



Dargues Environmental Monitoring Survey Report 2023

ScatsAbout and SG Ecology | for Aurelia Metals | June 28, 2023

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Abbreviation	Description
BAM	Biodiversity Assessment methodology 2020
BBAM	BioBanking Assessment Methodology
BC Act	NSW Biodiversity Conservation Act 2016
BMP	Biodiversity Management Plan
BOA	Biodiversity Offset Area
cm	centimeters
DGM	Dargues Gold Mine
E	Exotic species
EEC	Endangered Ecological Community
ha	hectares
HBT	Hollow bearing tree
HTE	High threat exotic weed
km	Kilometers
LWD	Large woody debris (>10cm diameter)
m	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 2 November 2022 (Spring) and 3 April 2023 (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 2022 and 2023 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.

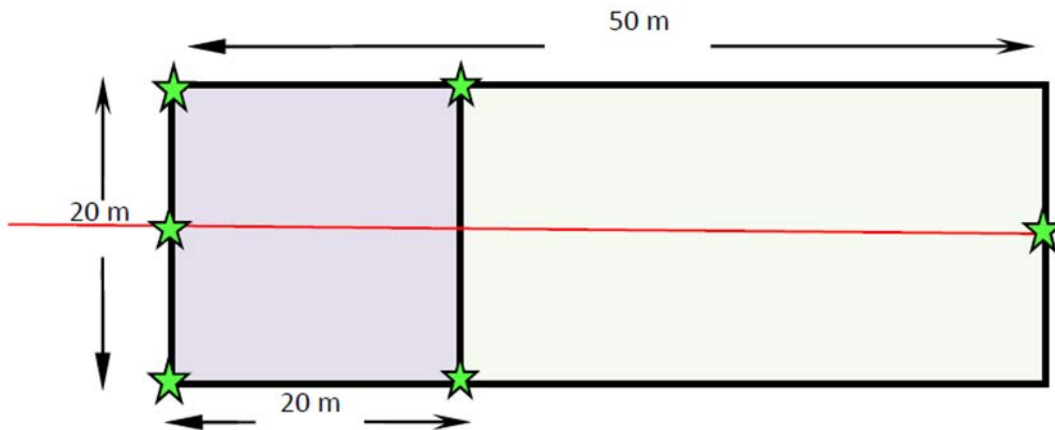


Figure 1: Marking and layout of Biometric plot (★) = star picket)

Figure 1 Marking and layout of Biometric sites

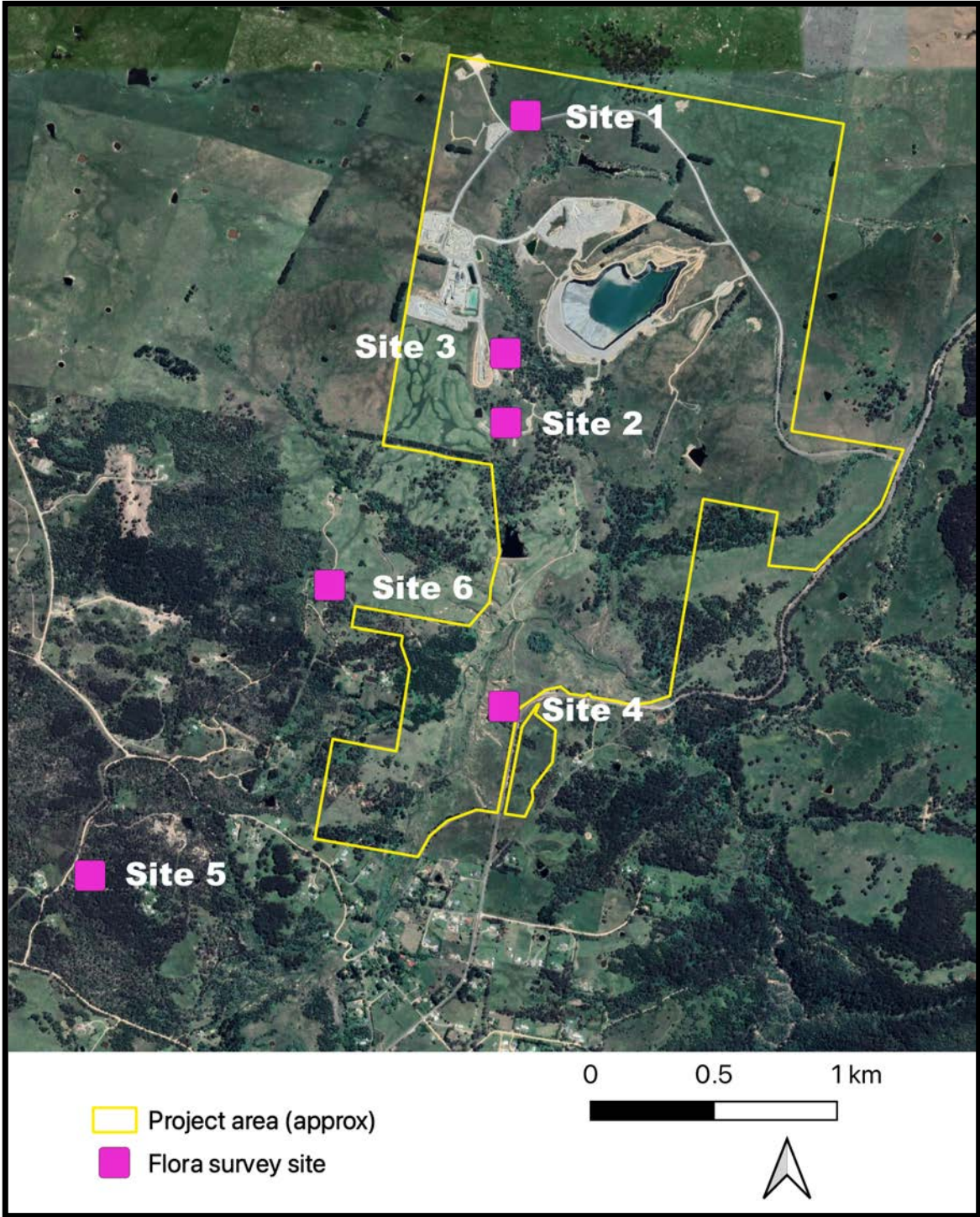


Figure 2 Location of flora survey sites

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.

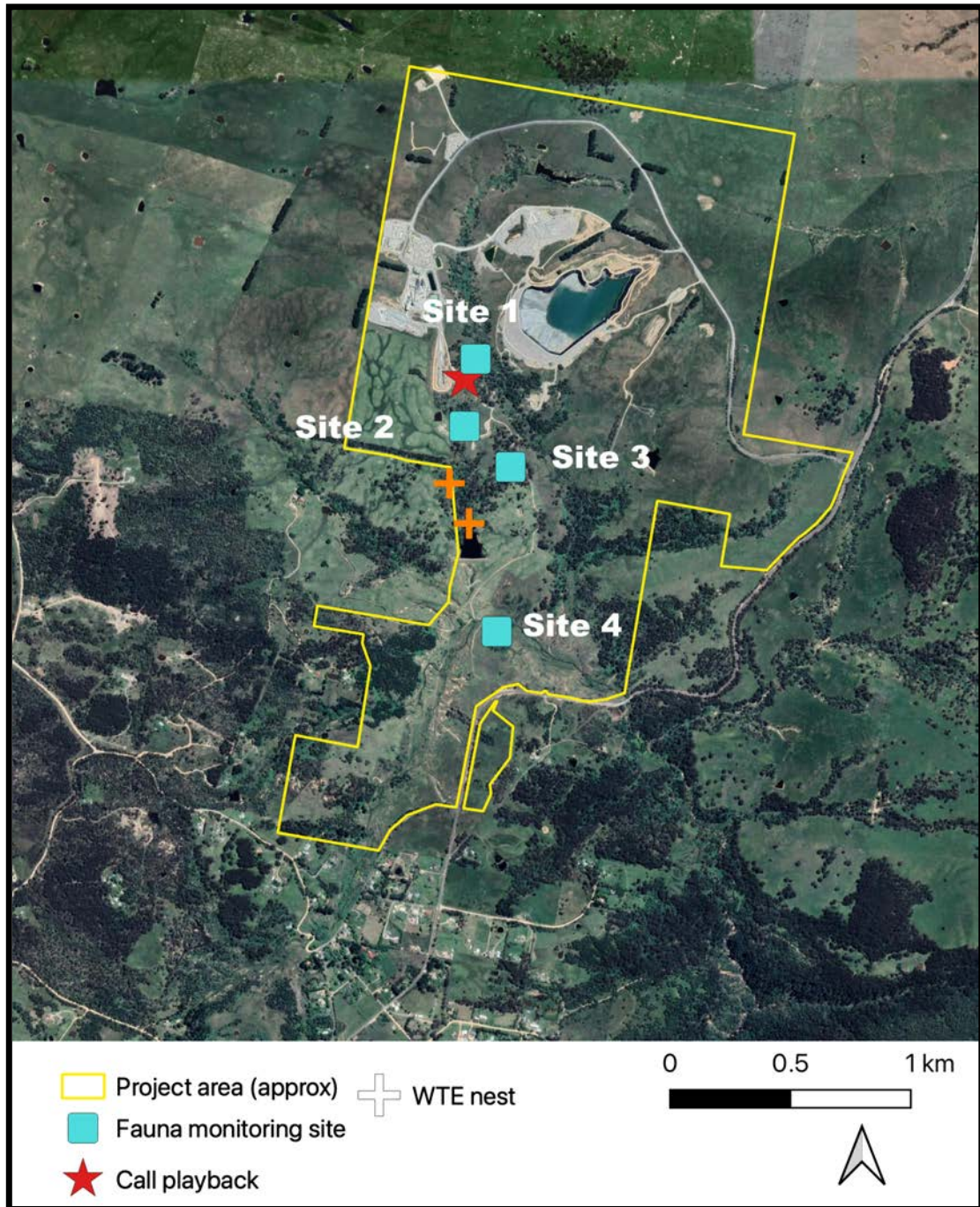


Figure 3 Location of fauna survey sites

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 117 flora species (consisting of 86 native species, 30 exotic species, and 1 species not determined as native or exotic) were recorded across the six floristic monitoring sites during spring 2022/23, this is three species less 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 2022/2023. 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

% Cover													
Site No.	Location	Native sp. Number	Tree	Shrub	Forbs	Grass	Other	Exotic sp. Number	Regn. Y/N	HBT	Logs (m)	Litter cover %	% HTE Cover
Spring 2022													
Site 1	On site	8	0	0	0.1	53.4	0	11	N/A	0	0	85	2
Site 4	On site	16	0	5	3.9	72.9	0	9	N/A	0	0	89	0.2
Site 6	Off site	17	0	0.1	15	3.9	0	9	N/A	0	0	95	0.1
Autumn 2023													
Site 1	On site	13	0	0	1	92.2	0	9	N/A	0	0	4.2	0
Site 4	On site	22	0	15	1.8	84.2	0	10	N/A	0	0	40	0.2
Site 6	Off site	17	0.1	0	15	32.5	0	6	N/A	0	0	10	2

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

All grassland sites continue to contain a high cover of exotic species (Figure 5). The exotic annual grasses *Holcus lanatus* and *Vulpia* sp. are most common. Other exotic perennial grasses common at the grassland sites were *Agrostis capillaris* and *Anthoxanthum odoratum*. Site 1 achieved greater than 50% native grass cover for the first time (Autumn 2023)

Table 3 Dominant species at each Grassland plot location

Site No.	On/Off site	Dominant Species both seasons
1	On site	<i>Poa labillardierei</i> , <i>Holcus lanatus</i> *, <i>Vulpia muralis</i> * <i>Microlaena stipoides</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

The balance between native and exotic species changed the two seasons at each location with *Microlaena* and *Themeda* performing strongest in the autumn surveys but being overshadowed

by exotics in spring. This may be due to the long cold wet winter which preceded the spring survey window. 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.

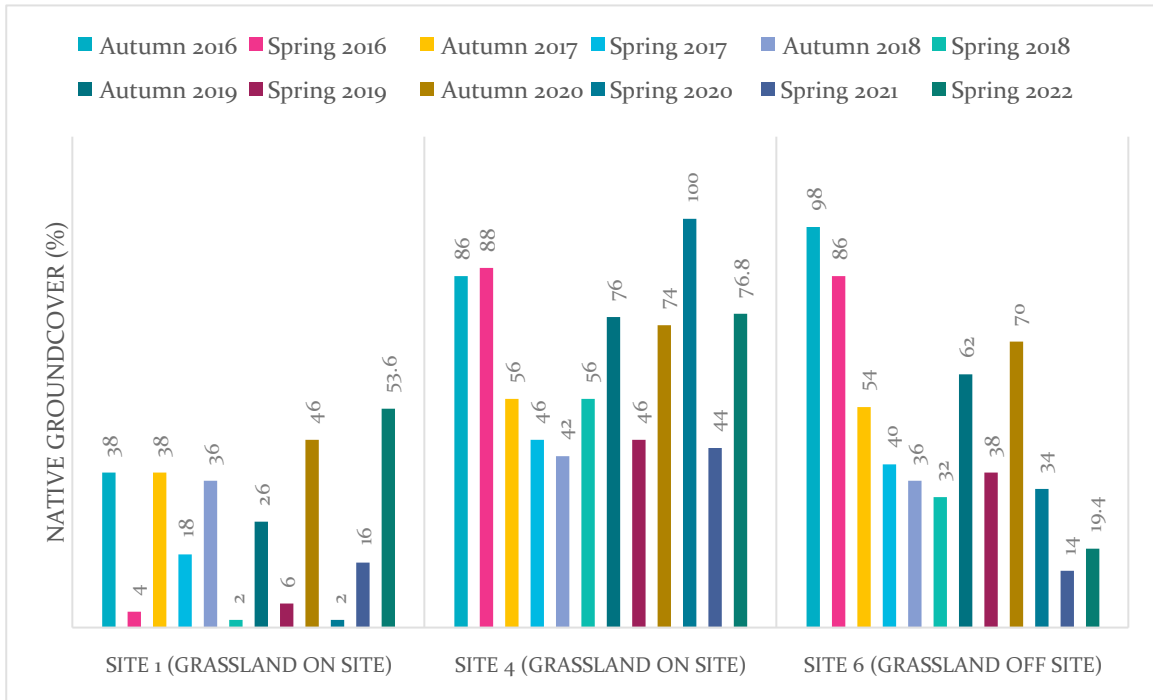


Figure 3 Native ground cover percentages within grassland plots in spring and autumn

Overall native ground cover showed a strong decline at all locations in Spring 2022 however this was countered by a degree of recovery at all sites in Autumn 2023. 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.

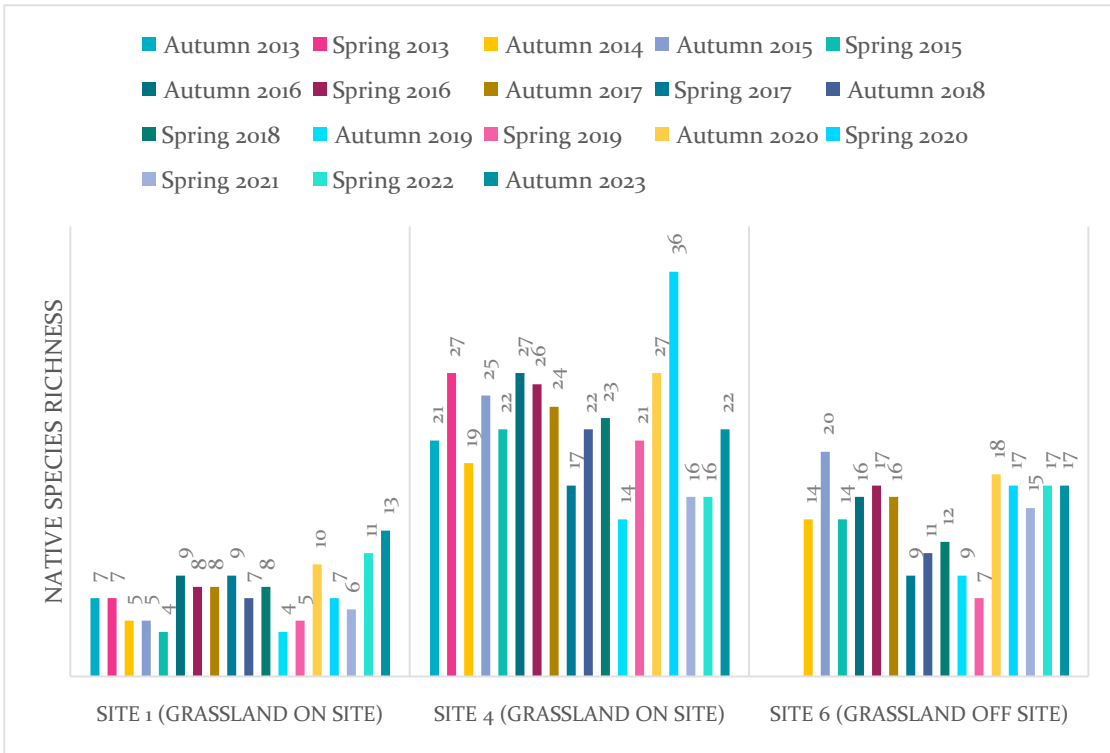


Figure 4 Native species richness at grassland sites Spring 2022 and Autumn 2023

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.

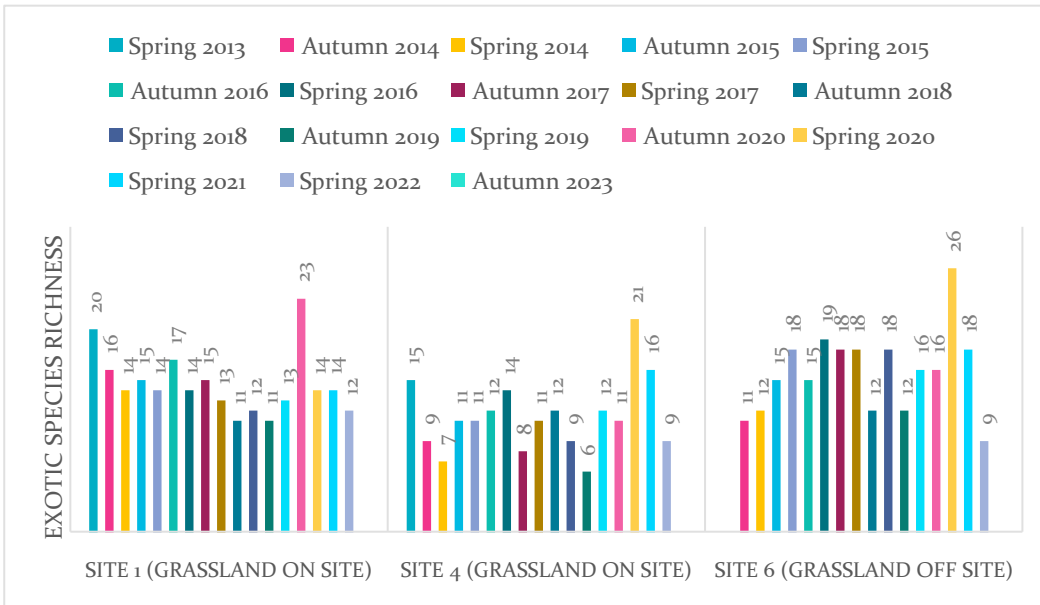


Figure 5 Exotic species cover spring 2022 and autumn 2023

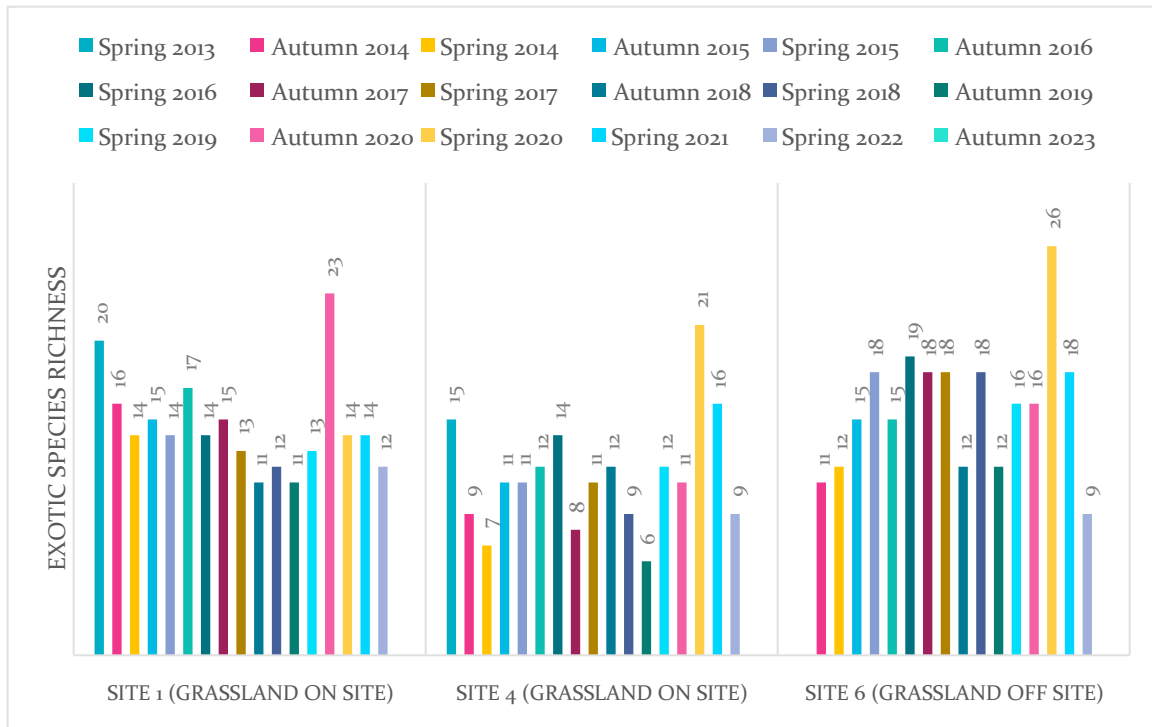


Figure 6 Exotic species richness Spring 2022 and Autumn 2023

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. Interestingly native species diversity was relatively stable over the last few years at that same location. During this survey round native species richness was greater than exotic species richness at Site 1 and Site 6, however exotic species were more dominant overall. Both onsite plots showed a dominance of native grass cover 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 was only collected in Spring 2022. 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 2022 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
Spring 2022													
Site 2	On site	11	30	0	6.8	50.2	0	16	N	7	210	15	3
Site 3	On site	23	5	0	16.5	60.4	0	18	N	2	161	54	7
Site 5	Off site	24	65	1.1	13.8	100	0.2	3	Y	2	81	97	0
Autumn 2023													
Site 2	On site	14	11	0	2.5	45.1	0.1	11	-	-	-	48	5
Site 3	On site	23	9.1	0	5.6	75.7	0.1	8	-	-	-	49	10
Site 5	Off site	29	35	2.5	5.5	100	0.4	2	-	-	-	66	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>	11
		Shrub	<i>Lepidium africanum</i> *	0
		Groundcover	<i>Microlaena stipoides</i> , <i>Holcus lanatus</i> *	54 (55% exotic)
3	On site	Canopy	<i>E. radiata</i>	11
		Shrub	<i>Rubus fruticosus</i> ssp. agg*	0
		Groundcover	<i>Microlaena stipoides</i> , <i>Poa sieberiana</i> ,	76

Site No.	On/Off site	Stratum	Dominant Species	Projected native foliage cover %
			<i>Austrostipa bigeniculata</i> ,	
5	Off site	Canopy	<i>Eucalyptus viminalis</i> , <i>E. radiata</i>	35
		Shrub	<i>Polyscias sambucifolia</i>	2.5
		Groundcover	<i>Austrostipa rudis</i> , <i>Lomandra longifolia</i> , <i>Microlaena stipoides</i>	100

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 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 with up to 25% cover. 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).

Exotic groundcover was higher than in 2021 over both off-site plots, the largest increase (28%) shown at site 2 from spring 2021. Higher than average rainfall may account for an increase in growth. Site 5 remains consistent at 0% exotic species cover. At the two on-site floristic plots, no exotic species were found to be particularly dominant, though those with the highest cover included annual/perennial *Lepidium africanum*.

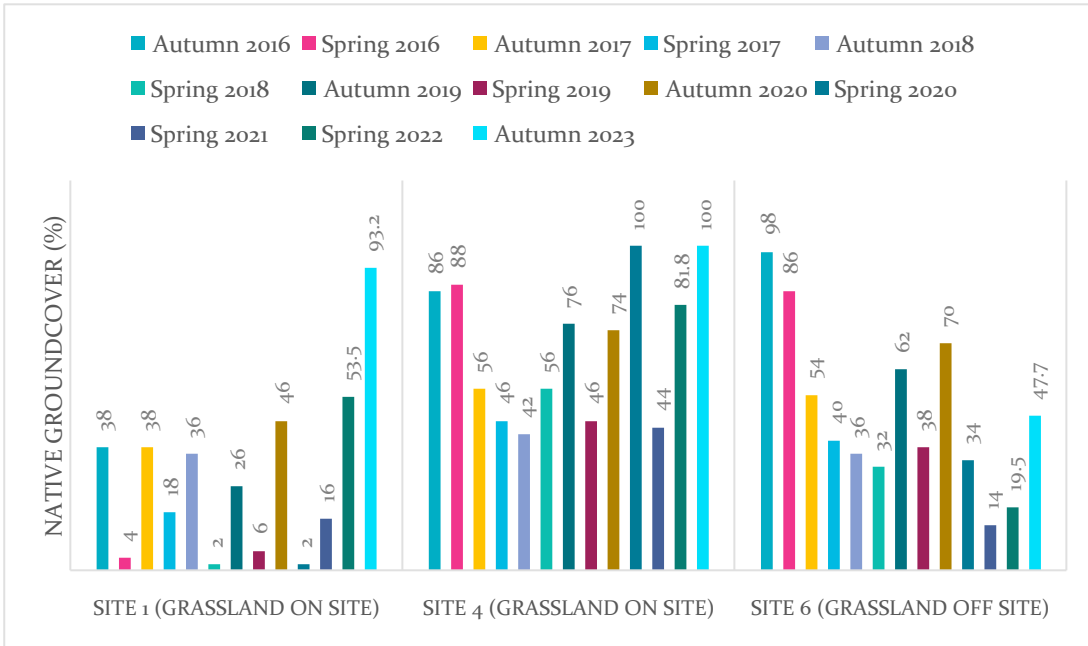


Figure 7 Native groundcover percentage Spring 2022 and Autumn 2023

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.

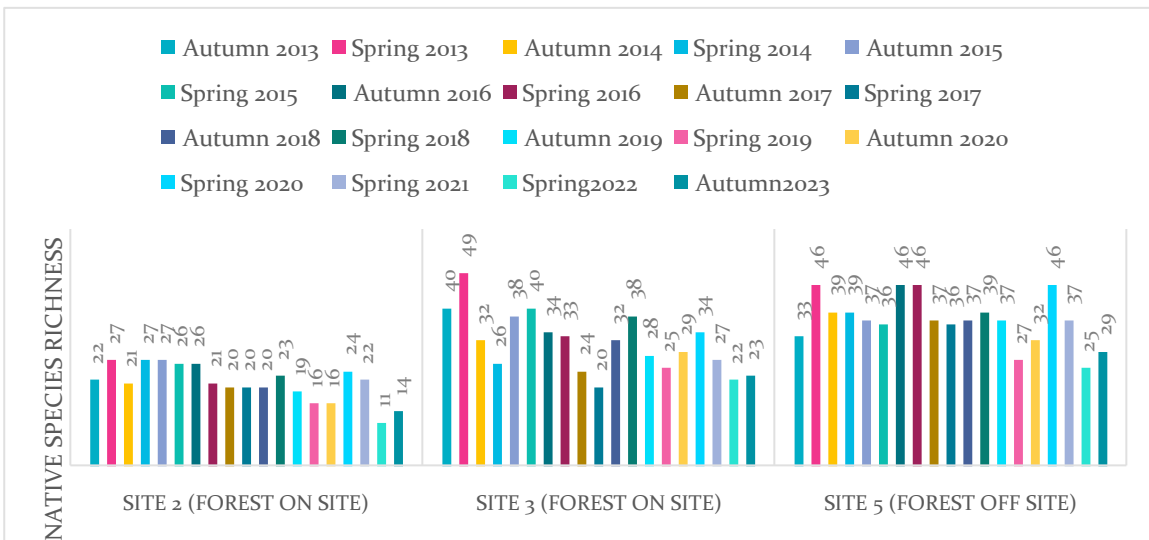


Figure 8 Native species richness forest sites Spring 2022 and Autumn 2023

The results from the nested flora quadrats show that native species richness continued to decrease in all plots since spring 2020. 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 (29 species 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 2022 and Autumn 2023. A slight negative trend is seen in the native species richness at all three sites.

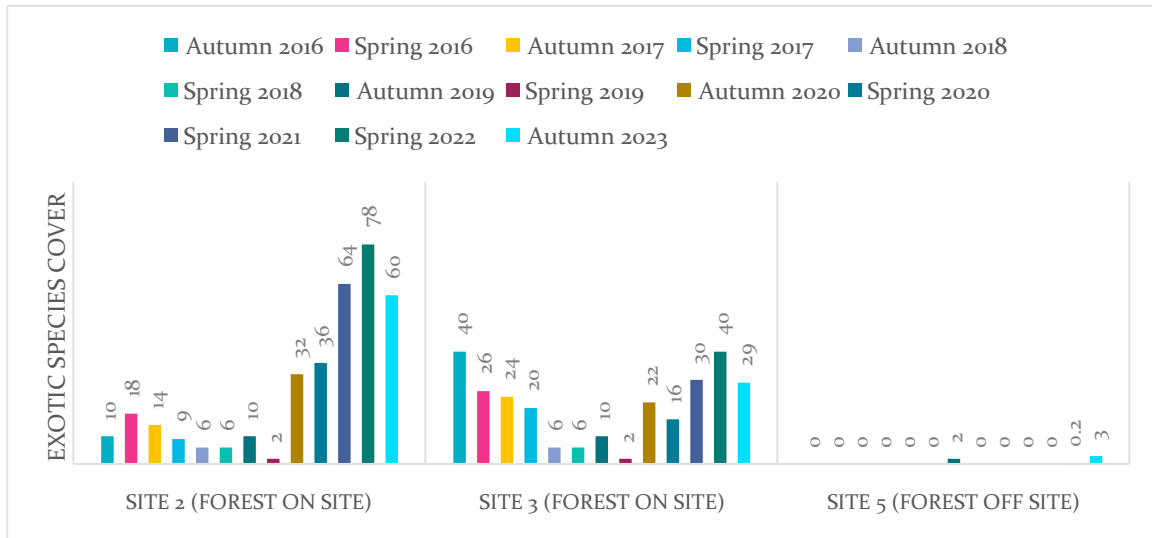


Figure 9 Exotic species cover Forest plots Spring 2022 and Autumn 2023

Lepidium africanum has 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. In Autumn 2023 *Lepidium* represented a 35% cover at the shrub layer at Site 2 and 5% 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. *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.

Both native and exotic groundcover declined continuously between spring 2016 and spring 2019 this is to be expected during drought years. Exotic groundcover increased substantially for the 2020 and 2021 surveys, indicating that the downward trend in cover may have been caused by drought, and that higher-than-average rainfall during those years allowed significant growth in exotic groundcover which was not reflected in native species cover until Spring 2022 when there was a resurgence of native species cover.

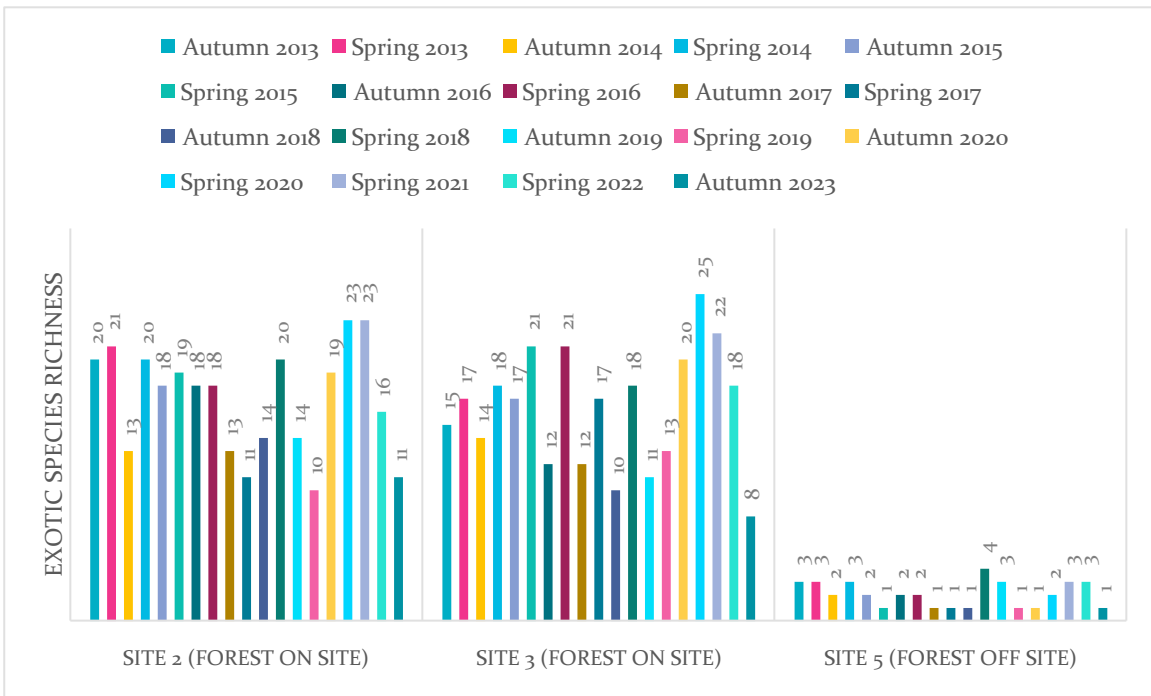


Figure 10 Exotic species richness Forest plots Spring 2022 and Autumn 2023

Exotic species richness has decreased again at Site 3 and is showing signs of decline at Site 2 (excluding 2020) and the off-site location. Generally, Sites 3 and 5 contain more native species than exotic species, one exception being Site 2 during Spring 2022 with 11 native and 16 exotics being recorded. 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. However, current uncontrolled grazing by a mob of sheep which roam at will across the site will also allow for weed seed spread and is likely to result in preferential grazing of selected native grasses and forbs.

TERRESTRIAL FAUNA

Diurnal bird survey

A total of 60 diurnal bird species were detected across the survey period (Appendix C). This is a slight increase in species diversity to previous years (ELA 2021). There was only the one species listed under the *Biodiversity Conservation Act* which was detected throughout the survey. The Gang-gang cockatoo (*Callocephalon fimbriatum*) was observed at site 4 and incidentally. Gang-gang cockatoos have been observed at the site in previous surveys. Many other threatened bird species known to the area, eg Scarlet robin (*Petroica boodang*), Flame robin (*Petroica phoenicea*), Diamond firetail (*Stagonopleura guttata*), are migratory species and are more frequent in the winter months.

Species diversity different between sites, ranging from 18 to 33 species per site. Site diversity has varied over the years, with the 2021 survey detecting a consistently higher diversity across all sites (Figure 11). The results from this survey are similar to other years at all but site 3. Site 3 was significantly lower in diversity, with only 18 species observed. A noticeable difference in this site was the abundance of Noisy minors and a grazing impacted understorey. 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. Grazing impacts from the feral sheep herd on site also promotes Noisy minor dominance by removing the shrubby understorey and protection for smaller birds.

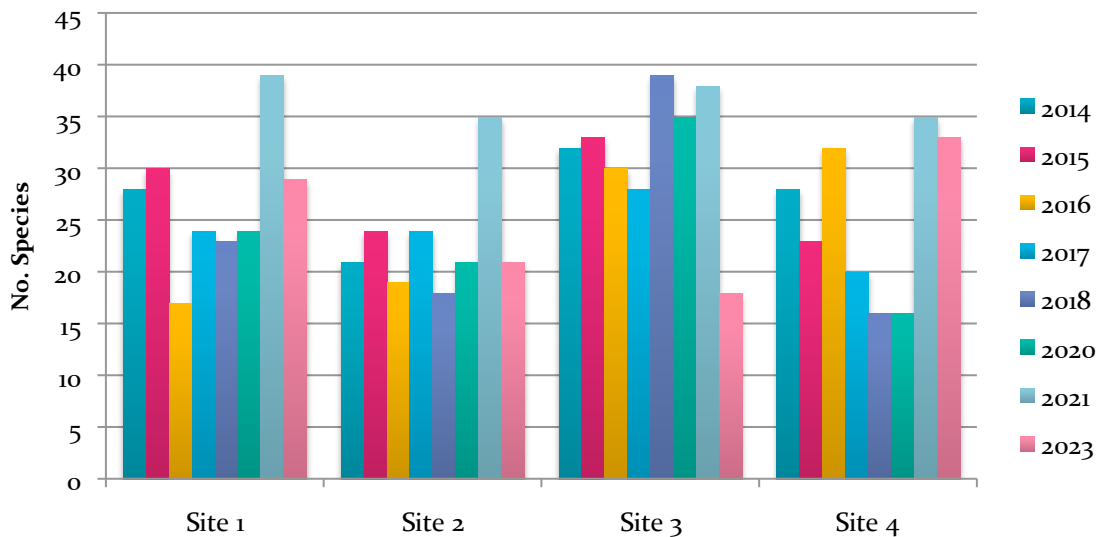


Figure 11: Total species observed per site during the 2 ha surveys (2014-2023)

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 next.

Herpetofauna survey

Four reptile and 7 amphibians were detected across the survey sites within the 2ha search area and incidentally (Table 6). No threatened species were observed. The survey period was favourable for reptile detection, however the nature of the dense grasses did inhibit reptile capture and identification. Consequently there were several skinks unable to be identified to species level. Despite this, the number of species detected were similar to previous surveys but with some variation in reptile species (EcoAus 2021). The absence of any snake detection is also 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*). An individual of this species was found as roadkill several weeks after the fauna survey (A. Saunders pers comm. 2023).

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
Garden skink	<i>Lampropholis spp.</i>	x	x		x	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

Common name	Scientific name	Site 1	Site 2	Site 3	Site 4	Incidental
Eastern stony creek frog	<i>Litoria wilcoxii</i>				x	
Smooth toadlet	<i>Uperoleia laevigata</i>					x

Camera trap survey

There was 7 mammal and one bird species detected during the camera trap survey (Table 7). The species recorded were similar to previous years and are all common and widespread in the area. Three species of introduced mammals were detected, the Red fox, Black rat and a feral Dorper sheep. All pose a threat to local species and habitat quality, through predation, competition and browsing damage.

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		
Bare-nosed wombat	<i>Vombatus ursinus</i>	x	x	x	x
Red fox	<i>Vulpes vulpes</i>	x	x	x	x
Black rat	<i>Rattus rattus</i>		x		x
Sheep	<i>Ovis Sp.</i>	x	x		
Australian Raven	<i>Corvus coronoides</i>		x		

Spotlight survey

A total of 9 mammals and 1 amphibian were observed during the spotlight survey (Table 8). An additional 4 amphibians were heard during the spotlight surveys. The results are similar to previous surveys, with Site 1 supporting the highest diversity of arboreal mammals.

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	
Sugar glider	<i>Petaurus breviceps</i>	x			
Common ringtail possum	<i>Pseudocheirus peregrinus</i>	x			
Sugar glider	<i>Petaurus breviceps</i>	x			
Common brushtail possum	<i>Trichosurus vulpecula</i>	x		x	x
Bare-nosed wombat	<i>Vombatus ursinus</i>	x	x	x	x
Rabbit	<i>Oryctolagus cuniculus</i>				x
Black rat	<i>Rattus rattus</i>		x		x
Sheep	<i>Ovis Sp.</i>	x			
Common eastern froglet	<i>Crinia signifera</i>				x
Eastern banjo frog	<i>Limnodynastes dumerilii</i>				x
Striped marsh frog	<i>Limnodynastes peronii</i>				x
Spotted grass frog	<i>Lymnodynastes tasmaniensis</i>	x		x	
Whistling tree frog	<i>Litoria verreauxii</i>				x

Call playback survey

The call playback survey failed to detect any of the target species, however the Southern boobook (*Ninox novaeseelandiae*) was heard on a single occasion. This result is consistent with previous call playback surveys.

Microchiropteran bat survey

There were 3,547 call sequences recorded across the 4 survey sites. Of these, 66.9% displayed sufficient quality to enable positive identification of a bat genus, species, or species complex. There were 8 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).

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	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	P	P	D
<i>Myotis macropus</i> *	Southern Myotis	D	P	P	D
<i>Nyctophylus sp.</i> Possible <i>N. geofferyi</i> , <i>N. gouldii</i>	Long-eared bat possible Gould's long-eared bat Lesser long-eared bat	P	P		P
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	D	D	D	D
<i>Saccolaimus flaviventris</i> *	Yellow-bellied Sheath-tailed Bat			P	

Scientific name	Common name	Site 1	Site 2	Site 3	Site 4
<i>Scoteanax rueppellii</i> *	Greater Broad-nosed Bat			P	P
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat			P	
<i>Vespadelus darlingtoni</i>	Large Forest Bat	D		P	P
<i>Vespadelus regulus</i>	Southern Forest Bat	P	P	P	
<i>Vespadelus vulturinus</i>	Little Forest Bat	D	D		P

The diversity of bat species did not vary greatly between sites (Tables 10-13), however the activity level was highest at Site 1 and 4. This may reflect the varied habitats or may be an artifact of the different recorders used. *Ozimops ridei* (Ride's Free-tailed Bat), *Chalinolobus gouldii* (Gould's Wattled Bat), *Austronomus australis* (White-striped Free-tailed Bat), *Miniopterus orianae oceanensis* (Large Bent-winged Bat)/*Vespadelus darlingtoni* (Large Forest Bat) / Large Bent-winged Bat (Southern Forest Bat) were the most commonly recorded species/complexes.

A diversity of habitat can be found across the sites, for example dams and flowing creeks provide foraging habitat for the Sothern myotis. Previous seasons have also lead to substantial vegetation growth and habitat for insect populations. The increase in species that utilise low-frequency echolocation calls used for long-range detection, such as White-striped Free-tailed Bat and Ride's Free-tailed Bat, may reflect the change in open grassland habitat quality in response to the previous wet seasons.

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 echolation 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	24	10	34
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	81	31	112
<i>Chalinolobus gouldii</i> / <i>Ozimops ridei</i>	Gould's Wattled Bat / Ride's Free-tailed Bat	0	22	22
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	2	1	3
<i>Falsistrellus tasmaniensis</i> * / <i>Scoteanax rueppellii</i> * / <i>Scotorepens orion</i>	Eastern False Pipistrelle / Greater Broad-nosed Bat / Eastern Broad-nosed Bat	0	6	6
<i>Falsistrellus tasmaniensis</i> * / <i>Vespadelus darlingtoni</i>	Eastern False Pipistrelle / Large Forest Bat	0	6	6
<i>Miniopterus orianae oceanensis</i> *	Large Bent-winged Bat	26	27	53
<i>Miniopterus orianae oceanensis</i> * / <i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Bent-winged Bat / Large Forest Bat / Southern Forest Bat	0	414	414
<i>Miniopterus orianae oceanensis</i> * / <i>Vespadelus regulus</i> / <i>Vespadelus vulturinus</i>	Large Bent-winged Bat / Southern Forest Bat / Little Forest Bat	0	134	134
<i>Myotis macropus</i> *	Southern Myotis	13	27	40
<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	26	26

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	41	13	54
<i>Vespadelus darlingtoni</i>	Large Forest Bat	1	0	1
<i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Forest Bat	0	0	7
<i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Southern Forest Bat / Little Forest Bat	0	22	22
<i>Vespadelus vulturnus</i>	Little Forest Bat	23	13	36
Unidentifiable / unusable				492
Total calls				1475
Percentage of usable calls				66.7

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	8	3	11
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	27	13	40
<i>Chalinolobus gouldii</i> / <i>Ozimops ridei</i>	Gould's Wattled Bat / Ride's Free-tailed Bat	0	72	72
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	1	1	2
<i>Chalinolobus morio</i> / <i>Vespadelus vulturnus</i>	Chocolate Wattled Bat / Little Forest Bat	0	1	1

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Falsistrellus tasmaniensis*</i> / <i>Scoteanax rueppellii*</i> / <i>Scotorepens orion</i>	Eastern False Pipistrelle / Greater Broad-nosed Bat / Eastern Broad-nosed Bat	0	3	3
<i>Miniopterus orianae oceanensis*</i>	Large Bent-winged Bat	0	8	8
<i>Miniopterus orianae oceanensis*</i> / <i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Bent-winged Bat / Large Forest Bat / Southern Forest Bat	0	414	414
<i>Miniopterus orianae oceanensis*</i> / <i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Large Bent-winged Bat / Southern Forest Bat / Little Forest Bat	0	16	16
<i>Myotis macropus*</i>	Southern Myotis	0	3	3
<i>Myotis macropus*</i> / <i>Nyctophilus species, in this region N. geoffroyi and N. gouldii are likely to be present.</i>	Southern Myotis / Large-eared Bats, in this region Gould's and Lesser are likely to be present.	0	8	8
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	3	0	3
<i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Forest Bat	0	4	4
<i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Southern Forest Bat / Little Forest Bat	0	5	5
<i>Vespadelus vulturnus</i>	Little Forest Bat	2	0	2
Unidentifiable / unusable				153
Total calls				408
Percentage of usable calls				62.5

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	6	1	7
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	32	8	40
<i>Chalinolobus gouldii</i> / <i>Ozimops ridei</i>	Gould's Wattled Bat / Ride's Free-tailed Bat	0	9	9
<i>Chalinolobus gouldii</i> / <i>Scotorepens orion</i>	Gould's Wattled Bat / Eastern Broad-nosed Bat	0	1	1
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	2	3	5
<i>Falsistrellus tasmaniensis</i> * / <i>Scoteanax rueppellii</i> * / <i>Scotorepens orion</i>	Eastern False Pipistrelle / Greater Broad-nosed Bat / Eastern Broad-nosed Bat	0	2	2
<i>Miniopterus orianae oceanensis</i> *	Large Bent-winged Bat	0	8	8
<i>Miniopterus orianae 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 orianae oceanensis</i> * / <i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Large Bent-winged Bat / Southern Forest Bat / Little Forest Bat	0	22	22
<i>Myotis macropus</i> *	Southern Myotis	0	12	12
<i>Myotis macropus</i> * / <i>Nyctophilus species, in this region N. geoffroyi and N. gouldii are likely to be present.</i>	Southern Myotis / Large-eared Bats, in this region Gould's and Lesser are likely to be present.	0	4	4
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	10	4	14

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Saccolaimus flaviventris</i> *	Yellow-bellied Sheath-tailed Bat	0	2	2
<i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Southern Forest Bat / Little Forest Bat	0	9	9
Unidentifiable / unusable				26
Total calls				179
Percentage of usable calls				85.3

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>Austronomus australis</i>	White-striped Free-tailed Bat	89	14	103
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	11	7	18
<i>Chalinolobus gouldii</i> / <i>Ozimops ridei</i>	Gould's Wattled Bat / Ride's Free-tailed Bat	0	36	36
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	2	3	22
<i>Chalinolobus morio</i> / <i>Vespadelus vulturnus</i>	Chocolate Wattled Bat / Little Forest Bat	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	5	5
<i>Falsistrellus tasmaniensis</i> * / <i>Vespadelus darlingtoni</i>	Eastern False Pipistrelle / Large Forest Bat	0	0	2

Scientific name	Common name	Definitely present	Potentially present	Total calls
<i>Miniopterus orianae oceanensis*</i>	Large Bent-winged Bat	21	35	56
<i>Miniopterus orianae oceanensis*</i> / <i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Bent-winged Bat / Large Forest Bat / Southern Forest Bat	0	489	489
<i>Miniopterus orianae oceanensis*</i> / <i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Large Bent-winged Bat / Southern Forest Bat / Little Forest Bat	0	82	82
<i>Myotis macropus*</i>	Southern Myotis	12	58	70
<i>Myotis macropus*</i> / <i>Nyctophilus species, in this region N. geoffroyi and N. gouldii are likely to be present.</i>	Southern Myotis / Large-eared Bats, in this region Gould's and Lesser are likely to be present.	0	9	9
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	105	28	133
<i>Vespadelus darlingtoni</i>	Large Forest Bat	0	2	2
<i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	Large Forest Bat	0	10	10
<i>Vespadelus regulus</i> / <i>Vespadelus vulturnus</i>	Southern Forest Bat / Little Forest Bat	0	45	45
<i>Vespadelus vulturnus</i>	Little Forest Bat	0	2	2
Unidentifiable / unusable				398
Total calls				1485
Percentage of usable calls				73.2

Incidental observations

Incidental observation through visual observation, hearing call or identifying trace material identified an additional 11 birds across the site (Appendix C). For mammals, only cattle grazing in the vicinity of Site 4 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 are utilizing a greater area across the site than what was detected for each site. In particular, rabbits are found across the site. 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*). Several individuals were sighted in Majors Creek, adjacent to Site 4.

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
Birds	52	55	50	43	77	55	55	61
Frogs	5	3	7	8	8	9	7	7
Reptiles	6	10	8	6	7	6	5	4
Mammals (excl. microbats)	8	9	8	9	7	6	12	11
Microbats	7	5	12	12	12	15	16	14
Total species	78	82	85	78	111	91	95	97

Conclusion and Recommendations

FLORA

Terrestrial flora monitoring does not indicate any substantial changes in species composition or abundance since operations commenced at DGM. Higher than average rainfall and above average temperatures over the last few years are likely to have affected the composition and number of exotic and native floral species.

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 first time (Autumn 2023) with 53.6% native cover. All sites are subject to ongoing agricultural management (cattle and/or sheep grazing). Exotic species richness remains relatively high at all grassland sites, with a considerable drop in the number of native species between 2020 and 2021.

The open forest sites remain in moderate condition. There has been a considerable increase in exotic species numbers and density since the drought ended in 2020 and a small decrease in the number of native species across all monitoring sites. This may be due to continued above average rainfall leading up to the survey period as well increased encroachment from nearby grazing disturbance and continual grazing by sheep.

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. 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).

- Removal of the feral sheep from the DGM may help to restore some of the balance of native forbs and grasses as well as allowing for regeneration of shrub and tree species within the open forest areas.
- 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.

Monitoring recommendations

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

As highlighted in previous reporting by ELA, 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 SPEICES LIST

Scientific Name	Common Name	Native or Exotic
<i>Acacia mearnsii</i>	Black Wattle	N
<i>Acacia spp.</i>	Wattle	N
<i>Acaena novae-zelandiae</i>	Bidgee-widgee	N
<i>Ajuga australis</i>	Austral Bugle	N
<i>Alternanthera denticulata</i>	Lesser Joyweed	N
<i>Anagallis arvensis</i>	Scarlet Pimpernel	E
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass	E
<i>Arthropodium milleflorum</i>	Pale Vanilla-lily	N
<i>Arthropodium spp.</i>	-	N
<i>Asperula conferta</i>	Common Woodruff	N
<i>Asperula scoparia</i>	Prickly Woodruff	N
<i>Austrostipa bigeniculata</i>	Yanganbil	N
<i>Austrostipa rudis</i>	-	N
<i>Austrostipa scabra</i>	Speargrass	N
<i>Billardiera scandens</i>	Hairy Apple Berry	N
<i>Bossiaea buxifolia</i>	-	N
<i>Brachyscome spp.</i>	Daisy	N
<i>briza minor</i>	Shivery Grass	E
<i>Bromus catharticus</i>	Praire Grass	E
<i>Bursaria spinosa</i>	Native Blackthorn	N
<i>Carex appressa</i>	Tall Sedge	N
<i>Carex inversa</i>	Knob Sedge	N
<i>Caustis flexuosa</i>	Curly Wig	N
<i>Cconyza spp.</i>	Fleabane	E
<i>Cerastium spp.</i>	-	E
<i>Chrysocephalum apiculatum</i>	Common Everlasting	N
<i>Cirsium vulgare</i>	Spear Thistle	E
<i>Cotula australis</i>	Common Cotula	N
<i>Cymbonotus lawsonianus</i>	-	N
<i>Cynodon dactylon</i>	Common Couch	N
<i>Cyperus gracilis</i>	Slender Flat-sedge	N
<i>Cytisus scoparius</i>	-	E
<i>Desmodium varians</i>	Slender Tick-trefoil	N
<i>Dianella longifolia</i>	Blueberry Lily	N

Scientific Name	Common Name	Native or Exotic
<i>Dichelachne spp.</i>	-	N
<i>Dichondra repens</i>	Kidney Weed	N
<i>Echinopogon ovatus</i>	Forest Hedgehog Grass	N
<i>Einadia hastata</i>	Berry Saltbush	N
<i>Eragrostis brownii</i>	Brown's Lovegrass	N
<i>Erodium spp.</i>	Crowfoot	N
<i>Eucalyptus radiata</i>	Narrow-leaved Peppermint	N
<i>Eucalyptus viminalis</i>	Ribbon Gum	N
<i>Euchiton involucratus</i>	Star Cudweed	N
<i>Euchiton sphaericus</i>	Star Cudweed	N
<i>Gamochaeta spp.</i>	-	N
<i>Geranium solanderi</i>	Native Geranium	N
<i>Glycine clandestina</i>	Twining glycine	N
<i>Gonocarpus spp.</i>	Raspwort	N
<i>Gonocarpus tetragynus</i>	Poverty Raspwort	N
<i>Haloragis heterophylla</i>	Variable Raspwort	N
<i>Hibbertia obtusifolia</i>	Hoary Guinea Flower	N
<i>Holcus lanatus</i>	Yorkshire Fog	E
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	N
<i>Hydrocotyle sibthorpioides</i>	-	N
<i>Hypericum gramineum</i>	Small St John's Wort	N
<i>Hypochaeris glabra</i>	Smooth Catsear	E
<i>Hypochoeris radicata</i>	Catsear	E
<i>Hypoxis hygrometrica</i>	Golden Weather-grass	N
<i>Juncus acutus</i>	-	N
<i>Juncus australis</i>	Rush	N
<i>Juncus bufonius</i>	Toad Rush	N
<i>Juncus filicaulis</i>	-	N
<i>Juncus spp.</i>	-	N
<i>Juncus subsecundus</i>	Finger Rush	N
<i>Kunzea parvifolia</i>	Violet Kunzea	N
<i>Lepidium spp.</i>	-	N
<i>Leptorhynchus squamatus</i>	Scaly Buttons	N
<i>Linum marginale</i>	Native Flax	N
<i>Lobelia purpurascens</i>	whiteroot	N
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	N
<i>Lythrum hyssopifolia</i>	Hyssop Loosestrife	U
<i>malva neglecta</i>	Dwarf Mallow	E
<i>Microlaena stipoides</i>	Weeping Grass	N

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

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

APPENDIX 2 – SITE PHOTOS SPRING 2022 AND AUTUMN 2023

The photographs below show the center line of each site during the Spring 2022 and Autumn 2023 survey period.



Plot 1 On site Grassland - Spring 2022



Plot 1 On site Grassland - Autumn 2023



Plot 2 On site Open Forest - Spring 2022



Plot 2 On site Open Forest - Autumn 2023 (different angle)



Plot 3 Open Forest - Spring 2022



Plot 3 Open Forest - Autumn 2023



Plot 4 On site Grasslands - Spring 2022



Plot 4 On site Grasslands - Autumn 2023



Plot 5 Off site Open Forest - Spring 2022



Plot 5 Off site Open Forest - Autumn 2023



Plot 6 Off site Grassland - Spring 2022



Plot 6 Off site Grassland - Autumn 2023

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	1
<i>Chenonetta jubata</i>	Australian Wood Duck	1	1	1	1	1
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	1	1	1		1
<i>Acanthiza pusilla</i>	Brown Thornbill	1				1
<i>Turdus merula</i>	Common Blackbird					1
<i>Platycercus elegans</i>	Crimson Rosella	1	1	1	1	1
<i>Platycercus eximius</i>	Eastern Rosella	1	1	1	1	1
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	1			1	1
<i>Psophodes olivaceus</i>	Eastern Whipbird	1				1
<i>Eopsaltria australis</i>	Eastern Yellow Robin					1
<i>Eolophus roseicapillus</i>	Galah			1	1	1
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo				1	1
<i>Cracticus torquatus</i>	Grey Butcherbird		1	1	1	1

Scientific Name	Common Name	Site 1	Site 2	Site 3	Site 4	Incidents
<i>Rhipidura albiscapa</i>	Grey Fantail	1			1	1
<i>Colluricincla harmonica</i>	Grey Shrike-thrush					1
<i>Chrysococcyx basalis</i>	Horsfields Bronze Cuckoo		1			1
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	1	1	1	1	1
<i>Grallina cyanoleuca</i>	Magpie-lark	1	1	1	1	1
<i>Falco cenchroides</i>	Nankeen Kestrel					1
<i>Manorina melanocephala</i>	Noisy Miner	1	1	1	1	1
<i>Cacomantis pallidus</i>	Pallid Cuckoo					1
<i>Strepera graculina</i>	Pied Currawong	1	1	1	1	1
<i>Anthochaera carunculata</i>	Red Wattlebird	1	1	1	1	1
<i>Pachycephala rufiventris</i>	Rufous Whistler					1
<i>Ninox novaeseelandiae</i>	Southern Boobook					1
<i>Pardalotus striatus</i>	Striated Pardalote	1				1
<i>Acanthiza lineata</i>	Striated Thornbill	1			1	1
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo		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
<i>Hirundo neoxena</i>	Welcome Swallow	1			1	1
<i>Egretta novaehollandiae</i>	White-faced Heron				1	1
<i>Cormobates leucophaea</i>	White-throated Treecreeper	1	1	1	1	1
<i>Rhipidura leucophrys</i>	Willie Wagtail	1			1	1
<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	1	1	1	1	1
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill				1	1
<i>Alisterus scapularis</i>	Australian King-parrot		1			1
<i>Accipiter fasciatus</i>	Brown Goshawk					1
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater					1
<i>Phaps chalcoptera</i>	Common Bronzewing					1
<i>Sturnus vulgaris</i>	Common Starling	1	1		1	1
<i>Ocyphaps lophotes</i>	Crested Pigeon					1
<i>Eurystomus orientalis</i>	Dollarbird	1			1	1
<i>Gallinula tenebrosa</i>	Dusky Moorhen	1				
<i>Artamus cyanopterus</i>	Dusky Woodswallow					1

Scientific Name	Common Name	Site 1	Site 2	Site 3	Site 4	Incidents
<i>Fulica atra</i>	Eurasian Coot					1
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo					1
<i>Strepera versicolor</i>	Grey Currawong				1	1
<i>Anas gracilis</i>	Grey Teal		1			1
<i>Microeca fascinans</i>	Jacky Winter					1
<i>Cacatua sanguinea</i>	Little Corella				1	1
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant					1
<i>Corvus mellori</i>	Little Raven			1		
<i>Vanellus miles</i>	Masked Lapwing	1				1
<i>Todiramphus sanctus</i>	Sacred Kingfisher	1				1
<i>Zosterops lateralis</i>	Silvereye				1	1
<i>Ptilonorhynchus violaceus</i>	Satin Bowerbird	1	1	1	1	1
<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
<i>Corcorax</i>	White-winged Chough					1

Scientific Name	Common Name	Site 1	Site 2	Site 3	Site 4	Incidents
<i>melanorhamphos</i>						
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo	1	1	1	1	1