

# Fauna Inventory Report: Western Grassland Reserve – One Tree East

Melbourne Strategic Assessment



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#### **Front cover photo**

Eastern Grey Kangaroo (*Macropus giganteus*) 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 a large block of land within the WGR, known as One Tree East (Figure 1).

The One Tree East property (436 ha) is a triangular block of land within the WGR and bounded by Ballan and Ripley Rds, in the locality of Quandong. It is divided into two paddocks known informally as Paddock 1 and Paddock 2.

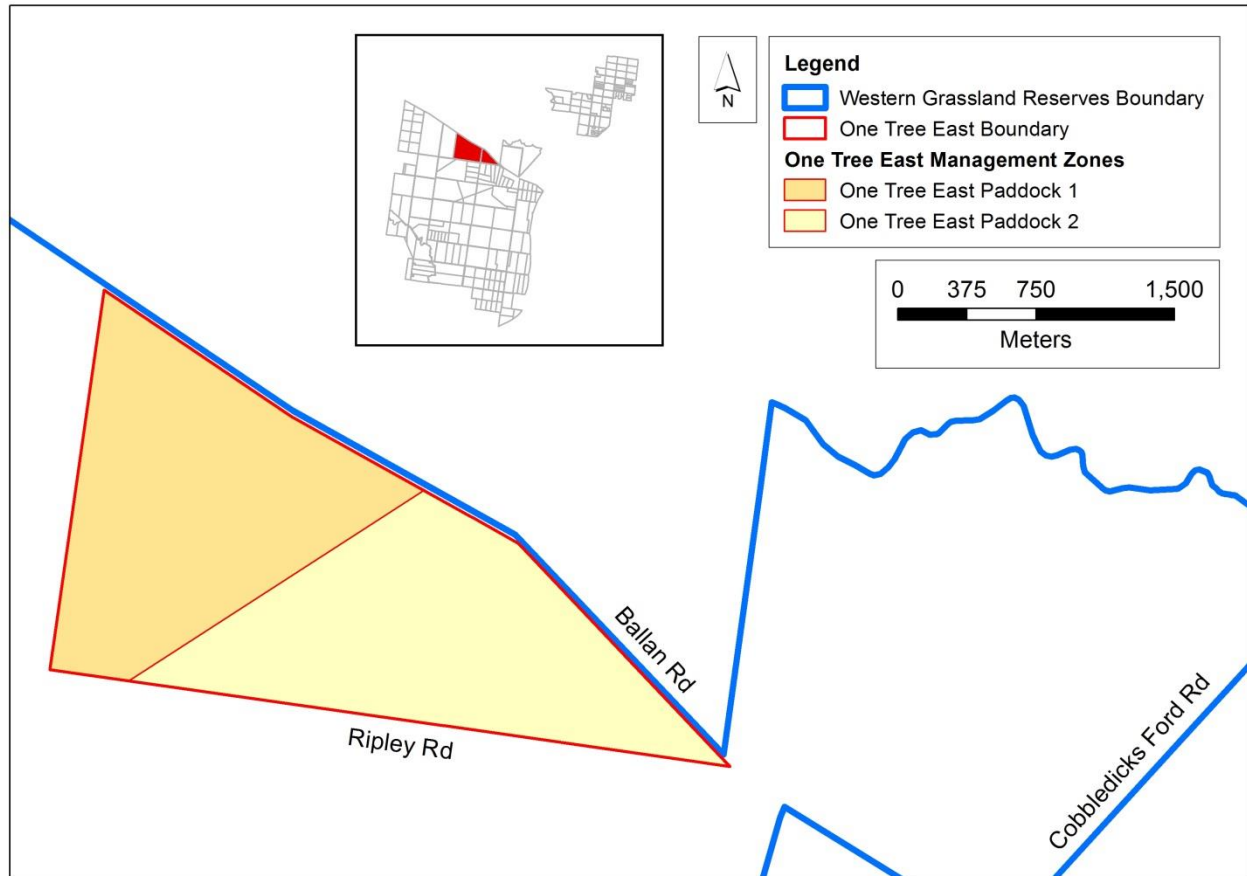


Figure 1. The survey area – One Tree East. Inset shows the location of One Tree East (red) within the Western Grassland Reserve.

## Previous survey information

This area has been the subject of three formal fauna surveys:

- Striped Legless Lizard surveys 2012 (Megan O'Shea)
- Targeted reptile surveys 2010 (Robertson et al., 2010)
- General and targeted fauna surveys 2011 (Biosis Research, 2011)

Additionally, a Fat-tailed Dunnart *Sminthopsis crassicaudata* found dead on Ballan Rd adjacent to the property in 2004 (ref VBA, Peter Gibbs).

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 methods described in DELWP (2015c). This document describes inventory guidelines for properties under the MSA program and the rationale for choosing particular survey techniques and targetting particular faunal groups on a property. In this case all techniques described in DELWP (2015c) were deemed suitable except for nocturnal spotlight surveys targeting Plains-wanderer, diurnal reptile surveys, and call playback surveys targeting nocturnal birds. The survey locations are shown in figure 2.

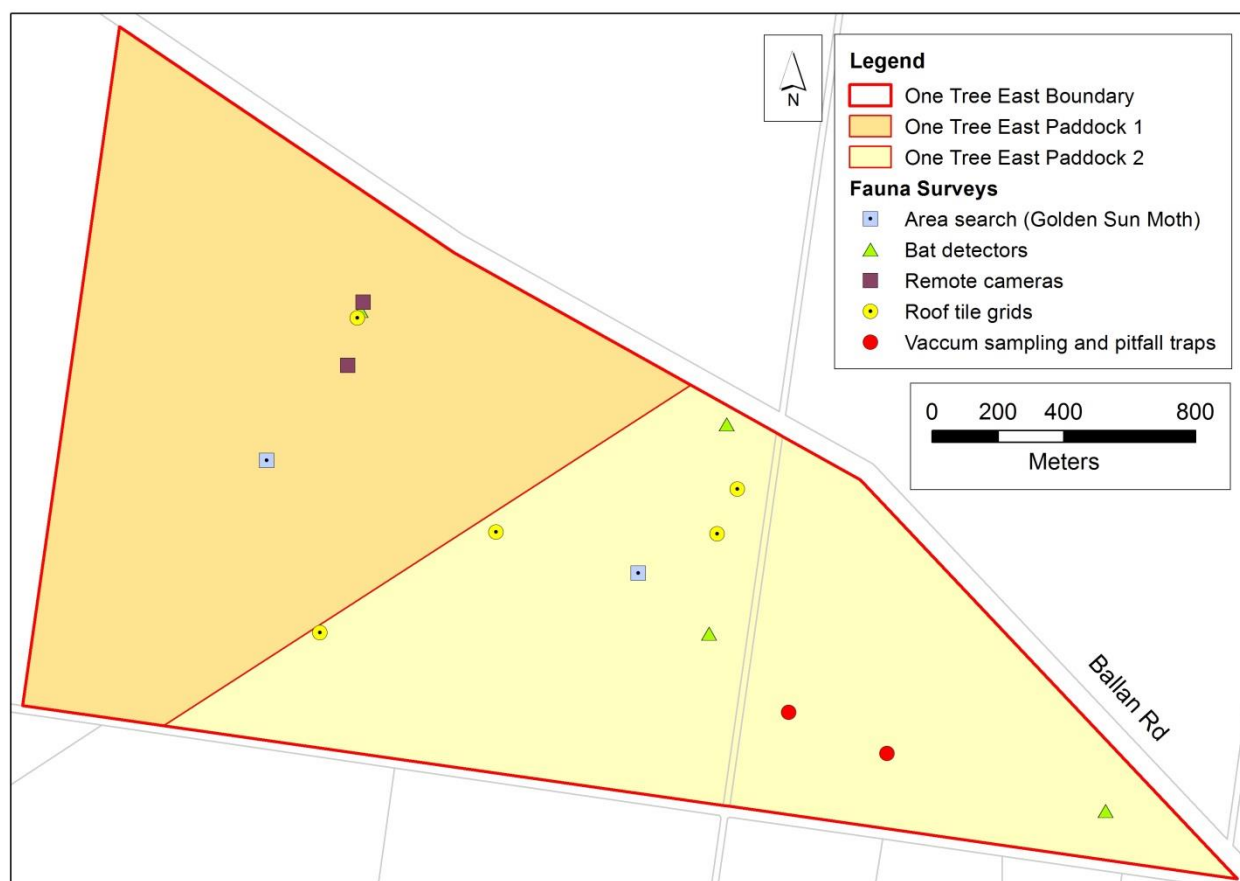


Figure 2. Survey locations on One Tree East by survey type.

## 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 this site, roof tile grids were installed at five locations between 9-11 September 2014 (Figure 2). Locations were chosen to represent the broad habitat types on the property (e.g grassland, rocky rises, areas of trees) 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	282147	5810990	15/10/14	22/04/2015
2	282205	5811129	15/10/14	22/04/2015
3	281043	5811622	30/09/14	13/03/2015
4	280978	5810667	15/10/14	22/04/2015
5	281477	5810982	15/10/14	22/04/2015

## Roof tile grids (Striped Legless Lizard)

Targeted roof tile grids were set up at eight 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- Striped Legless Lizards (GDA 94, z55)**

Grid No.	Easting	Northing	First survey date	Final survey date
1	280163	5811260	24/09/2015	9/11/2015
2	280421	5810980	21/09/2015	9/11/2015
3	281399	5811695	11/09/2015	9/11/2015
4	280997	5811295	11/09/2015	4/11/2015
5	281088	5811464	11/09/2015	4/11/2015
6	280640	5812127	22/09/2015	9/11/2015
7	280331	5811568	24/09/2015	9/11/2015
8	281608	5811302	11/09/2015	4/11/2015

## Remote cameras

Automated cameras were installed at two locations in One Tree East (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, trees areas).

## Call recognition and spotlighting (Frogs)

The dam in the eastern portion of One Tree East was surveyed using spotlighting and call recognition, primarily targeting frogs. Surveys were conducted on three separate 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 dam.

## Diurnal survey (birds)

Surveys for diurnal birds were conducted by one experienced observer on September 26<sup>th</sup> 2014 between 08:55-15:15. The property was divided into two paddocks, Paddock 1 and Paddock 2 (Figure 2). Both paddocks were systematically walked in transects ~50 m apart. All birds seen or heard were identified and the number of individuals counted. Incidental records of other vertebrates encountered during the bird surveys were also recorded.

## Bat detectors

Computerised bat echolocation call detector units (AnaBat<sup>TM</sup> 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 uncertain 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 and other nocturnal vertebrates were conducted where trees or water-bodies occur:

- along the north-western boundary
- the dam in the eastern portion of One Tree East

Each of the two treed areas was surveyed on two occasions. Observers used a white light (LENSER LED P14 torch) to locate animals, sometimes from eyeshine, and facilitate identification.

## Area search (Golden Sun Moth)

Surveys for the Golden Sun Moth were conducted according to the protocol described in the MRF (DELWP, 2015a). Two 400 x 400 m plots, each comprising 20 transects (oriented north-south) 20 m apart, were established (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
OT1	281910	5810867	04/12/2014
OT2	280776	5811184	04/12/2014

## Vacuum sampling and pitfall traps

Terrestrial arachnids were surveyed using pitfall traps and vacuum transects, at two locations, a sub-set of those locations selected for grassland monitoring (Table 4). 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.

### *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, 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*

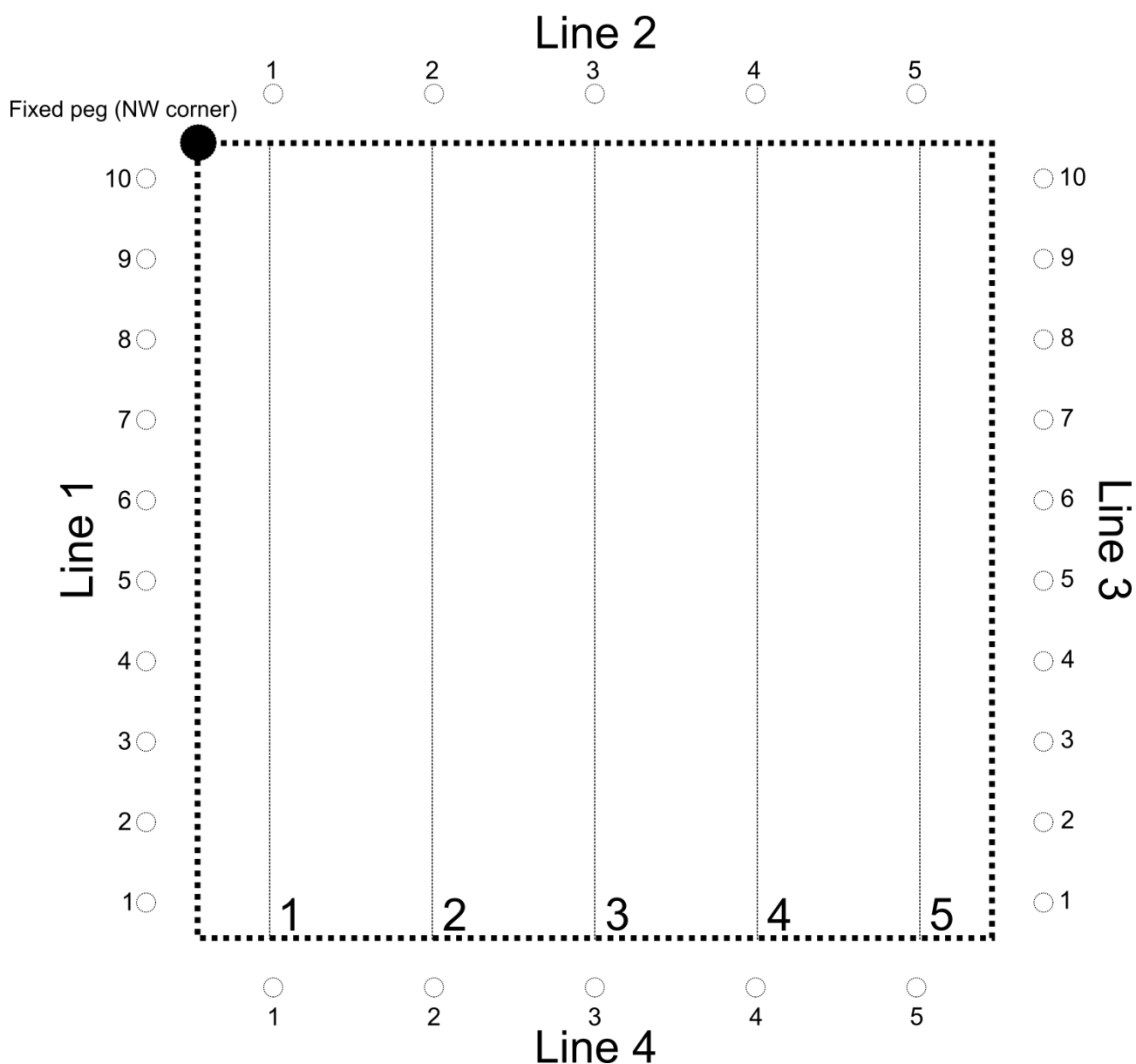
Within each of the plots five 20 m transects were established, running north-south, 4 m apart and 2 m from the edge of the plot (Figure 3). Specimens were collected using a hand-held vacuum sampler (Doxon et al., 2011), the opening covered by a mesh bag that retained the sample. Each transect was walked 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
15	C3G/NG	282375	5810456	27/11/2014	01/12/2014	01/12/2014
16	C3G/NG	282676	5810338	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 One Tree East during the survey season, usually while staff were in transit or outside of the times dedicated to standardised surveys.

In this report, fauna species in tables are sorted by Class (in the sequence: mammals, birds, reptiles, frogs, insects, spiders) then listed alphabetically by genus then by species.

# Results

## Roof tile grids

One vertebrate species was recorded during the roof tile grid survey, the introduced House Mouse *Mus musculus*. The House Mouse is considered common in grassland habitats of the WGR.

## Roof tile grids (Striped Legless Lizard)

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

## Remote cameras

Ten vertebrate species were identified from camera images (Table 5). These comprised four mammal species and six bird species. Five of these species are introduced (\*), three mammal species and two bird species. All are relatively common or wide-ranging species (e.g Red Fox and Australian Magpie, Figure 4).

**Table 5. Occurrence of vertebrates from the camera survey.**

Common name	Scientific name
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
Australian Magpie	<i>Cracticus tibicen</i>
Australian Magpie-lark	<i>Grallina cyanoleuca</i>
Eastern Grey Kangaroo	<i>Macropus giganteus</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
European Rabbit*	<i>Oryctolagus cuniculus</i>
House Sparrow*	<i>Passer domesticus</i>
Black Rat*	<i>Rattus rattus</i>
Willy Wag-tail	<i>Rhipidura leucophrys</i>
Common Starling*	<i>Sturnus vulgaris</i>
Red Fox*	<i>Vulpes vulpes</i>



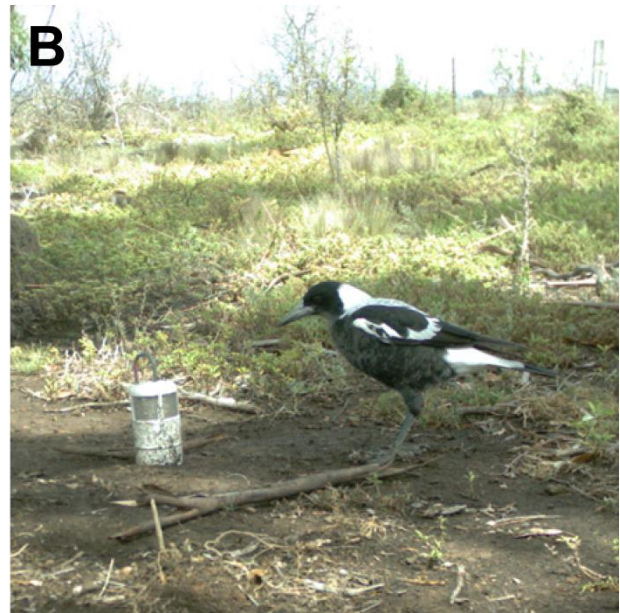


Figure 4. (A) Red Fox and (B) Australian Magpie, captured on automated camera at One Tree East

## Call recognition and spotlighting (Frogs)

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

## Diurnal survey (birds)

Twenty-four birds species (including four introduced species) were detected during diurnal bird surveys (Table 6), the most common being the introduced Common Skylark . The Little Raven was the most commonly detected native species. Two species officially listed as threatened were recorded during the survey: Black falcon, listed as Vulnerable in Victoria, and Spotted Harrier, listed as Near Threatened in Victoria (Victorian Department of Sustainability and Environment, 2013).

Records of four mammal species, three of which are introduced (\*), were also collected incidentally during these surveys (Table 5).

Table 6. Bird species detected in One Tree East on September 26th 2014.

Common name	Scientific name	Total
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	4
Common Skylark*	<i>Alauda arvensis</i>	95
Black Duck	<i>Anas superciliosa</i>	4
Richard's Pipit	<i>Anthus richardi</i>	9
Wedge-tailed Eagle	<i>Aquila audax</i>	1
European Goldfinch*	<i>Carduelis carduelis</i>	3
Spotted Harrier	<i>Circus assimilis</i>	1
Golden-headed Cisticola	<i>Cisticola exilis</i>	3
Little Raven	<i>Corvus mellori</i>	13

Common name	Scientific name	Total
Stubble Quail	<i>Coturnix pectoralis</i>	2
Australian Magpie	<i>Cracticus tibicen</i>	6
Black-shouldered Kite	<i>Elanus axillaris</i>	3
Galah	<i>Eolophus roseicapilla</i>	4
Brown Falcon	<i>Falco berigora</i>	1
Black Falcon	<i>Falco subniger</i>	1
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	2
Superb Fairy-wren	<i>Malurus cyaneus</i>	7
Singing Bushlark	<i>Mirafraga cantillans</i>	2
Crested Pigeon	<i>Ocyphaps lophotes</i>	1
House Sparrow*	<i>Passer domesticus</i>	22
Willie Wagtail	<i>Rhipidura leucophrys</i>	2
Common Starling*	<i>Sturnus vulgaris</i>	4
Zebra Finch	<i>Taeniopygia guttata</i>	4
Masked Lapwing	<i>Vanellus miles</i>	1

## Bat detectors

AnaBat detectors recorded ten insectivorous bat species across One Tree East (Table 7). All are relatively common species and exhibit broad continental or Victorian distributions (Menkhorst and Knight, 2011).

**Table 7. Occurrence of insectivorous bats for One Tree East derived from the AnaBat detectors. The habitat at each detector location was; OT1: beside dam in grassland parcel, OT2: grassland, OT3: along line of Sugar Gums down fenceline and OT4: small dry temporary wetland. ^The calls of three species of Long-eared Bat (*Nyctophilus*) cannot be distinguished.**

Common name	Scientific name	OT1	OT2	OT3	OT4
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	✓	✓		✓
Chocolate Wattled Bat	<i>Chalinolobus morio</i>	✓	✓	✓	✓
Southern Freetail Bat	<i>Mormopterus planiceps</i> (lp)	✓	✓		✓
Eastern Freetail Bat	<i>Mormopterus ridei</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 along the fenceline row of Sugar Gums near the western periphery of the One Tree East Block. This location was the only one in the block with mature trees. The call-playback session failed to elicit any birds.

## Spotlighting (arboreal mammals)

Spotlight surveys of treed areas in One Tree East yielded three species (Table 8).

**Table 8. Vertebrate records from the nocturnal search and spotlight surveys of One Tree East.**

Common name	Scientific name	Total
Australian Magpie	<i>Cracticus tibicen</i>	7
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	1
Red Fox*	<i>Vulpes vulpes</i>	2

## Area search (Golden Sun Moth)

Flying male Golden Sun Moths were detected at both study plots; the times to detection at the two sites were six and 16 minutes (Table 9). Multiple moths were observed at both plots.

**Table 9. Results of area searches for Golden Sun Moth at One Tree East (GDA 94, z55).**

Plot	Easting	Northing	Moth detected	Time to detection (mins)
OT1	282048	5810856	✓	6
OT2	280717	5811083	✓	16

## Vacuum sampling and pitfall traps

Spider surveys yielded 330 specimens from six families, 59 (18%) specimens were not identified to family level (Table 10). Unidentified spiders were mostly juveniles with features that were not developed enough for identification. Two families, Lycosidae (Wolf Spiders) and Miturgidae (Prowling Spiders), were very common and collected from most pitfall traplines at each both sampling site. Salticidae (Jumping Spiders) were the most commonly collected using vacuum samples. Two families, Zodariidae (Ant Spiders) and Prodidomidae (Long Spinnerete Ground Spiders) were uncommon, represented by one or two specimens.

**Table 10. Spider families recorded from pitfall and vacuum sampling at One Tree East in 2014.**

Common Name	Scientific name	Pitfall	Vacuum	Total
Ground Spiders	Gnaphosidae	11		11
Wolf Spiders	Lycosidae	50	1	51
Prowling Spiders	Miturgidae	45		45
Long Spinnerete Ground Spiders	Prodidomidae	2		2
Jumping Spiders	Salticidae	3	158	161
Ant Spiders	Zodariidae	1		1
Unidentified		3	56	59
Total		115	215	330

## Incidental observations

Twenty-three vertebrate species were recorded incidentally during fauna surveys of One Tree East, comprising generally widespread and common species, seven of which are introduced species (\*) (Table 11).

**Table 11. Additional species recorded incidentally from One Tree East during visits September 2014-June 2015.**

Common name	Scientific name
Common Myna*	<i>Acridotheres tristis</i>
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Emu	<i>Dromaius novaehollandiae</i>
Nankeen Kestrel	<i>Falco cenchroides</i>
Cat*	<i>Felis catus</i>
Redback Spider	<i>Latrodectus hasseltii</i> (Family: Theridiidae)
Brown Hare*	<i>Lepus europaeus</i>
Straw-necked Ibis	<i>Threskiornis spinicollis</i>
Banded Lapwing	<i>Vanellus tricolor</i>
Black Wallaby	<i>Wallabia bicolor</i>

## Threatened species

Three threatened species were recorded from One Tree East during this study: Black Falcon, Spotted Harrier, Golden Sun Moth.

## Conclusion

A total of 55 terrestrial vertebrate species were recorded during the 2014-2015 survey of One Tree East in the WGR, comprising 18 mammal species (including at least ten bat species), 31 bird species, three reptile species and three frog species. In all, eleven introduced species were recorded, comprising six mammal species and five bird species. Most of the vertebrate species identified from the area during this study are common and widespread and considered habitat generalists. However, the wetlands on the property were dry during the survey period, during wet periods they may be inhabited by additional species, particularly frogs, turtles and water birds.

Seven spider families were recorded. These families are principally hunting spiders (Gnaphosidae, Lycosidae, Miturgidae, Salticidae and Prodidomidae). However, the tangle-web building Redback Spider (*Latrodectus hasseltii*) and the ant and termite specialist family Zodariidae were also found.

A list of species recorded from One Tree East, 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 One Tree East block: Black Falcon, Spotted Harrier Emu and Golden Sun Moth from this study, and Fat-tailed Dunnart from surveys conducted in 2010 (Robertson et al., 2010).

The Black Falcon (*Falco subniger*) (Vulnerable in Victoria; Victorian Department of Sustainability and Environment, 2013). It is the largest of the Australian falcons and is sparsely spread in the inland and across northern, eastern, southern and central Australia (Birdlife Australia website). The Black Falcon inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees (NSW Office of Environment & Heritage, 2013).

The Spotted Harrier (*Circus assimili*) (Near Threatened in Victoria; Victorian Department of Sustainability and Environment, 2013). It has a broad distribution across open environments of the Australian mainland: grassy open woodland, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands (NSW Office of Environment & Heritage, 2013).

The Emu (*Dromaius novaehollandiae*) as Near Threatened in Victoria; Victorian Department of Sustainability and Environment, 2013) is Australia's largest native bird. This flightless species has a broad continental distribution and is found in a range of habitats, including grasslands and open woodlands. It is listed in Victoria. One individual, most likely an escapee from an emu farm, was recorded on One Tree East in 2012.

The Fat-tailed Dunnart (*Sminthopsis crassicaudata*) Near Threatened in Victoria; Victorian Department of Sustainability and Environment, 2013) was recorded in One Tree East 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).

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 One Tree East 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 One Tree East, 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.

Although not recorded on One Tree East, there are historical records of the following threatened species in the surrounding area: 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*). Both of these species are known to prey on native mammals, birds and reptiles. The property also supports a population of European Rabbits (*Oryctolagus cuniculus*) and Brown Hare (*Lepus europaeus*) and Black Rat (*Rattus rattus*) was also detected. Additionally, five introduced bird species were detected.



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## Appendix 1: List of taxa recorded on One Tree East

The list below presents all species of terrestrial vertebrates, ordered alphabetically by genus then species within each vertebrate Class, recorded from the One Tree East 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>				
Brown Hare*	<i>Lepus europaeus</i>				
Eastern Grey Kangaroo	<i>Macropus giganteus</i>				
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>				
Black rat*	<i>Rattus rattus</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>				
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>					
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>				
Common Myna*	<i>Acridotheres tristis</i>				
Common Skylark*	<i>Alauda arvensis</i>				
Black Duck	<i>Anas superciliosa</i>				
Richard's Pipit	<i>Anthus richardi</i>				
Wedge-tailed Eagle	<i>Aquila audax</i>				
White-necked Heron	<i>Ardea pacifica</i>				

Common name	Scientific name	EPBC Status	Advis	FFG	Additional taxa from other studies
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>				
European Goldfinch*	<i>Carduelis carduelis</i>				
Spotted Harrier	<i>Circus assimilis</i>		NT		
Golden-headed Cisticola	<i>Cisticola exilis</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>				
Emu	<i>Dromaius novaehollandiae</i>		NT		
Black-shouldered Kite	<i>Elanus axillaris</i>				
Galah	<i>Eolophus roseicapilla</i>				
Brown Falcon	<i>Falco berigora</i>				
Nankeen Kestrel	<i>Falco cenchroides</i>				
Black Falcon	<i>Falco subniger</i>		V		
Australian Magpie-lark	<i>Grallina cyanoleuca</i>				
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>				
Superb Fairy-wren	<i>Malurus cyaneus</i>				
Singing Bushlark	<i>Mirafra cantillans</i>				
Crested Pigeon	<i>Ocyphaps lophotes</i>				
House Sparrow*	<i>Passer domesticus</i>				
Eastern Rosella	<i>Platycercus eximius</i>				
Willy Wagtail	<i>Rhipidura leucophrys</i>				
Common Starling*	<i>Sturnus vulgaris</i>				
Straw-necked Ibis	<i>Threskiornis spinicollis</i>				
Zebra Finch	<i>Taeniopygia guttata</i>				
Masked Lapwing	<i>Vanellus miles</i>				
Banded Lapwing	<i>Vanellus tricolor</i>				
<b>Reptiles</b>					
Common Blue-tongued Lizard	<i>Tiliqua scincoides</i>				✓
<b>Frogs</b>					
Common Froglet	<i>Crinia signifera</i>				✓
Pobblebonk	<i>Limnodynastes dumerilii</i>				
Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>				
<b>Insects</b>					
Golden Sun Moth	<i>Synemon plana</i>	CR	CR	L	
<b>Spiders</b>					
Ground Spiders	Gnaphosidae				
Wolf Spiders	Lycosidae				
Prowling Spiders	Miturgidae				
Long Spinnerete Ground Spiders	Prodidomidae				
Jumping Spiders	Salticidae				
Redback spider	Theridiidae ( <i>Latrodectus hasseltii</i> )				

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Ant Spiders

Zodariidae

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

The list below presents all species of terrestrial vertebrates, ordered alphabetically by genus then species within each vertebrate Class, recorded from the One Tree East 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 (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>										
Brown Hare*	<i>Lepus europaeus</i>										
Eastern Grey Kangaroo	<i>Macropus giganteus</i>		✓								
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>		✓								
Black rat*	<i>Rattus rattus</i>		✓								
Inland Broad-nosed Bat	<i>Scotorepens balstoni</i>					✓					
Fat-tailed Dunnart	<i>Sminthopsis crassicaudata</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>					✓					
Red Fox*	<i>Vulpes vulpes</i>		✓								
Black Wallaby	<i>Wallabia bicolor</i>									✓	
<b>Birds</b>											
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>		✓		✓						
Common Myna*	<i>Acridotheres tristis</i>										



Common name	Scientific name	Roof tile grids	Remote cameras	Call recognition and spotlighting (frogs)	Diurnal survey (birds)	Bat detectors	Spotlighting – arboreal mammals	Area search - GSM	Spider surveys – pitfall and/or vacuum	Additional species from Incidental Records	Other surveys
Common Skylark*	<i>Alauda arvensis</i>				✓						
Black Duck	<i>Anas superciliosa</i>				✓						
Richard's Pipit	<i>Anthus richardi</i>				✓						
Wedge-tailed Eagle	<i>Aquila audax</i>				✓						
White-necked Heron	<i>Ardea pacifica</i>										
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>									✓	
European Goldfinch*	<i>Carduelis carduelis</i>				✓						
Spotted Harrier	<i>Circus assimilis</i>				✓						
Golden-headed Cisticola	<i>Cisticola exilis</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>									✓	
Emu	<i>Dromaius novaehollandiae</i>									✓	
Black-shouldered Kite	<i>Elanus axillaris</i>				✓						
Galah	<i>Eolophus roseicapilla</i>				✓						
Brown Falcon	<i>Falco berigora</i>				✓						
Nankeen Kestrel	<i>Falco cenchroides</i>									✓	
Black Falcon	<i>Falco subniger</i>				✓						
Australian Magpie-lark	<i>Grallina cyanoleuca</i>		✓								
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>				✓						
Superb Fairy-wren	<i>Malurus cyaneus</i>		✓		✓						
Singing Bushlark	<i>Mirafra cantillans</i>				✓						
Crested Pigeon	<i>Ocyphaps lophotes</i>				✓						
House Sparrow*	<i>Passer domesticus</i>		✓		✓						
Eastern Rosella	<i>Platycercus eximius</i>									✓	
Willy Wagtail	<i>Rhipidura leucophrys</i>		✓		✓						
Common Starling*	<i>Sturnus vulgaris</i>		✓		✓						
Zebra Finch	<i>Taeniopygia guttata</i>				✓						
Masked Lapwing	<i>Vanellus miles</i>				✓						
Banded Lapwing	<i>Vanellus tricolor</i>									✓	
Reptiles											

Common name	Scientific name	Roof tile grids	Remote cameras	Call recognition and spotlighting (frogs)	Diurnal survey (birds)	Bat detectors	Spotlighting – arboreal mammals	Area search - GSM	Spider surveys – pitfall and/or vacuum	Additional species from Incidental Records	Other surveys
Common Blue-tongued Lizard	<i>Tiliqua scincoides</i>										✓
<b>Frogs</b>											
Common Froglet	<i>Crinia signifera</i>										✓
Pobblebonk	<i>Limnodynastes dumerilii</i>										✓
Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>										✓
<b>Insects</b>											
Golden Sun Moth	<i>Synemon plana</i>							✓			
<b>Spiders</b>											
Ground Spiders	Gnaphosidae								✓		
Wolf Spiders	Lycosidae								✓		
Prowling Spiders	Miturgidae								✓		
Long Spinnerete Ground Spiders	Prodidomidae								✓		
Jumping Spiders	Salticidae								✓		
Redback spider	Theridiidae ( <i>Latrodectus hasseltii</i> )									✓	
Ant Spiders	Zodariidae								✓		

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