Brown Snake	<i>Pseudonaja textilis</i>												✓	
Tussock Skink	<i>Pseudemoia pagenstecheri</i>	✓												
Little Whip Snake	<i>Rhinoplocephalus flagellum</i>	✓												
Common Blue-tongued Lizard	<i>Tiliqua scincoides</i>				✓									
<b>Frogs</b>														
Common Eastern Froglet	<i>Crinia signifera</i>	✓												
Pobblebonk	<i>Limnodynastes dumerilii</i>			✓										
Striped Marsh Frog	<i>Limnodynastes peronii</i>				✓									

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Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>	✓												
<b>Insects</b>														
Golden Sun Moth	<i>Synemon plana</i>										✓			
<b>Spiders</b>														
Hackled-mesh Weavers	Amaurobiidae											✓		
Ground Spiders	Gnaphosidae											✓		
Sheet-web Spiders	Linyphidae											✓		
Wolf Spiders	Lycosidae											✓		
Pirate Spiders	Mimetidae											✓		
Prowling Spiders	Miturgidae											✓		
Goblin Spiders	Oonopidae											✓		
Daddy Long-legs Spiders	Pholcidae											✓		
Long Spinneret Ground Spiders	Prodidomidae											✓		
Jumping Spiders	Salticidae											✓		
Redback Spider	Theridiidae ( <i>Latrodectus hasseltii</i> )												✓	
Ant Spiders	Zodariidae											✓		

^ Most likely Eastern Long-necked Turtle *Chelodina longicollis*

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