



# Dargues Terrestrial Ecology Monitoring Survey Report 2024

ScatsAbout and SG Ecology | for Aurelia Metals | June 3, 2024

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<b>Abbreviation</b>	<b>Description</b>
<b>BAM</b>	Biodiversity Assessment methodology 2020
<b>BBAM</b>	BioBanking Assessment Methodology
<b>BC Act</b>	NSW Biodiversity Conservation Act 2016
<b>BMP</b>	Biodiversity Management Plan
<b>BOA</b>	Biodiversity Offset Area
<b>cm</b>	centimeters
<b>DGM</b>	Dargues Gold Mine
<b>E</b>	Exotic species
<b>EEC</b>	Endangered Ecological Community
<b>ha</b>	hectares
<b>HBT</b>	Hollow bearing tree
<b>HTE</b>	High threat exotic weed
<b>km</b>	Kilometers
<b>LWD</b>	Large woody debris (>10cm diameter)
<b>m</b>	Meters

## Introduction

ScatsAbout and SG Ecology were engaged by Aurelia Metals Ltd to complete the annual terrestrial flora and fauna monitoring program for Dargues Gold Mine (DGM) for the 2022 -23 survey period as detailed in the Biodiversity Management Plan (BMP) (R. 1W. Corkery & Co. 2012) and previous monitoring reports (ELA 2021; EnviorKey 2015; ELA 2017a; ELA 2018a).

This report summarises the results of 2022/23 terrestrial monitoring within the onsite Biodiversity Offset Area (BOA) and associated reference sites. Recommendations to guide management and ongoing monitoring priorities are provided within the summary section.

## Project context and background

DGM is located 2.5 km north of Majors Creek and 13 km south of Braidwood, in the South Eastern Highlands Bioregion of New South Wales.

DGM was granted project approval in February 2012, and a BMP was prepared in May 2012 (R.W. Corkery & Co 2012). In accordance with the conditions of project approval, the BMP outlines the requirements for monitoring vegetation (flora) and fauna at DGM.

These requirements include:

- Monitoring of six vegetation quadrats (four on-site and two off-site reference sites) in Tableland Basalt Forest of the Sydney Basin and South Eastern Highlands Bioregion ('Tableland Basalt Forest') endangered ecological community (EEC), and native grassland areas. The off-site monitoring sites are to be located in good condition examples of these EECs to act as references against which to assess the performance of the On-site Biodiversity Offset Strategy (R.W. Corkery & Co. 2012).
- Fauna monitoring at four locations as previously identified by EnviroKey in the Terrestrial Flora and Fauna Monitoring Report (2015). Monitoring at each location includes surveys for diurnal birds, nocturnal species, microchiropteran bats (microbats) and ground fauna (amphibians, terrestrial mammals and reptiles).

Flora monitoring occurs at six locations in autumn and spring, with fauna monitoring occurring in early summer (i.e. December). As noted in previous reports, due to a large fire in Tallaganda National Park area that began in November 2019, fauna monitoring was not undertaken in that year.

DGM was in care and maintenance mode, from December 2013 to 2017. Therefore, as no development work had occurred prior to this, it is considered that results from surveys undertaken during that time represent the "baseline" condition of vegetation on-site. The 2017 report presented the first results with the potential to indicate any impacts directly related to project activities.

## Methods

### TERRESTRIAL FLORA MONITORING

Flora monitoring was conducted by Sarah Glauert and Georgeanna Story on 8 November 2023 (Spring) and 25 March 2024 (Autumn). Monitoring continued at the six previously established flora monitoring sites, as described in EnviroKey (2015) (**Figure 2**).

Site 1 and 4 are located within the DMG project boundary and have historically been considered areas of native dominated grassland (“native grassland”). It is worth noting that all of the ‘native grassland’ monitoring sites are mapped PCT 0 (not classified) within the newly released State Vegetation Type Mapping (SVTM) (Sept 2022). In 2014 Site 6 was relocated approximately 150 m north due to changed access arrangements. Site 6 has been used as the off-site grassland reference. However, following modifications to the original project approval, the DGM project boundary now encompasses Site 6, as such the site can no longer technically be considered an “off-site” reference site in accordance with the BMP. Given there are currently no suitable alternative sites available for monitoring and the value of the data gathered at the site to date, monitoring at this site has continued and will continue in the absence of a suitable off-site reference location.

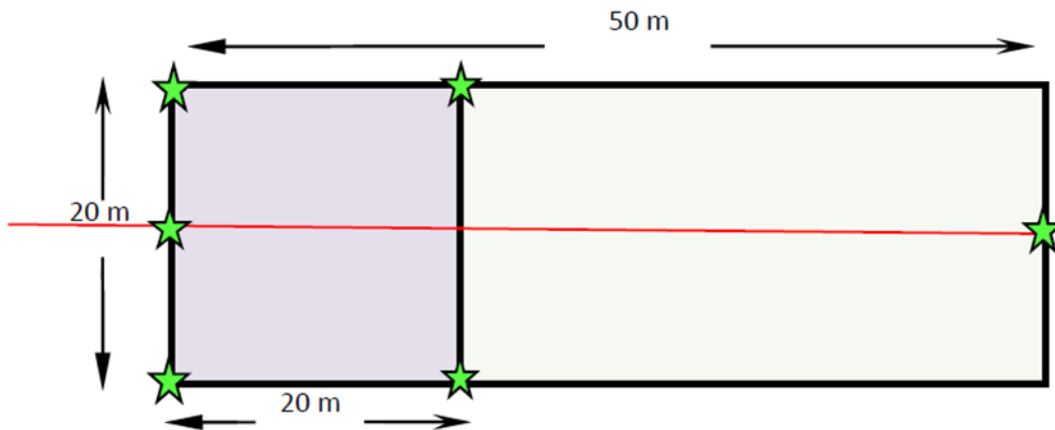
Sites 2 and 3 are located in remnant Ribbon Gum – Narrow-leaved Peppermint Grassy Open Forest (“open forest”) inside the DGM project boundary (“on-site”). Site 5 is the “off-site” reference for this open forest vegetation community. This vegetation community is described in the BMP as corresponding to Tableland Basalt Forest, listed as an EEC under the NSW *Biodiversity Conservation Act 2016* (BC Act). Recent updates to the SVTM now show Site 4 as mapped as PCT 3347 - Southern Tableland Creekflat Ribbon Gum Forest and Sites 3 and 5 mapped as 3348 - Southern Tableland Granites Ribbon Gum Grassy Forest. Neither of these PCTs correlate to the EEC Tableland Basalt Forest as they do not occur within the correct Bioregion as listed in the EEC description. Tabulation of the vegetation data collected during the recent survey events verifies that this updated PCT mapping is correct.

At each flora monitoring site, monitoring was undertaken using the Biodiversity Assessment Methodology (BAM 2020) rather than the previously used BioBanking Assessment Method (BBAM) (OEH 2014). The main metrics of species diversity and density are recorded in the same way for both methodologies. As highlighted in the 2014 monitoring report (EnviroKey 2015), flora monitoring sites were initially established and assessed using inconsistent methodologies. In accordance with the BBAM, from autumn 2016 ELA adopted the standard nested 50 m x 20 m and 20 m x 20 m quadrat (Biometric plot) for all six monitoring sites, this was continued in 2024 using the BAM methodology.

Biometric transects ran downslope from the start point, with the nested 20 m x 20 m floristic quadrat located at the upslope end of the transect. The start and end points of each transect were recorded with a handheld GPS. Photographs were taken from the start and end points,

facing down the transect, 90 deg to the right, 180 and 270 degrees (respectively) along the transect.

In spring 2016, monitoring sites were permanently marked with star pickets in the layout presented in Figure 1 below (i.e. pickets placed at the start and end of the 50 m transect, and at each corner of the nested 20 m x 20 m flora quadrat). This layout is consistent with BAM 2020 and was therefore used for both recent survey round. This ensures that the data collected is comparable with that from previous years.



**Figure 1:** Marking and layout of Biometric plot (★) = star picket)

*Figure 1 Marking and layout of Biometric sites*

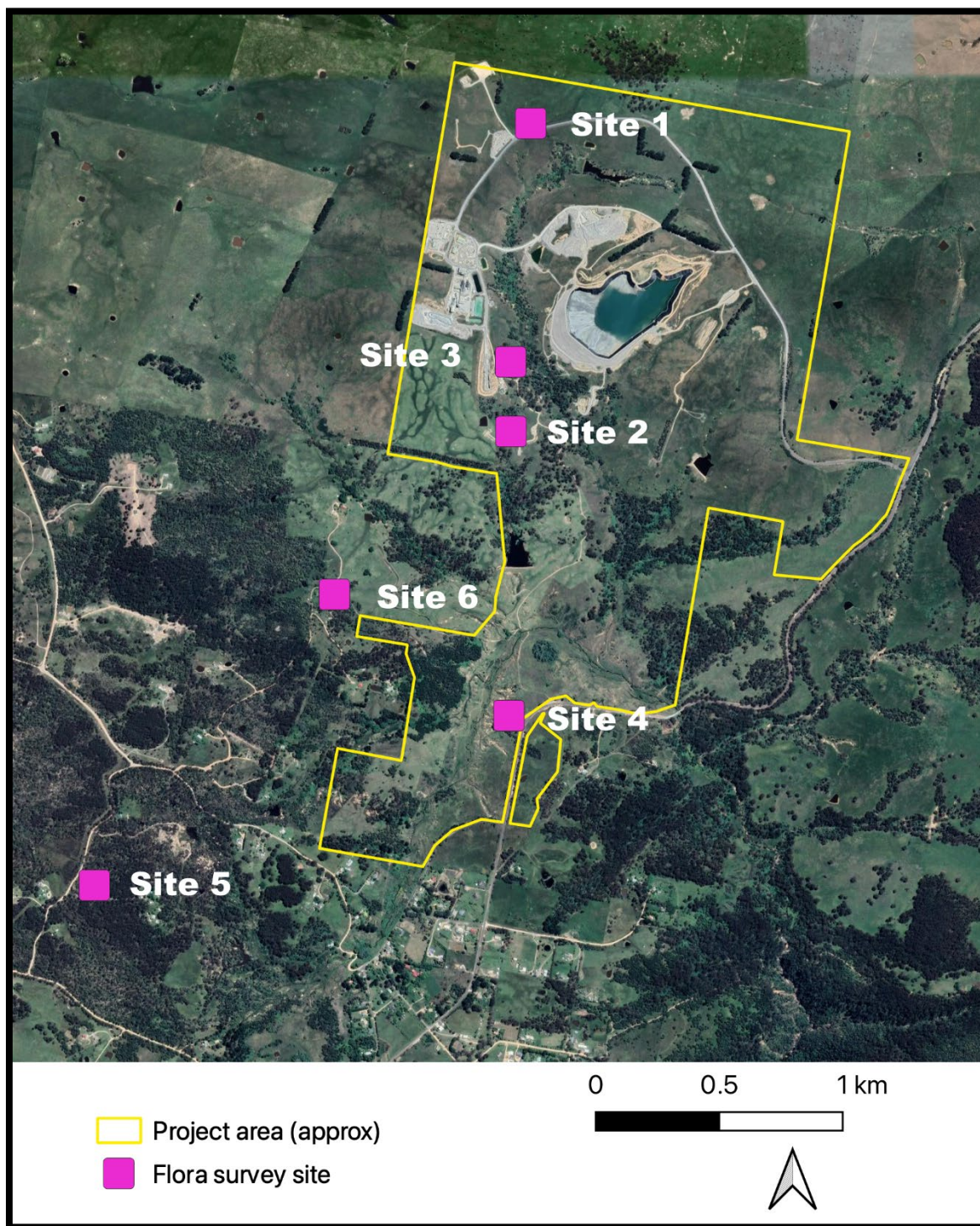


Figure 2 Location of flora survey sites



## TERRESTRIAL FAUNA MONITORING

Fauna surveys were undertaken to maintain consistency with previous surveys (Eco Logical Australia 2017) and sites (EnviroKey 2015). The 4 survey sites are highlighted in Figure 3. Surveys were conducted from 14 - 17 February 2023.

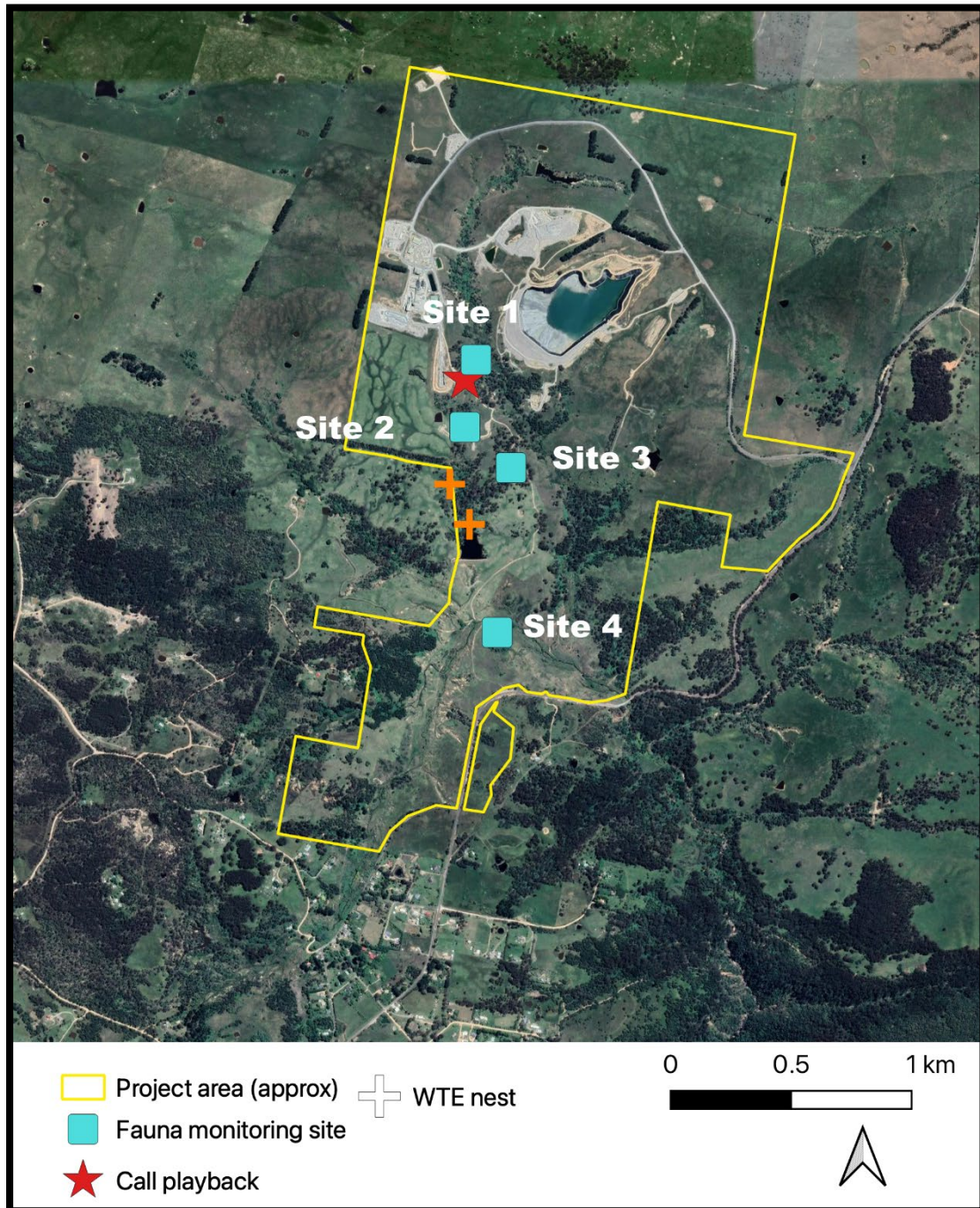


Figure 3 Location of fauna survey sites

### Diurnal bird survey

Diurnal bird surveys were undertaken at all 4 sites from 14 - 17 February 2023. Each site was randomly surveyed during the early morning and late afternoon over 3 consecutive days. Each survey consisted of a 20 minute timed species count within a 2 hectare (ha) area. Surveys consisted of an initial 10 minute observation from a central point, followed by a further 10 minute meandering observation within the 2ha area. All species observed within the 2ha site were recorded and any species heard or observed outside of the site were noted as incidental observations. Field identification guides used were Morcombe & Stewart (2010).

### Little Eagle nest survey

A systematic foot survey was undertaken across the site to detect little eagle (*Hieraaetus morphnoides*) nests. Any potential nest was confirmed by observing individuals at the nest, presence of trace material or displaying the nest characteristics of little eagles. The position of any nest was recorded using Garmin hand held GPS.

### Diurnal herpetofauna survey

Diurnal herpetofauna surveys were completed at all 4 sites on 16 February 2023. Each site survey comprised of 1 hour of searching across a 2ha area. Searches were conducted within and under grass tussocks, leaf litter, loose bark, fallen timber, surface rocks and tree hollows. All frog and reptiles encountered were identified in the field. Field identification was assisted by Cogger (1996) and Bennett (2011).

### Camera trap survey

Two infra-red cameras (Browning Spec Ops Edge BCT-8E) were deployed at each site and recorded for 10 consecutive days from the 15 February 2023. Cameras were secured to a bracket and steel post and positioned 3-5m from the bait station to provide maximum viewing. At each site 1 camera was baited with the standard rolled oat/peanut butter bait, which was positioned along a fallen log. The second camera focused on a tree trunk and was baited with the standard mix as well as a honey mix that was sprayed up the tree trunk to lure arboreal fauna. Cameras were set at medium sensitivity for 3 sequential photos with a one minute delay between triggers. Images were subsequently examined for any fauna detections.

### Spotlight survey

Spotlight surveys were conducted at each site on two consecutive nights (15 & 16 February 2023). Surveys were conducted along a 100m transect using a hand held spotlight at approximately 15 meters per minute. The number and species identified was recorded for any animal sighted. When necessary, binoculars were used to confirm the identification.

### Call playback survey

Call playback was conducted at Site 1 over 2 consecutive nights (15 & 16 February 2023) for one hour per survey. Before broadcasting calls an initial 10-minute listening and spotlight search of the area was conducted to assess the presence of any owls. Each animal call was then played with a 3-minute listening period. A UE Boom speaker with a bluetooth connection to the playlist on an iPhone 11 was used to broadcast the calls. After all calls had been played another 10 minute listening and spotlight period identified any species responding by call or having moved into the area. Call playback was performed for the following species in this order: *Petaurus norfolcensis* (Squirrel Glider), *Burhinus grallarius* (Bush Stone Curlew), *Petaurus australis* (Yellow-bellied Glider), *Phascolarctos cinereus* (Koala), *Ninox strenua* (Powerful Owl), *Tyto tenebricosa* (Sooty Owl), *Tyto novaehollandiae* (Masked Owl) and *Ninox connivens* (Barking Owl).

### Microchiropteran bat survey

Microchiropteran bat (microbat) surveys were completed at each site for 2 consecutive nights between 11 - 17 February 2023. Microbat echolocations were recorded using Song Meter Mini Bat (Wildlife Acoustics) and Chorus recorders (Titley Electronics). Recorders were set to record ultrasonic microbat echolocations passively from sunset to sunrise. The WAV sound files were analysed using Kaleidoscope Pro (V5.2) in either Zero crossing and/or full spectrum formats. Recorded echolocation calls were then identified by comparison with reference call libraries and the literature (Parnaby 1992, Pennay et al. 2004, Reinhold et al 2001, Forests NSW nd). Information on species distribution was also used to help guide species identification using the references Churchill (2008), Pennay et al (2011), Australian Bat Society (2021) and Baker and Gynther (2023).

Call identification followed the protocols outlined in Ecological Australia (2021) and Lloyd et al (2006). Calls were preferentially identified using the search phase recordings and identified as a definite identification or potential identification, depending on the quality of the call. An unidentified identification was also used when recordings contained less than 3 pulses and identification confidence was low. The Long-eared bats (*Nyctophilus* spp.) are difficult to identify to species level with any confidence and were therefore pooled together (Pennay *et al* 2004). There are two *Nyctophilus* species present in the region, the Lesser long-eared bat (*N. geoffroyi*) and Gould's long-eared bat (*N. gouldii*). Neither species are listed as threatened.

### Incidental observations

Any additional fauna or fauna trace observed during site visits were recorded and included in the final site species list. The position of any threatened species were recorded.

## Results

Weather conditions for the flora surveys were favourable however it should be noted that due to La Nina the area experienced a wetter and colder spring and summer than is usual. It is believed that this has resulted in slow germination and growth of many native forbs and grasses.

Weather conditions throughout the survey period were mild to warm temperatures with no rain and no to light winds. Rainfall and temperature data as measured by the Braidwood BOM station (BOM 2023) (Table 1).

Table 1 Weather conditions during the 2023 survey

Date	Min temp °C	Max temp °C	Rainfall mm
14/02/2023	11.3	19.6	0
15/02/2023	11.8	26.7	0
16/02/2023	10.0	30.2	0
17/02/2023	11.9	32.1	0

### TERRESTRIAL FLORA

A total of 119 flora species (consisting of 88 native species, 30 exotic species, and 1 species not determined as native or exotic) were recorded across the six floristic monitoring sites during 2023/24, this is two native species more than the previous year. Three High Threat Exotic (HTE) weed species were found within the sites. These weeds are considered to be invasive and difficult to control and thus a risk to biodiversity. The following sections present detailed results of flora monitoring of open forest and native grassland sites during 2023/2024. A list of all flora species recorded during this survey round is presented in **Appendix A**. The full floristic monitoring data from spring and autumn has been provided to Aurelia Metals Ltd in Excel format. Photographs of each site are included in **Appendix B**.

#### Native grasslands

Plot data collected at each grassland site is presented in Table 2 below. As expected for grasslands there are no canopy or hollow-bearing present. A low shrub layer of *Kunzea parvifolia* (Violet Kunzea) remains present at Site 4. While native, this species is considered indicative of past clearing and soil disturbance is not reflective of typical shrub cover or composition in the context of native grasslands. Table 3 displays the dominant flora species present at each site.

Table 2 Biometric data for grassland plots

Site No.	Location	Native sp. Number	% Cover										
			Tree	Shrub	Forbs	Grass	Other	Exotic sp. Number	Regn. Y/N	HBT	Logs (m)	Litter cover %	% HTE Cover
<b>Spring 2022</b>													
Site 1	On site	13	0	0	1.5	13.7	0	9	N/A	0	0	60	0
Site 4	On site	19	0	2	3.4	73.1	0	9	N/A	0	0	24	0.2
Site 6	Off site	16	0	0	1	6.8	0	13	N/A	0	0	37	0.1
<b>Autumn 2023</b>													
Site 1	On site	16	0	0	6.9	74.6	0	10	N/A	0	0	3.8	0
Site 4	On site	22	0	7	12.1	77	0.5	10	N/A	0	0	40	0.2
Site 6	Off site	16	0	0	3.5	32.7	0	13	N/A	0	0	3.8	2

HBT = Hollow bearing tree; HTE = Hight threat exotic weed

All grassland sites continue to contain a high cover of exotic species (Figure 5). The exotic annual grasses *Holcus lanatus* and *Paspalum dilatatum* are most common. Other exotic perennial grasses common at the grassland sites were *Vulpia muralis* and *Anthoxanthum odoratum*. Site 1 spring results reflect large areas of no live cover.

Table 3 Dominant species at each Grassland pot location

Site No.	On/Off site	Dominant Species both seasons
1	On site	<i>Microlaena stipoides</i> , <i>Cynodon dactylon</i> , <i>Paspalum dilatatum</i> *, <i>Lolium sp.</i> *, <i>Holcus lanatus</i> *
4	On site	<i>Themeda triandra</i> , <i>Hypochaeris radicata</i> *, <i>Leptorhynchus squamatus</i> , <i>Holcus lanatus</i> *, <i>Anthoxanthum odoratum</i> *
6	Off site	<i>Anthoxanthum odoratum</i> *, <i>Vulpia muralis</i> *, <i>Holcus lanatus</i> *

\*=Exotic species

As in previous years, the balance between native and exotic species changed the two seasons at each grassland location with *Microlaena* and *Themeda* performing strongest in the autumn surveys but being overshadowed by exotics in spring. Historically it does appear that exotic

species may be up to 10% greater in cover than native species during the spring window. The percentage cover of both native and exotics can be seen in Figures 3 to 6 below.

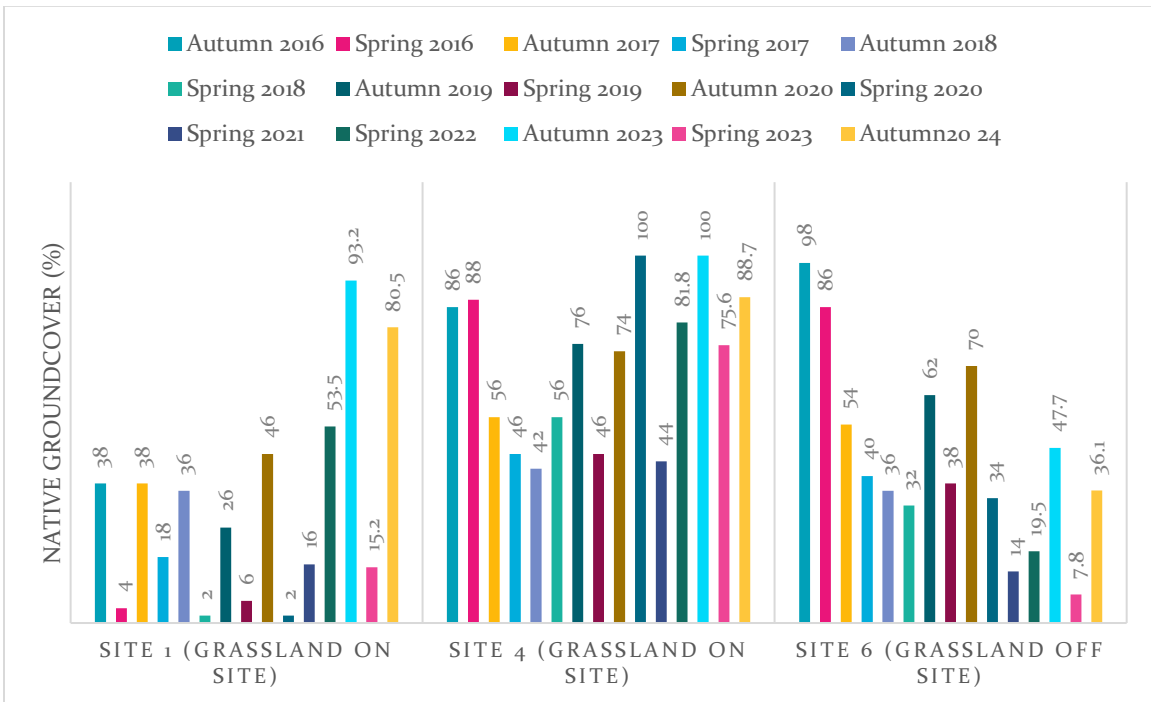


Figure 3 Native ground cover percentages within grassland plots in spring and autumn

Overall native ground cover showed a strong decline at all locations in Spring 2023. This may be due to the late start of spring rains. However, this was countered by a degree of recovery at all sites in Autumn 2024. It is interesting to note that site six continues to have a reduction in overall native groundcover where the other onsite locations are relatively stable, this appears to indicate that current onsite management of grasslands is meeting the requirements of the license.

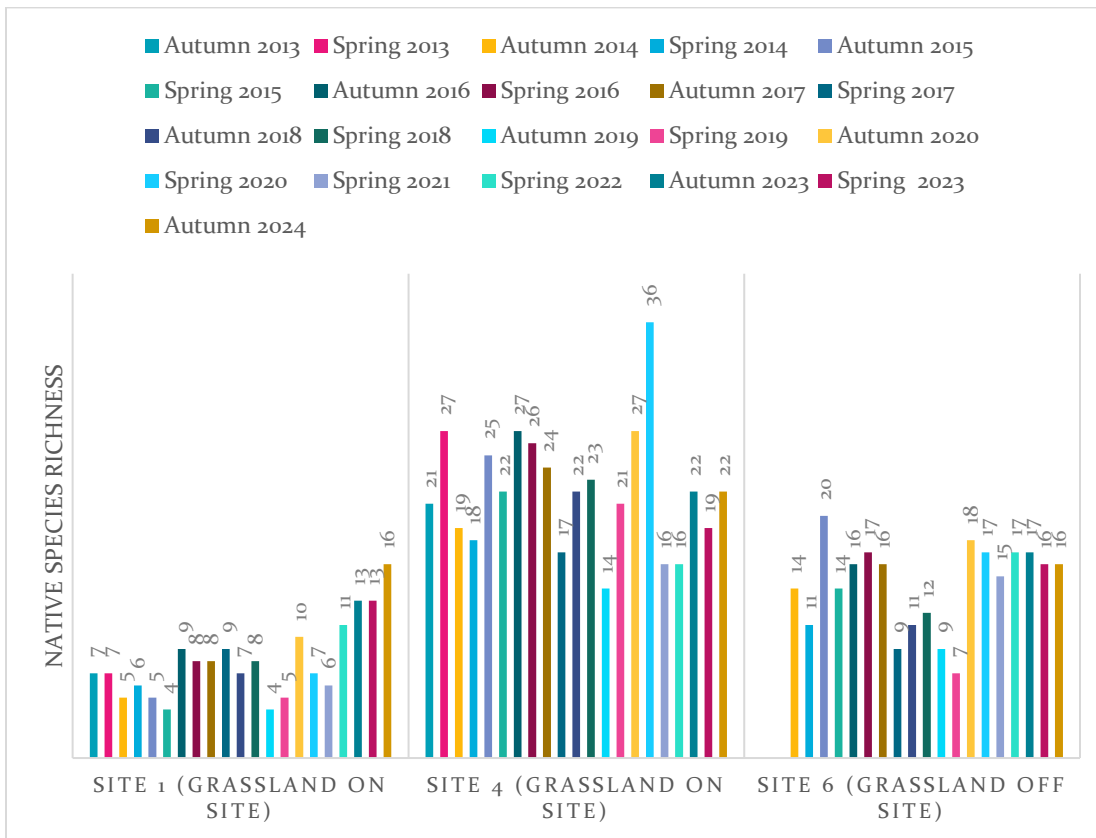


Figure 4 Native species richness at grassland sites Spring 2022 and Autumn 2023

Native species richness has fluctuated between years and seasons, this is not unexpected in vegetation communities as diversity can be strongly influenced by seasonal and yearly climate events. The timing of each monitoring event within each season is also likely to influence the diversity and cover as all species respond differently to early or late starts to Spring. Summer rainfall is also a strong driver for the diversity and cover identifiable in the Autumn survey. Historically, Site 1 appears to have suffered the highest loss of spring diversity following late rains however recovery in Autumn appears strong.

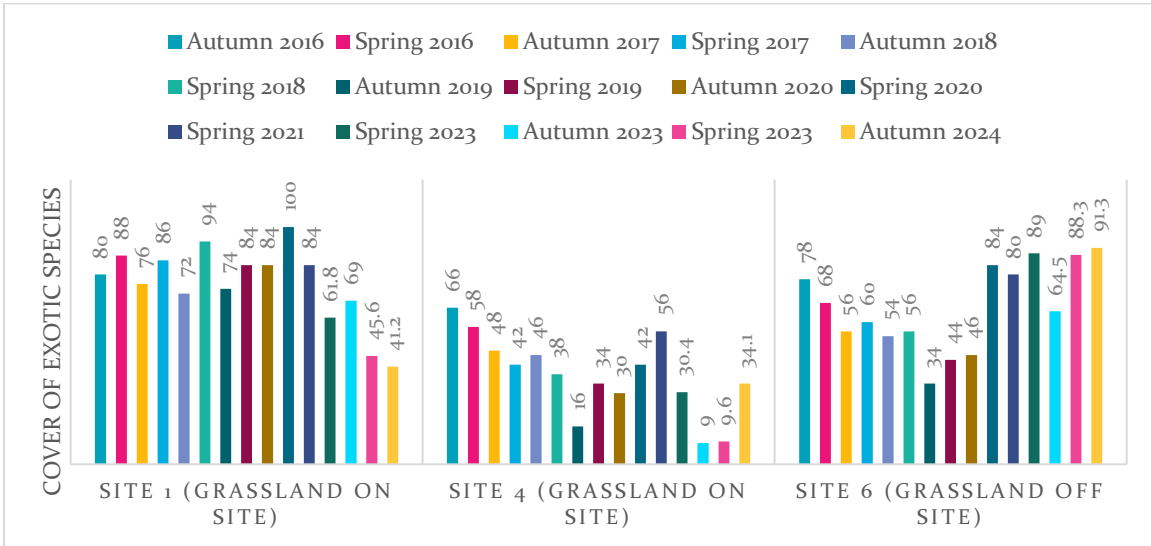


Figure 5 Exotic species cover spring 2022 and autumn 2023

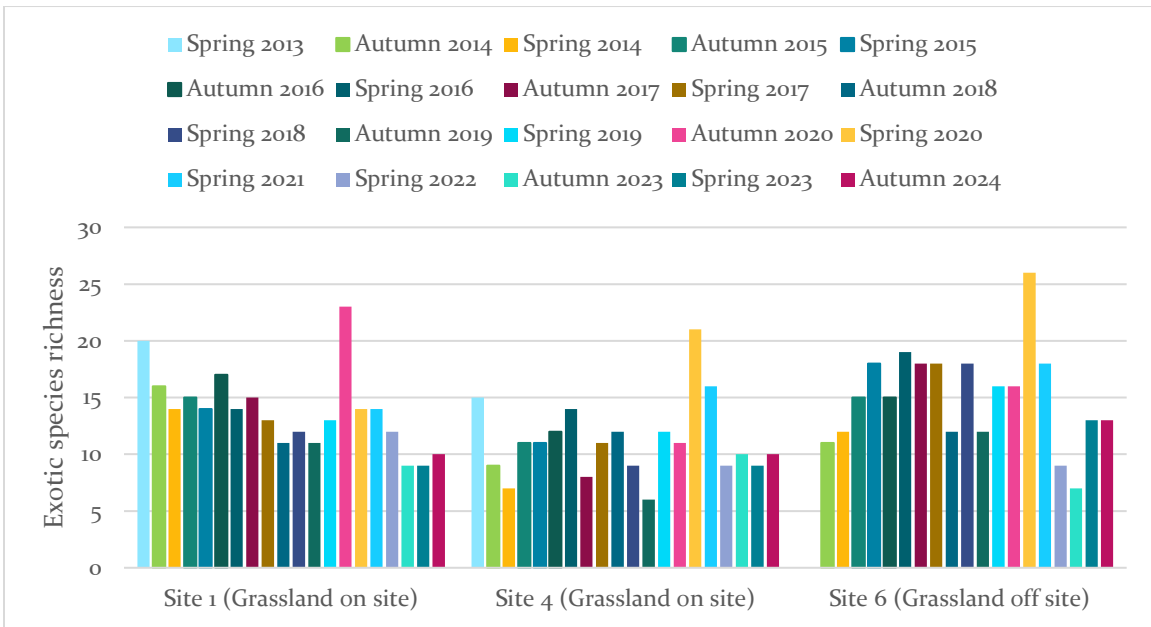


Figure 6 Exotic species richness Spring 2022 and Autumn 2023

Tables 5 and 6 display how exotic species richness and cover has shown substantial fluctuation within sites over seasons and years. Autumn 2023 was the first time the offsite exotic species richness and cover showed a dramatic decline unfortunately these species have regained a foothold at sites 4 and 6. Native species diversity remain relatively stable at all locations. During this survey round native species richness was greater than exotic species richness at all sites. Exotic species were more dominant overall in Spring at Site 1 and all year at Site 6 (offsite).. Both onsite plots showed a dominance of native grass cover in Autumn, while Site 6 (off site) has continued to show a decline in native grass cover.



## Open Forest

Plot data collected at each forest site is presented in Table 4 below. Due to the slow development of hollows, fallen timber and regeneration of trees data relating to those metrics were only collected in Spring 2023. Mature hollow-bearing trees and logs were present in all open forest monitoring sites; these features provide structural complexity and potential fauna habitat. A summary of the vegetation structure and composition of each open forest site recorded during spring 2023 is presented in Table 5.

Table 4 Biometric plot data for Open Forest sites Spring 2022 and Autumn 2023

% Cover													
Site No.	Location	Native sp. No	Tree	Shrub	Forbs	Grass	Other	Exotic sp. No	Regn Y/N	HBT	Logs (m)	Litter cover %	% HTE Cover
<b>Spring 2022</b>													
Site 2	On site	20	15	0	6.6	12.2	0.1	11	N	6	96	53	0
Site 3	On site	15	7.1	0	1	20.3	0.1	8	Y	2	100	62	0
Site 5	Off site	31	65	1.3	2.8	100	0.6	3	N	2	59	48	0
<b>Autumn 2023</b>													
Site 2	On site	13	11	0	2.5	45.1	0.1	17	-	-	-	48	5
Site 3	On site	23	9.1	0	5.6	75.7	0.1	13	-	-	-	49	10
Site 5	Off site	25	46	2	39.2	100	2.5	6	-	-	-	21	0.1

HBT= Hollow bearing tree, HTE= High Threat Exotic Weed

As described in previous monitoring reports (e.g. ELA 2021), all open forest sites are located in grassy forest dominated by an open canopy of *Eucalyptus viminalis* (Ribbon Gum) and *E. radiata* (Narrow-leaved Peppermint). The shrub layer in all plots is sparse which is indicative of these plant community types.

Table 5 Vegetation structure and composition open forest sites Spring 2022 and Autumn 2023

Site No.	On/Off site	Stratum	Dominant Species	Projected native foliage cover %
2	On site	Canopy	<i>Eucalyptus viminalis</i> , <i>E. radiata</i>	13
		Shrub	N/A	0
		Groundcover	<i>Microlaena stipoides</i>	40
3	On site	Canopy	<i>Eucalyptus radiata</i>	11
		Shrub	<i>Rubus fruticosus</i> ssp. agg*	0
		Groundcover	<i>Microlaena stipoides</i> , <i>Poa sieberiana</i> ,	65
5	Off site	Canopy	<i>Eucalyptus viminalis</i> , <i>E. radiata</i>	45
		Shrub	<i>Polyscias sambucifolia</i>	1
		Groundcover	<i>Austrostipa rudis</i> , <i>Microlaena stipoides</i> , <i>Lomandra longifolia</i> , <i>Lobelia purpurascens</i>	100

The overall groundcover at Sites 2 and 3 was significantly reduced during the spring survey due to recent herbicide spraying for exotic weeds such as Blackberry and *Lepidium africanum*. This can be clearly seen in the photographs in Appendix B The dominant onsite (Sites 2 and 3) forest groundcover was similar to the previous year with the native perennial grass *Microlaena stipoides* (Weeping Grass) and *Poa sieberiana* (Snow grass). It is worth noting that the exotic *Holcus lanatus* (Fog grass) was once again codominant with *Microlaena stipoides* at Site 2 during the spring survey. Other native grass species, such as *Rytidosperma racemosum* (Wallaby Grass), *Poa sieberiana* (Snow grass), *Themeda triandra* (Kangaroo Grass) were also present. As in previous years, Site 5 (off-site) was dominated by the native grass *Austrostipa rudis* (60% Spring 2023) with *Microlaena stipoides* dominating in Autumn 2024 (70% cover).

Exotic groundcover was significantly higher at Site 2 with over 73% cover in Autumn this is most likely to be explained as a result of the herbicide application in Spring 2023. Site 5 has shown an increase in exotic species diversity from 3 to 6 species but a decrease in exotic species cover from 3% in Autumn 2023 to 0.5% in Autumn 2024. There has been a dramatic reduction in the cover of *Lepidium africanum* at both Sites 2 & 3 where targeted spraying occurred.

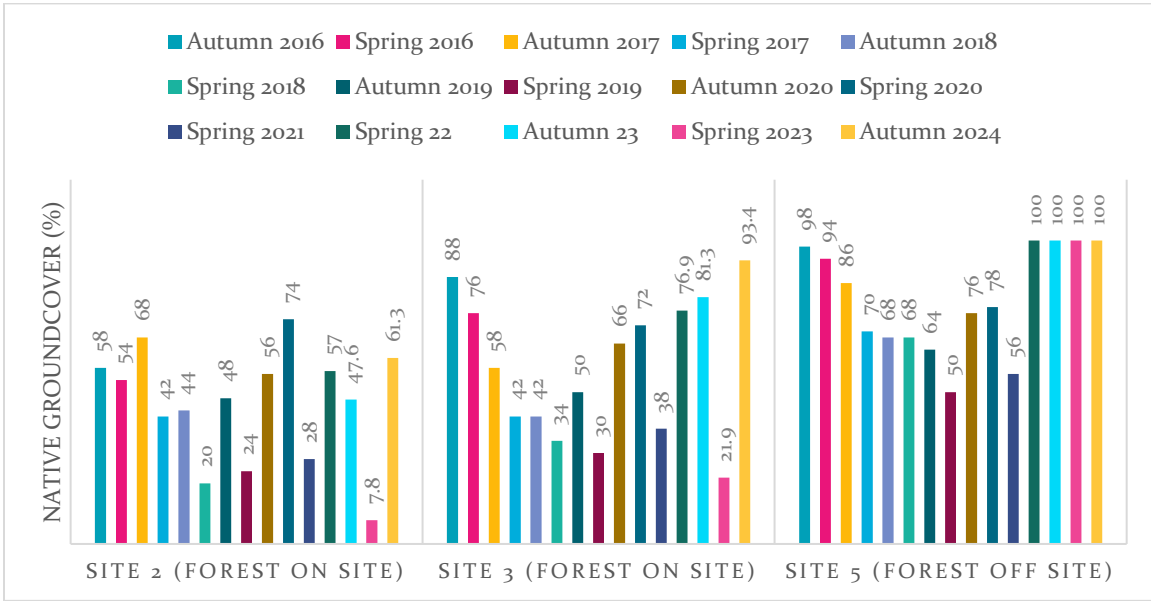


Figure 7 Native groundcover percentage Spring 2022 and Autumn 2023

The dominant onsite (Sites 2 and 3) forest groundcover was similar to previous years with the native perennial grasses *Microlaena stipoides* (Weeping Grass) and *Poa sieberiana* (Snow grass) being 50% of overall groundcover or higher. It is worth noting that the exotic *Holcus lanatus* (Fog grass) was codominant with *Microlaena stipoides* at Site 2 during the spring survey with both at 50% cover. Other native grass species, such as *Rytidosperma racemosum* (Wallaby Grass), *Poa sieberiana* (Snow grass), *Themeda triandra* (Kangaroo Grass) were also present with up to 25% cover throughout the seasons. As in previous years, Site 5 (off-site) was dominated by the native grass *Austrostipa rudis* (60% Autumn 2023) with *Microlaena stipoides* dominating in Spring 2022 (90% cover). Sites 3 and 5 continue to show a dominance of native groundcover while Site 2 is being dominated by exotic grasses as the years progress.

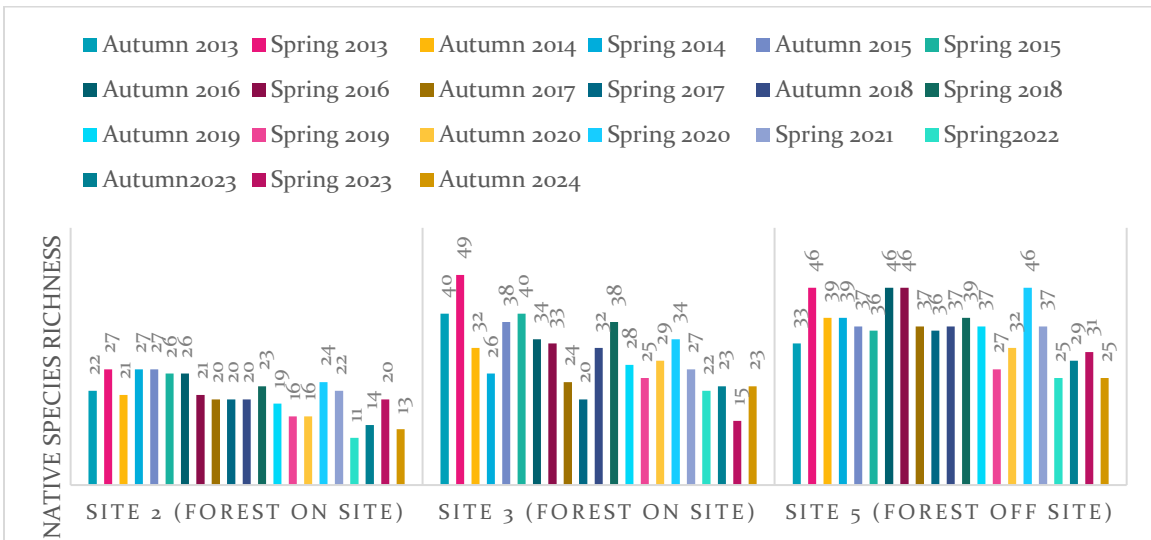


Figure 8 Native species richness forest sites Spring 2022 and Autumn 2023

The results from the flora quadrats do not show any real trend in native species richness over the last two years. The off-site reference site, Site 5, continues to have the highest native species richness of all monitoring sites, and though the overall number has reduced from 2020 (31 species in Spring 2023 down from 46) it is still higher than the on-site sites (2 and 3). Since monitoring began in 2013, native species richness has been more variable across seasons at Site 3 compared to the other open forest sites, this trend continued in Spring 2023 and Autumn 2024. A long term negative trend is seen in the native species richness at all three sites.

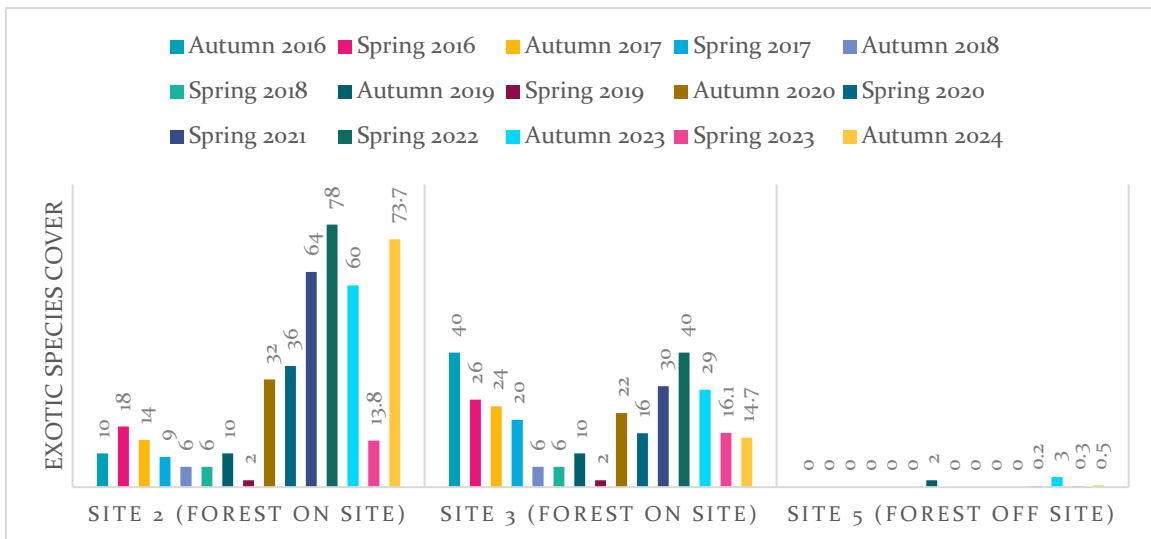


Figure 9 Exotic species cover Forest plots Spring 2022 and Autumn 2023

*Lepidium africanum* had been an emerging exotic species at Site 2 over the last six years and was also the most abundant exotic species at Site 3 in 2020. Targeted spraying of this species in Spring 2023 reduced its cover from 35% to 2% at Site 2 and 5% to 0 at Site 3. *Rubus fruticosus* (Blackberry), a High Threat Exotic and Priority Weed in the South East Local Land Services (LLS) Region, has been recorded at all three of the open forest sites in the past and is a dominant midstory species in site 3 with 10% cover in Autumn 2023. Targeted spraying has occurred since however Site 3 had 15% cover in Spring 2023. *Cytisus scoparius* (Scotch Broom), also a High Threat Exotic and Priority Weed, was recorded at Sites 2 and 3 in 2019, but have not been recorded since.

Native ground cover at Sites 2 & 3 experienced heavy decline following herbicide application prior to surveys in spring 2023 both sites showed strong recovery in cover by Autumn with Site 2 increasing from 7.8 to 61.3% cover and Site 3 from 21.9 to 93.4% cover. Site 5 remained at 100% native cover with very few exotic species present. Some areas such as Site 5 have over 100% cover due to the layered nature of the ground layer where plants such as lobelia often grow under native grass species.

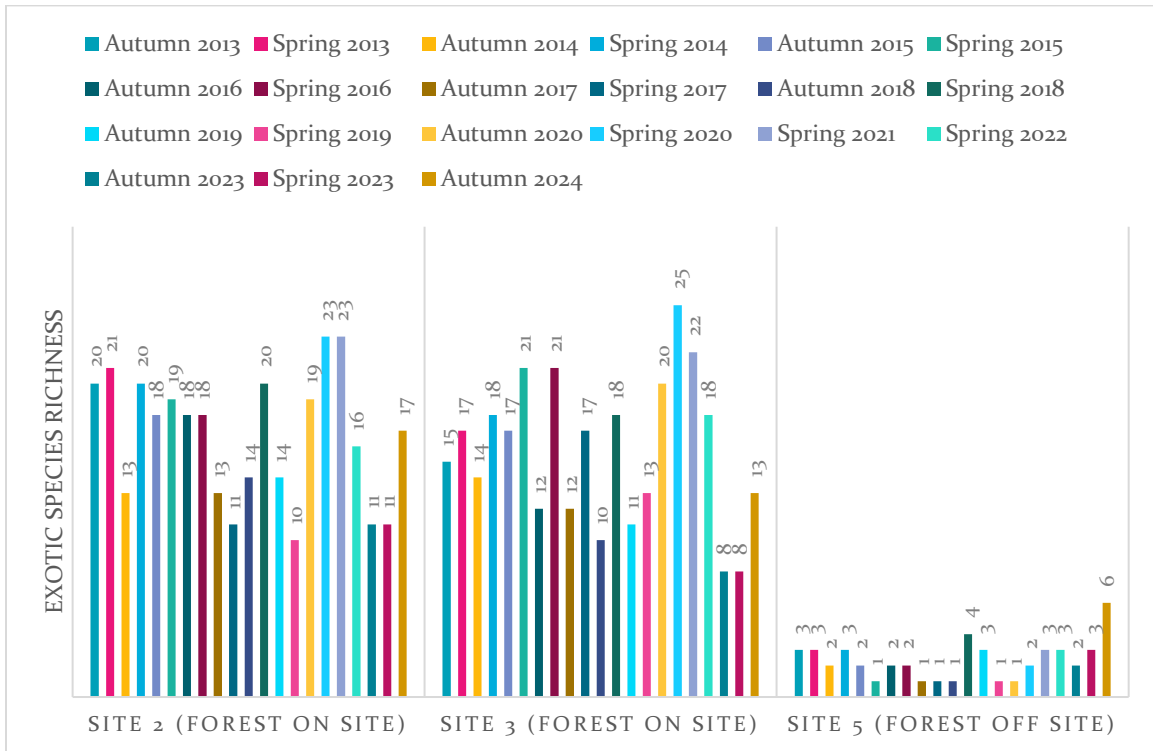


Figure 10 Exotic species richness Forest plots Spring 2022 and Autumn 2023

Exotic species richness has increased at both all sites in Autumn 2024. Sites 3 and 5 contain more native species than exotic species, Site 2 alternates between Spring 20 Native and 11 exotic to Autumn with 13 Native and 17 Exotics present. Exotic species richness continues to be lower in autumn compared to spring; this result is consistent with the ecology of the dominant exotic species in this area and the early autumn timing of surveys (i.e. before the winter growing period of many exotic annuals). This variability is therefore likely due to seasonal variation driving changes in the presence and abundance of annual native species. The diversity of exotic annual forbs and pasture grasses at Site 2 and Site 3 may, in part, be due to encroachment of exotic species from adjacent agricultural land.

Recent removal of a mob of semi feral sheep, which had been roaming the offset area resulting uncontrolled grazing, will hopefully begin to positively affect the distribution and abundance of native species as these are often preferentially grazed by stock. An encouraging sign was the observation, in January 2024, of a juvenile eucalyptus for the first time on site, no natural regeneration had previously been noted.

## TERRESTRIAL FAUNA

### Diurnal bird survey

A total of 57 diurnal bird species were detected across the survey period (Appendix C). This is a slight decrease in species diversity from 2023 results but similar to the years previous to that (ScatsAbout and SG Ecology 2023). There was only the one endangered species listed under the *Biodiversity Conservation Act* observed during the survey. This was the Gang-gang cockatoo (*Callocephalon fimbriatum*) and the species was observed at all sites on every day and in flocks containing up to 23 individuals. Gang-gang cockatoos have been observed at the site in previous surveys, however not in the large flock sizes observed during this year. Individuals were observed investigating tree hollows, however no nesting was detected, although young would be expected to have fledged by the survey period. Survey timing also impacts the detection of other threatened species that are known to be present in the area. Species such as the Scarlet robin (*Petroica boodang*), Flame robin (*Petroica phoenicea*) and Diamond firetail (*Stagonopleura guttata*) are migratory species which are more frequent in the winter months. Supplementary surveys during the cooler periods have identified Scarlet robins at the site.

Species diversity different between sites, ranging from 20 to 35 species per site. Site diversity was similar to the previous year and showed a distinct reduction in diversity at site 3 when compared with the other sites (Figure 11). As in previous years, Noisy minors continue to dominate the site. Noisy minors have been continually identified as an issue for other bird species and the general health of the woodlands. Noisy minors aggressively exclude and out-compete other birds and with the absence of small woodland birds, an increase in invertebrates can lead to localised tree dieback. Small woodland birds benefit from a shrubby understorey for protection and a legacy of the grazing from the feral sheep herd is a reduced shrubby understorey. With the removal of the feral sheep last year, future growth of understorey species will assist in providing protection to small woodland birds and the current dominance of noisy minors in the bird assemblage.

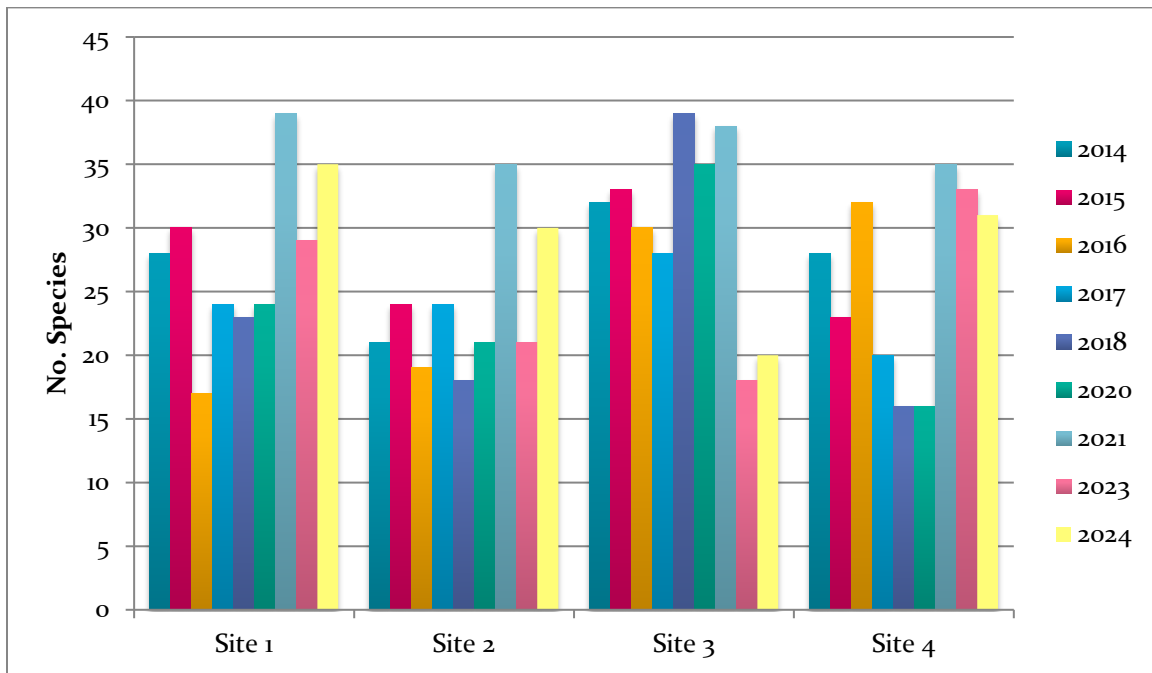


Figure 11 Total species observed per site during the 2 ha surveys (2014-2024)

### Little Eagle nest survey

No Little eagle nests were detected at the site. Two Wedge-tailed eagle (*Aquila audax*) nests were sighted with two Wedge-tailed eagles frequenting the one nest. No young were observed in the nest.

### Herpetofauna survey

Five reptile and 6 amphibians were detected across the survey sites within the 2ha search area and incidentally (Table 6). No threatened species were observed. The majority of species were detected incidentally, rather than during the dedicated search period (Figure 12). Despite this, the number of species detected were similar to previous surveys but with some variation in reptile species (EcoAus 2021, ScatsAbout and SG Ecology 2023). The absence of any snake detection is attributed to the vegetation density impacting sightability rather than species absence. Several snake species have been identified in previous surveys, including the Highland copperhead (*Austrelaps ramsayi*).

Table 6 Herpetofauna species observed at each site and as an incidental record.

Common name	Scientific name	Site 1	Site 2	Site 3	Site 4	Incidental
Eastern striped skink	<i>Ctenotus robustus</i>				X	
Garden skink	<i>Lampropholis delicata</i>	X	X	X	X	X

Common name	Scientific name	Site 1	Site 2	Site 3	Site 4	Incidental
Eastern bearded dragon	<i>Pogona barbata</i>					x
Cunninghams skink	<i>Egernia cunninghami</i>					x
Eastern blue-tongue	<i>Tiliqua scincoides</i>					x
Common eastern froglet	<i>Crinia signifera</i>		x			x
Eastern banjo frog	<i>Limnodynastes dumerilii</i>					x
Striped marsh frog	<i>Limnodynastes peronii</i>	x	x	x		x
Spotted grass frog	<i>Limnodynastes tasmaniensis</i>	x	x			x
Whistling tree frog	<i>Litoria verreauxii</i>		x		x	x
Eastern stony creek frog	<i>Litoria wilcoxii</i>					x





Figure 12 Example of reptiles observed during the 2024 survey, a. Eastern bearded dragon (*Pogono barbata*) and b. Garden skink (*Lampropholis delicata*).

### Camera trap survey

There was 7 mammal, one reptile and 7 bird species detected during the camera trap survey (Table 7). The mammal species recorded were similar to previous years and are all common and widespread in the area. The reptile and bird diversity detected this survey is above previous years, however only the Buff-banded rail was unique to the camera survey. Two species of introduced mammals were detected, the Red fox and Black rat. All pose a threat to local species through predation and competition. The Red fox was particularly prevalent across the site.

The Spotted-tailed quoll (*Dasyurus maculata*) is a target species of the survey but was not detected on this occasion. To maximize the detection of Spotted-tail quolls using baited camera traps, surveys are best conducted in winter during the breeding season (A. Claridge pers comm. 2022).

Table 7: Species detected through camera trap survey for each site.

Common name	Scientific name	Site 1	Site 2	Site 3	Site 4
Eastern grey kangaroo	<i>Macropus giganteus</i>	x	x	x	x
Swamp Wallaby	<i>Wallabia bicolor</i>	x	x		
Common brushtail possum	<i>Trichosurus vulpecula</i>	x	x	x	x
Bare-nosed wombat	<i>Vombatus ursinus</i>	x	x	x	x
Echidna	<i>Tachyglossus aculeatus</i>		x	x	
Red fox	<i>Vulpes vulpes</i>	x	x	x	
Black rat	<i>Rattus rattus</i>				x
Eastern bearded dragon	<i>Pogona barbata</i>				x

Australian Raven	<i>Corvus coronoides</i>		x		
Buff-banded rail	<i>Gallirallus philippensis</i>		x		
Common bronzewing	<i>Phaps chalcoptera</i>		x		
Grey butcherbird	<i>Cracticus torquatus</i>			x	
Laughing kookaburra	<i>Dacelo novaeguineae</i>			x	x
Magpie Lark	<i>Grallina cyanoleuca</i>		x	x	
Noisy Minor	<i>Manorina melanocephala</i>		x	x	

### Spotlight survey

A total of 8 mammals, 2 birds and 1 amphibian were observed during the spotlight survey (Table 8). An additional 2 amphibians were heard during the spotlight surveys. The results are similar to previous surveys.

Table 8: Spotlight survey results for each site.

Common name	Scientific name	Site 1	Site 2	Site 3	Site 4
Eastern grey kangaroo	<i>Macropus giganteus</i>		x	x	
Swamp Wallaby	<i>Wallabia bicolor</i>		x		
Common ringtail possum	<i>Pseudocheirus peregrinus</i>		x	x	
Common brushtail possum	<i>Trichosurus vulpecula</i>	x	x	x	
Krefts glider	<i>Petaurus notatus</i>	x			

Bare-nosed wombat	<i>Vombatus ursinus</i>		x	x	x
Rabbit	<i>Oryctolagus cuniculus</i>		x		
Red fox	<i>Vulpes vulpes</i>		x		x
Eastern barn owl	<i>Tyto javanica</i>				x
Southern Boobook	<i>Ninox boobook</i>	x			
Common eastern froglet	<i>Crinia signifera</i>		x	x	
Spotted grass frog	<i>Lymnodynastes tasmaniensis</i>		x	x	
Whistling tree frog	<i>Litoria verreauxii</i>				x



Figure 13 Example of species observed during the 2024 spotlight and bird surveys, a. Kreft's glider (*Petaurus notatus*) and b. Gang-gang cockatoo (*Callocephalon fimbriatum*).

### Call playback survey

The call playback survey failed to detect any of the target species. This result is consistent with previous call playback surveys.

### Microchiropteran bat survey

There were 2,886 call sequences recorded across the 4 survey sites. Of these, 62.8% displayed sufficient quality to enable positive identification of a bat genus, species, or species complex. There were 11 species confidently identified and a possible 14 species detected throughout the survey, 5 of which are listed under the NSW BC Act (Table 9). Based on call signatures the Little bent-winged bat (*Miniopterus orianae oceanensis*) and Southern myotis (*Myotis macropus*) were confirmed at the site. Both have previously been identified as being present at the site (Ecological Australia 2020: 2021; SA & SG Ecology 2023).

Table 9 Microbat species diversity recorded ultrasonically across the four survey sites. \* Identifies species listed under the BC Act.

Scientific name	Common name	Site 1	Site 2	Site 3	Site 4
<i>Austronomus australis</i>	White-striped Free-tailed Bat	D	D	D	
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	D	D	D	D
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	D	D	D	D
<i>Falsistrellus tasmaniensis</i> *	Eastern False Pipistrelle	P	P	P	P
<i>Miniopterus orianae oceanensis</i> *	Large Bent-winged Bat	D	D	D	D
<i>Myotis macropus</i> *	Southern Myotis	D	D	D	P
<i>Nyctophilus sp.</i> Possible <i>N. geofferyi</i> , <i>N. gouldii</i>	Long-eared bat possible Gould's long-eared bat Lesser long-eared bat	D	P	D	P
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	D	D	D	D
<i>Saccolaimus flaviventris</i> *	Yellow-bellied Sheath-tailed Bat	P			
<i>Scoteanax rueppellii</i> *	Greater Broad-nosed Bat	P		P	
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	D	P	D	
<i>Vespadelus darlingtoni</i>	Large Forest Bat	D	D	D	P
<i>Vespadelus regulus</i>	Southern Forest Bat	D	P	D	
<i>Vespadelus vulturnus</i>	Little Forest Bat	D	D	P	P

The diversity of bat species did not vary greatly between sites (Tables 10-13), although Site 4 was reduced slightly due to equipment malfunction on the second night of survey. As in previous years activity levels were highest at Site 1 and lowest at Site 4. This may reflect the varied habitats or may be an artefact of the different recorders used. *Ozimops ridei* (Ride's Free-tailed Bat), *Chalinolobus gouldii* (Gould's Wattled Bat), *Chalinolobus morio* (Chocolate Wattled Bat) / *Vespadelus vulturnus* (Little Forest Bat), *Miniopterus orianae oceanensis* (Large Bent-winged Bat)/*Vespadelus darlingtoni* (Large Forest Bat) / *Vespadelus regulus* (Southern Forest Bat) were the most commonly recorded species/complexes. *Austronomus australis* (White-striped Free-tailed Bat) was much reduced compared with the activity levels detected in the previous year's survey (SA & SG Ecology 2023), however detections were greatest at site 4, so the reduction may be an artefact of the reduced survey period.

A diversity of microbats detected at the site reflects the diversity of habitat present and the adaptability of particular species. The species detected most frequently either display a preference for modified woodlands or an adaptability to variable habitats (Baker and Gynther 2023).

As outlined in the methods section, the majority of call sequences were attributed to bat genus or species complex due to the limitations of the echolocation technique. Ecological Australia (2021) detail the specific considerations for each of the species and similarities between species.

Table 10 Microbat species diversity and number of calls recorded at Site 1. \* identifies species listed under the BC Act.

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Austronomus australis</i>	White-striped Free-tailed Bat	12	3	13
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	67	41	108
<i>Chalinolobus gouldii</i> / <i>Ozimops ridei</i>	Gould's Wattled Bat / Ride's Free-tailed Bat	0	41	41
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	66	106	172
<i>Chalinolobus morio</i> / <i>Vespadelus vulturnus</i>	Chocolate Wattled Bat / Little Forest Bat	0	34	34
<i>Falsistrellus tasmaniensis</i> *	Eastern False Pipistrelle	0	2	2
<i>Falsistrellus tasmaniensis</i> * / <i>Scoteanax rueppellii</i> * / <i>Scotorepens orion</i>	Eastern False Pipistrelle / Greater Broad-nosed Bat / Eastern Broad-nosed Bat	0	4	4
<i>Miniopterus oriana oceanensis</i> *	Large Bent-winged Bat	29	19	48
<i>Miniopterus oriana oceanensis</i> * / <i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Bent-winged Bat / Large Forest Bat / Southern Forest Bat	0	111	111
<i>Miniopterus oriana oceanensis</i> * / <i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Large Bent-winged Bat / Southern Forest Bat / Little Forest Bat	0	2	2
<i>Myotis macropus</i> *	Southern Myotis	2	3	5
<i>Myotis macropus</i> * / <i>Nyctophilus species</i> , in this region <i>N. geoffroyi</i> and <i>N. gouldii</i> are likely to be present.	Southern Myotis / Large-eared Bats, in this region Gould's and Lesser are likely to be present.	0	5	5

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Nyctophilus</i> species, in this region <i>N. geoffroyi</i> and <i>N. gouldii</i> are likely to be present.	Large-eared Bats, in this region Gould's and Lesser are likely to be present.	15	9	24
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	40	18	58
<i>Saccolaimus flaviventris</i> *	Yellow-bellied Sheath-tailed Bat	0	3	3
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	5	8	13
<i>Scoteanax rueppellii</i> *	Greater Broad-nosed Bat	0	4	4
<i>Vespadelus darlingtoni</i>	Large Forest Bat	25	33	58
<i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Forest Bat	0	3	3
<i>Vespadelus regulus</i>	Southern Forest Bat	23	57	80
<i>Vespadelus vulturinus</i>	Little Forest Bat	11	9	20
Unidentifiable / unusable				600
Total calls				1,414
Percentage of usable calls				57.6



Table 11 Microbat species diversity and number of calls recorded at Site 2. \* Identifies species listed under the BC Act.

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Austronomus australis</i>	White-striped Free-tailed Bat	2	0	2
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	89	32	121
<i>Chalinolobus gouldii</i> / <i>Ozimops ridei</i>	Gould's Wattled Bat / Ride's Free-tailed Bat	0	15	15
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	14	8	22
<i>Chalinolobus morio</i> / <i>Vespadelus vulturnus</i>	Chocolate Wattled Bat / Little Forest Bat	0	47	47
<i>Falsistrellus tasmaniensis</i> *	Eastern False Pipistrelle	0	1	1
<i>Miniopterus oriana oceanensis</i> *	Large Bent-winged Bat	21	52	73
<i>Miniopterus oriana oceanensis</i> * / <i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Bent-winged Bat / Large Forest Bat / Southern Forest Bat	0	36	36
<i>Miniopterus oriana oceanensis</i> * / <i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Large Bent-winged Bat / Southern Forest Bat / Little Forest Bat	0	1	1
<i>Myotis macropus</i> *	Southern Myotis	0	3	3
<i>Myotis macropus</i> * / <i>Nyctophilus</i> species, in this region <i>N. geoffroyi</i> and <i>N. gouldii</i> are likely to be present.	Southern Myotis / Large-eared Bats, in this region Gould's and Lesser are likely to be present.	2	1	3
<i>Nyctophilus</i> species, in this region <i>N. geoffroyi</i> and <i>N. gouldii</i> are likely to be present.	Large-eared Bats, in this region Gould's and Lesser are likely to be present.	0	9	9

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	6	0	6
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	0	8	8
<i>Vespadelus darlingtoni</i>	Large Forest Bat	5	5	10
<i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Forest Bat / Southern Forest Bat	0	3	3
<i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Southern Forest Bat / Little Forest Bat	0	4	4
<i>Vespadelus vulturnus</i>	Little Forest Bat	19	6	25
Unidentifiable / unusable				201
<b>Total calls</b>				<b>612</b>
Percentage of usable calls				67.6

Table 12 Microbat species diversity and number of calls recorded at Site 3. \* Identifies species listed under the BC Act.

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Austronomus australis</i>	White-striped Free-tailed Bat	17	8	25
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	60	18	78
<i>Chalinolobus gouldii</i> / <i>Ozimops ridei</i>	Gould's Wattled Bat / Ride's Free-tailed Bat	0	54	54
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	15	13	28
<i>Falsistrellus tasmaniensis</i> * / <i>Scoteanax rueppellii</i> * / <i>Scotorepens orion</i>	Eastern False Pipistrelle / Greater Broad-nosed Bat / Eastern Broad-nosed Bat	0	5	5
<i>Falsistrellus tasmaniensis</i> *	Eastern False Pipistrelle	0	2	2
<i>Miniopterus oriana oceanensis</i> *	Large Bent-winged Bat	10	11	21
<i>Miniopterus oriana oceanensis</i> * / <i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Bent-winged Bat / Large Forest Bat / Southern Forest Bat	0	31	31
<i>Miniopterus oriana oceanensis</i> * / <i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Large Bent-winged Bat / Southern Forest Bat / Little Forest Bat	0	57	57
<i>Myotis macropus</i> *	Southern Myotis	3	4	7
<i>Myotis macropus</i> * / <i>Nyctophilus species</i> , in this region <i>N. geoffroyi</i> and <i>N. gouldii</i> are likely to be present.	Southern Myotis / Large-eared Bats, in this region Gould's and Lesser are likely to be present.	0	8	8
<i>Nyctophilus species</i> , in this region <i>N. geoffroyi</i> and <i>N. gouldii</i> are likely to be present.	Large-eared Bats, in this region Gould's and Lesser are likely to be present.	7	5	12

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	52	34	86
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	5	14	19
<i>Scoteanax rueppellii*</i>	Greater Broad-nosed Bat	0	20	20
<i>Vespadelus darlingtoni</i>	Large Forest Bat	9	12	21
<i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Forest Bat / Southern Forest Bat	0	12	12
<i>Vespadelus regulus</i>	Southern Forest Bat	9	4	13
<i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Southern Forest Bat / Little Forest Bat	0	21	21
<i>Vespadelus vulturnus</i>	Little Forest Bat	0	11	11
Unidentifiable / unusable				267
<b>Total calls</b>				<b>801</b>
Percentage of usable calls				66.6

Table 13 Microbat species diversity and number of calls recorded at Site 4. \*Identifies species listed under the BC Act.

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	10	7	17
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	1	4	5
<i>Chalinolobus morio</i> / <i>Vespadelus vulturnus</i>	Chocolate Wattled Bat / Little Forest Bat	0	9	9
<i>Falsistrellus tasmaniensis</i> *	Eastern False Pipistrelle	0	1	1
<i>Miniopterus orianae oceanensis</i> *	Large Bent-winged Bat	4	2	6
<i>Miniopterus orianae oceanensis</i> * / <i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Bent-winged Bat / Large Forest Bat / Southern Forest Bat	0	2	2
<i>Miniopterus orianae oceanensis</i> * / <i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Large Bent-winged Bat / Southern Forest Bat / Little Forest Bat	0	1	1
<i>Myotis macropus</i> * / <i>Nyctophilus</i> species, in this region <i>N. geoffroyi</i> and <i>N. gouldii</i> are likely to be present.	Southern Myotis / Large-eared Bats, in this region Gould's and Lesser are likely to be present.	0	1	1
<i>Nyctophilus</i> species, in this region <i>N. geoffroyi</i> and <i>N. gouldii</i> are likely to be present.	Large-eared Bats, in this region Gould's and Lesser are likely to be present.	0	6	6
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	1	0	1
<i>Vespadelus darlingtoni</i>	Large Forest Bat	0	2	2
<i>Vespadelus vulturnus</i>	Little Forest Bat	0	2	2
Unidentifiable / unusable				6

Total calls				59
Percentage of usable calls				89.9

### Incidental observations

Incidental observation through visual observation, hearing call or identifying trace material identified an additional 10 birds across the site (Appendix C). For mammals, only cattle were an additional species. The identification of trace material however, such as scats, did provide information on site use. Scat presence indicated that most mammals utilise large areas across site. In particular, rabbits are found across the site and cattle have access to most areas. Additional reptiles and amphibians were most frequently identified through frog calling and are listed in Table 6 and Appendix C as incidental observations. The final species incidentally observed was the Short-finned eel (*Anguilla australis*). Eels have been observed in Majors Creek during previous surveys and several individuals were observed during the 2024 survey.

### Survey comparisons

The total number of species identified during the 2023 survey is similar to the 2020 and 2021 surveys. The diversity within groups is also similar, with the largest variation within the bird group. This variation is mirrored throughout the historical surveys, with birds displaying the greatest fluctuations. This is perhaps not surprising with mobile nature of birds enabling them to respond rapidly to the changing environment. Microbat diversity has also increased in recent years, perhaps in response to the wetter years and subsequent insect availability.

Table 14: Comparison of total species diversity and group diversity between years of monitoring.

Group	2014	2015	2016	2017	2018	2020	2021	2023	2024
Birds	52	55	50	43	77	55	55	61	57
Frogs	5	3	7	8	8	9	7	7	6
Reptiles	6	10	8	6	7	6	5	4	5
Mammals (excl. microbats)	8	9	8	9	7	6	12	11	10
Microbats	7	5	12	12	12	15	16	14	14
<b>Total species</b>	<b>78</b>	<b>82</b>	<b>85</b>	<b>78</b>	<b>111</b>	<b>91</b>	<b>95</b>	<b>97</b>	<b>92</b>

## Conclusion and Recommendations

### FLORA

Terrestrial flora monitoring indicates a gradual decline in native species diversity over time both on and offsite since operations commenced at DGM. Herbicide application at Sites 2 and 3 in spring 2023 greatly impacted the native species diversity and cover however there appears to be signs of recovery in the Autumn 2024 data. Removal of the roaming sheep appears to have had a positive impact on forest area regeneration, with juvenile eucalyptus being observed for the first time on site.

Both on-site native grassland Site 1 and off-site native grassland Site 6 remain in a degraded condition, with a high abundance and cover of exotic perennial and annual species. Site 1 achieved greater than 50% native grass cover for the third time (Autumn 2023) with 80.5% native cover. All sites are subject to ongoing agricultural management (cattle grazing) which is likely to impact species diversity and cover. Exotic species richness remains relatively high at all grassland sites, there has been a gradual increase in native species diversity in 2023/2024.

The open forest sites remain in moderate condition with targeted herbicide application occurring in spring 2023. Following this application, there has been halt to the increase in exotic species numbers and density which has been ongoing since the drought ended in 2020. There is now an opportunity for strategic seeding and planting to enhance the ecological values of these areas.

### FAUNA

Terrestrial fauna monitoring produced results that were comparable with previous years. There were slight variations within groups that in some instances can be attributed to changes in detectability and migratory movements. Arboreal mammal species continue to be well represented, especially at Site 1. Detection of small mammals however was restricted to the introduced Black rat. There was also evidence of a negative Noisy minor influence with a decline of bird species with increasing Noisy minors.

There are a number of favourable habitat features present within the site, such as hollow-bearing trees, large woody debris, rocks and creeks that have maintained a reasonable diversity of fauna. The removal of sheep in 2023 will provide an opportunity for regeneration and increased habitat in the future. There is however, the opportunity to further protect and enhance aspects of this habitat. Management options are outlined below.

### Management recommendations

- Implement weed management activities (manual removal and/or spraying) targeting the priority weeds *Rubus fruticosus* spp. agg. (Blackberry) and *Cytisus scoparius* (Scotch Broom) over all of the DGM. Blackberry may be providing habitat and a potential food source for several bird species throughout DMG including the fauna monitoring



locations. It is recommended that native shrubs should be established before removing all blackberry from the area so that native birds using this species for habitat or food are not adversely impacted (DPI 2008b).

- If the target for grassland areas is to comply with Section 6.4.5.3 of the BMP (transition to Natural Temperate Grasslands) then revision of existing management practices is required. This may include exclusion and/or changed timing for grazing stock and or reintroduction of native grass and forb species.
- Control of pest species, in particular rabbit and foxes, is recommended. Both species are considered as key threatening processes for threatened species due to predation, competition and habitat destruction (DPE 2017) No pigs or deer were observed during this survey, however are common in the area. Strategic control that focuses on minimising erosion by rabbits and predation impact by foxes is recommended. Coordinated control with neighbouring properties would also produce a better outcome.
- Now that the sheep have been removed from site strategic planting of suitable scattered shrub species within the forest areas will provide habitat for smaller birds at the blackberry is removed from site.

#### Monitoring recommendations

Monitoring should continue as per the current schedule to enable the identification of long-term patterns.

As highlighted in previous reporting, off-site grassland Site 6 is more reflective of a modified native grassland than a “good condition” example of the Natural Temperate Grassland EEC. Given that Site 6 has been surveyed for many years and is not considered to have been impacted by activities relating to the mine, it is considered the best “Natural Temperate Grassland” reference site available for the project and should continue to be monitored.

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## APPENDIX A – FLORA SPECIES LIST

Common Name	Scientific Name	Native / Exotic
Black Wattle	<i>Acacia mearnsii</i>	N
Wattle	<i>Acacia spp.</i>	N
Bidgee-widgee	<i>Acaena novae-zelandiae</i>	N
Austral Bugle	<i>Ajuga australis</i>	N
Lesser Joyweed	<i>Alternanthera denticulata</i>	N
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>	E
Pale Vanilla-lily	<i>Arthropodium milleflorum</i>	N
	<i>Arthropodium spp.</i>	N
Common Woodruff	<i>Asperula conferta</i>	N
Prickly Woodruff	<i>Asperula scoparia</i>	N
Yanganbil	<i>Austrostipa bigeniculata</i>	N
	<i>Austrostipa rudis</i>	N
Speargrass	<i>Austrostipa scabra</i>	N
Hairy Apple Berry	<i>Billardiera scandens</i>	N
Scarlet Pimpernel	<i>Anagallis arvensis</i>	E
	<i>Bossiaea buxifolia</i>	N
	<i>Brachyscome spp.</i>	N
Shivery Grass	<i>Briza minor</i>	E
Praire Grass	<i>Bromus catharticus</i>	E
Native Blackthorn	<i>Bursaria spinosa</i>	N
Tall Sedge	<i>Carex appressa</i>	N
Knob Sedge	<i>Carex inversa</i>	N
	<i>Cerastium spp.</i>	E
Fishweed	<i>Chenopodium glaucum</i>	N
Common Everlasting	<i>Chrysocephalum apiculatum</i>	N
Clustered everlasting	<i>Chrysocephalum semipapposum</i>	N
Spear Thistle	<i>Cirsium vulgare</i>	E
Flea bane	<i>Conyza spp.</i>	E
	<i>Cymbonotus lawsonianus</i>	N
Common Couch	<i>Cynodon dactylon</i>	N
Slender Flat-sedge	<i>Cyperus gracilis</i>	N
	<i>Cytisus scoparius</i>	E
Slender Tick-trefoil	<i>Desmodium varians</i>	N
Blueberry Lily	<i>Dianella longifolia</i>	N
Plume grass	<i>Dichelachne micrantha</i>	N
Kidney Weed	<i>Dichondra repens</i>	N
Forest Hedgehog Grass	<i>Echinopogon ovatus</i>	N
Berry Saltbush	<i>Einadia hastata</i>	N

Common Name	Scientific Name	Native / Exotic
Brown's Lovegrass	<i>Eragrostis brownii</i>	N
Narrow-leaved Peppermint	<i>Eucalyptus radiata</i>	N
Ribbon Gum	<i>Eucalyptus viminalis</i>	N
Star Cudweed	<i>Euchiton involucratus</i>	N
Star Cudweed	<i>Euchiton sphaericus</i>	N
Annual trampweed	<i>Facelis retusa</i>	N
Fescue	<i>Festuca sp.</i>	E
	<i>Gamochaeta spp.</i>	N
Native Geranium	<i>Geranium solanderi</i>	N
Twining glycine	<i>Glycine clandestina</i>	N
Raspwort	<i>Gonocarpus spp.</i>	N
Poverty Raspwort	<i>Gonocarpus tetragynus</i>	N
Variable Raspwort	<i>Haloragis heterophylla</i>	N
Hoary Guinea Flower	<i>Hibbertia obtusifolia</i>	N
Yorkshire Fog	<i>Holcus lanatus</i>	E
Stinking Pennywort	<i>Hydrocotyle laxiflora</i>	N
	<i>Hydrocotyle sibthorpioides</i>	N
Small St John's Wort	<i>Hypericum gramineum</i>	N
Smooth Catsear	<i>Hypochoeris glabra</i>	E
Catsear	<i>Hypochoeris radicata</i>	E
Golden Weather-grass	<i>Hypoxis hygrometrica</i>	N
	<i>Juncus acutus</i>	N
Rush	<i>Juncus australis</i>	N
Toad Rush	<i>Juncus bufonius</i>	N
	<i>Juncus filicaulis</i>	N
	<i>Juncus spp.</i>	N
Finger Rush	<i>Juncus subsecundus</i>	N
Violet Kunzea	<i>Kunzea parvifolia</i>	N
	<i>Lepidium spp.</i>	N
Scaly Buttons	<i>Leptorhynchos squamatus</i>	N
Native Flax	<i>Linum marginale</i>	N
Whiteroot	<i>Lobelia purpurascens</i>	N
Spiny-headed Mat-rush	<i>Lomandra longifolia</i>	N
Hyssop Loosestrife	<i>Lythrum hyssopifolia</i>	U
Dwarf Mallow	<i>Malva neglecta</i>	E
Weeping Grass	<i>Microlaena stipoides</i>	N
Hairy Stinkweed	<i>Opercularia hispida</i>	N
	<i>Oxalis spp.</i>	N
Hairy Panic	<i>Panicum effusum</i>	N

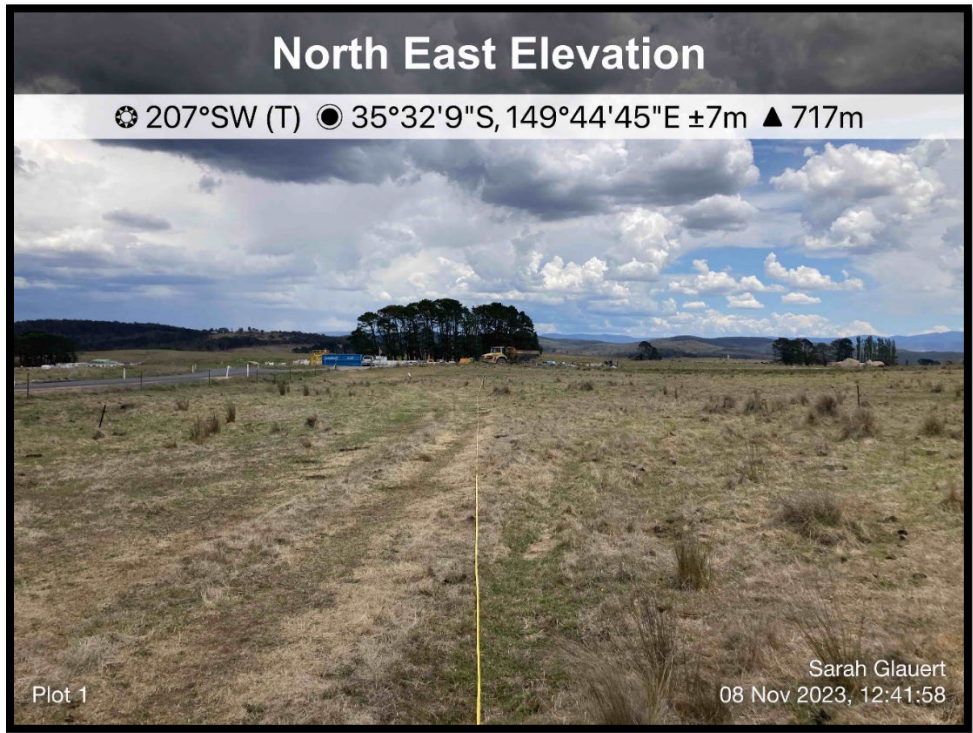
Common Name	Scientific Name	Native / Exotic
Water Couch	<i>Paspalum distichum</i>	E
	<i>Paspalum spp.</i>	E
	<i>Persicaria prostrata</i>	N
	<i>Persicaria prostrata</i>	N
	<i>Phytolacca spp.</i>	E
Lamb's Tongues	<i>Plantago lanceolata</i>	E
Winter Grass	<i>Poa annua</i>	E
	<i>Poa labillardierei</i>	N
	<i>Poa meionectes</i>	N
Snowgrass	<i>Poa sieberiana</i>	N
Dwarf milkwort	<i>Polygala japonica</i>	N
	<i>Polyscias sambucifolia subsp. sambucifolia</i>	N
Self-heal	<i>Prunella vulgaris</i>	E
Bracken	<i>Pteridium esculentum</i>	N
Blackberry complex	<i>Rubus fruticosus</i>	E
Native Raspberry	<i>Rubus parvifolius</i>	N
	<i>Rumex acetosella</i>	N
Swamp Dock	<i>Rumex brownii</i>	N
Dock	<i>Rumex spp.</i>	E
Wallaby Grass	<i>Rytidosperma racemosum</i>	N
Spike Centaury	<i>Schenkia australis</i>	N
Fluke Bogrush	<i>Schoenus apogon</i>	N
Yellow Centaury	<i>Sebaea ovata</i>	N
Hill Fireweed	<i>Senecio hispidulus</i>	N
	<i>Senecio minimus</i>	N
Cotton Fireweed	<i>Senecio quadridentatus</i>	N
Black-berry Nightshade	<i>Solanum nigrum</i>	E
Prickly Sowthistle	<i>Sonchus asper</i>	E
Rat's Tail Couch	<i>Sporobolus creber</i>	E
Dandelion	<i>Taraxacum officinale</i>	E
	<i>Themeda triandra</i>	N
Yellow Autumn-lily	<i>Tricoryne elatior</i>	N
Yellow Suckling Clover	<i>Trifolium dubium</i>	E
White Clover	<i>Trifolium repens</i>	E
	<i>Trifolium spp.</i>	E
Subterranean Clover	<i>Trifolium subterraneum</i>	E
Native violet	<i>Viola betonicifolia</i>	N
Native violet	<i>Viola hederacea</i>	N
	<i>Vittadinia cuneata</i>	N

Common Name	Scientific Name	Native / Exotic
	<i>Vittadinia muelleri</i>	N
Rat's-tail Fescue	<i>Vulpia spp.</i>	E
Sprawling Bluebell	<i>Wahlenbergia gracilis</i>	N

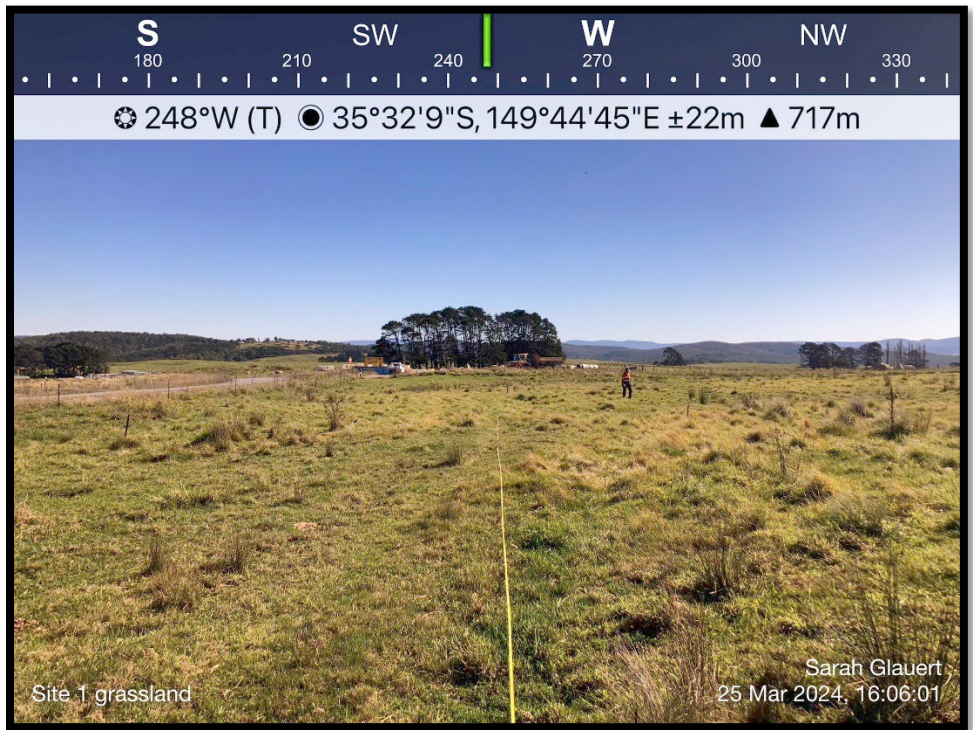
## APPENDIX 2 – SITE PHOTOS SPRING 2023 AND AUTUMN 2024

The photographs below show the center line of each site during the Spring 2023 and Autumn 2024 survey period.





Plot 1 On site Grassland - Spring 2023



Plot 1 On site Grassland - Autumn 2024



Plot 2 On site Open Forest - Spring 2023



Plot 2 On site Open Forest - Autumn 2024



Plot 3 Open Forest - Spring 2023



Plot 3 Open Forest - Autumn 2024



**Plot 4 On site Grasslands - Spring 2023**



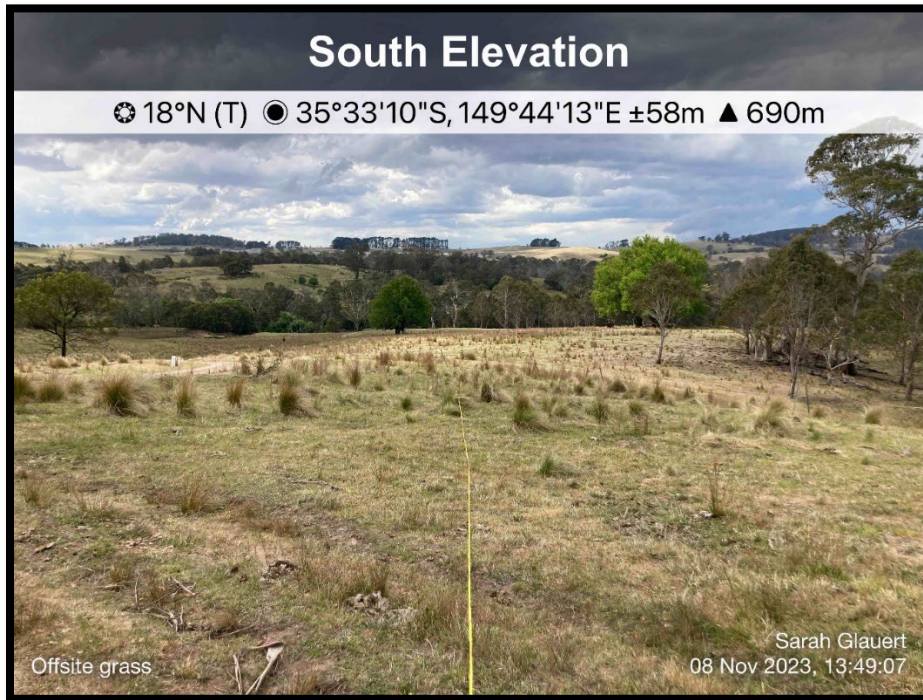
**Plot 4 On site Grasslands - Autumn 2024**



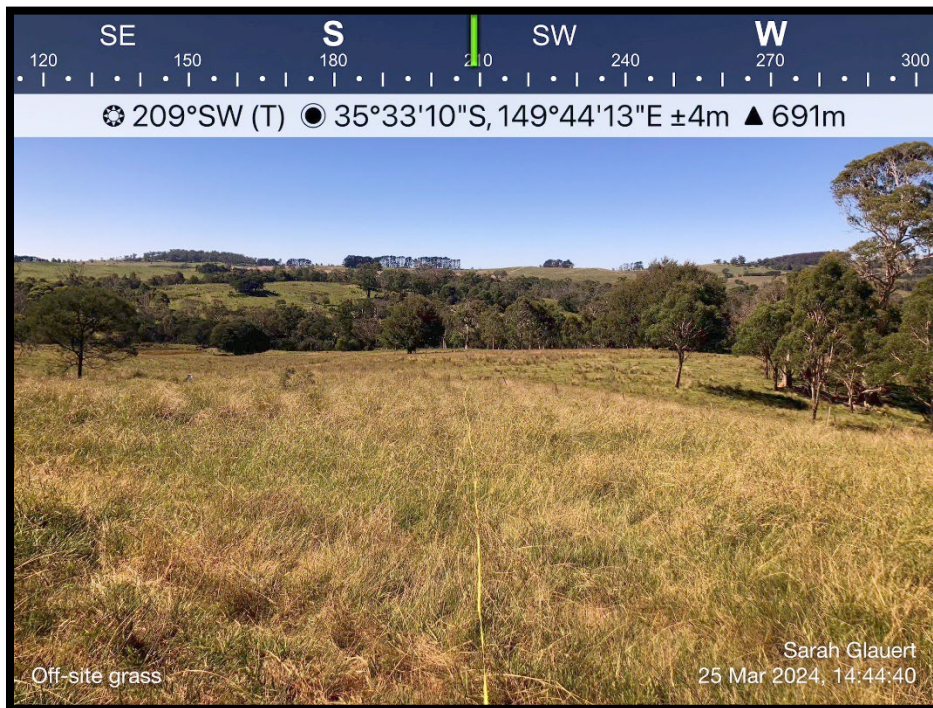
Plot 5 Off site Open Forest - Spring 2023



Plot 5 Off site Open Forest - Autumn 2024



Plot 6 Off site Grassland - Spring 2023



Plot 6 Off site Grassland - Autumn 2024

## Appendix C Diurnal Bird List

Scientific Name	Common Name	Site 1	Site 2	Site 3	Site 4	Incidents
<i>Cracticus tibicen</i>	Australian Magpie	1	1	1	1	1
<i>Corvus coronoides</i>	Australian Raven	1	1		1	1
<i>Acrocephalus australia</i>	Australian Reed Warbler					1
<i>Chenonetta jubata</i>	Australian Wood Duck	1	1			1
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike					1
<i>Acanthiza pusilla</i>	Brown Thornbill	1		1	1	1
<i>Turdus merula</i>	Common Blackbird					1
<i>Ocyphaps lophotes</i>	Crested pigeon					1
<i>Platycercus elegans</i>	Crimson Rosella	1	1	1	1	1
<i>Platycercus eximius</i>	Eastern Rosella	1	1	1		1
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	1	1			1
<i>Psophodes olivaceus</i>	Eastern Whipbird	1	1	1	1	1
<i>Eopsaltria australis</i>	Eastern Yellow Robin					1
<i>Eolophus roseicapillus</i>	Galah	1	1	1	1	1
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	1	1	1	1	1

Scientific Name	Common Name	Site 1	Site 2	Site 3	Site 4	Incidents
<i>Cracticus torquatus</i>	Grey Butcherbird	1	1	1	1	1
<i>Rhipidura albiscapa</i>	Grey Fantail	1	1	1	1	1
<i>Colluricincla harmonica</i>	Grey Shrike-thrush				1	1
<i>Chrysococcyx basalis</i>	Horsfields Bronze Cuckoo	1	1		1	1
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	1	1	1	1	1
<i>Grallina cyanoleuca</i>	Magpie-lark	1	1	1		1
<i>Falco cenchroides</i>	Nankeen Kestrel					1
<i>Manorina melanocephala</i>	Noisy Miner	1	1	1	1	1
<i>Pachycephala olivacea</i>	Olive whistler					1
<i>Strepera graculina</i>	Pied Currawong	1	1	1	1	1
<i>Anthochaera carunculata</i>	Red Wattlebird	1	1	1	1	1
<i>Ninox novaeseelandiae</i>	Southern Boobook					1
<i>Pardalotus striatus</i>	Striated Pardalote	1			1	1
<i>Acanthiza lineata</i>	Striated Thornbill	1	1			1
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	1	1	1	1	1



Scientific Name	Common Name	Site 1	Site 2	Site 3	Site 4	Incidents
<i>Malurus cyaneus</i>	Superb Fairy-wren	1	1	1	1	1
<i>Hirundo neoxena</i>	Welcome Swallow	1				1
<i>Egretta novaehollandiae</i>	White-faced Heron	1	1		1	1
<i>Cormobates leucophaea</i>	White-throated Treecreeper	1	1	1	1	1
<i>Rhipidura leucophrys</i>	Willie Wagtail	1	1		1	1
<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	1	1		1	1
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill				1	1
<i>Anthus novaeseelandiae</i>	Australasian Pipit				1	1
<i>Alisterus scapularis</i>	Australian King-parrot					1
<i>Elanus axillaris</i>	Black-shouldered Kite					1
<i>Accipiter fasciatus</i>	Brown Goshawk					1
<i>Cturnix ypsilophora</i>	Brown Quail				1	1
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	1				1
<i>Phaps chalcoptera</i>	Common Bronzewing			1		1
<i>Sturnus vulgaris</i>	Common Starling	1	1			1

Scientific Name	Common Name	Site 1	Site 2	Site 3	Site 4	Incidents
<i>Eurystomus orientalis</i>	Dollarbird	1				1
<i>Artamus cyanopterus</i>	Dusky Woodswallow	1				1
<i>Tyto javanica</i>	Eastern Barn Owl					
<i>Carduelis carduelis</i>	European Goldfinch					1
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo					1
<i>Pachycephala pectoralis</i>	Golden Whistler					1
<i>Strepera versicolor</i>	Grey Currawong				1	1
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant		1		1	1
<i>Vanellus miles</i>	Masked Lapwing		1		1	1
<i>Neochmia temporalis</i>	Red-browed Finch					1
<i>Todiramphus sanctus</i>	Sacred Kingfisher	1	1			1
<i>Zosterops lateralis</i>	Silvereye				1	1
<i>Petroica boodang</i>	Scarlet Robin					1
<i>Pardalotus punctatus</i>	Spotted Pardalote	1				
<i>Ptilonorhynchus violaceus</i>	Satin Bowerbird	1	1	1		1
<i>Hirundo nigricans</i>	Tree Martin	1				1

Scientific Name	Common Name	Site 1	Site 2	Site 3	Site 4	Incidents
<i>Aquila audax</i>	Wedge-tailed Eagle				1	1
<i>Sericornis frontalis</i>	White-browed Scrubwren				1	1
<i>Lichenostomus leucotis</i>	White-eared Honeyeater					1