umwelt
Environmental & Social Consultants

2

ACT Government | Suburban Land Agency

2024 GOLDEN SUN MOTH MONITORING REPORT

Yarralumla Equestrian Park

FINAL

April 2025

2024 GOLDEN SUN MOTH MONITORING REPORT

Yarralumla Equestrian Park

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
ACT Government Suburban Land Agency

Project Director:	Clare McInnes
Project Manager:	Clare McInnes
Report No.	21034/R05
Date:	February 2025

Unit 3 2-6 Shea Street
Phillip, ACT, 2606

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	Clare McInnes	15/4/2025	Clare McInnes	15/4/2025
V2	Clare McInnes	4/6/2025	Clare McInnes	4/6/2025

Table of Contents

Figures

Tables

1.0 Introduction

Umwelt monitored the extent and condition of the critically endangered *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory* ecological community (natural temperate grassland) and the extent and condition of habitat for the vulnerable golden sun moth (*Synemon plana*) and its population within the Yarralumla Equestrian Park (YEP) offset area (YEP offset area; **Figure 1.1**). The monitoring was undertaken on behalf of the ACT Government Suburban Land Agency and forms part of the annual reporting requirements for the YEP offset area, pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval decision (EPBC 2012/6292).

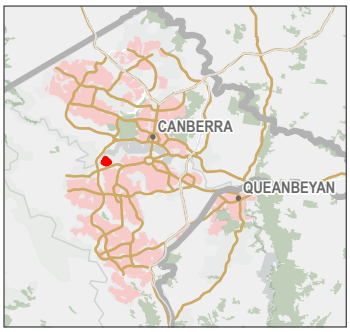
This report presents the results of monitoring surveys undertaken in November 2024 within the YEP offset area. The results are briefly examined in relation to existing site information, and the baseline (where applicable) and monitoring data collected from year 1 through to year 9 (RJPL 2014; RJPL 2015; SMEC 2016; SMEC 2017; SMEC 2018; Umwelt 2019; Umwelt 2020; Umwelt 2021a; Umwelt 2022; Umwelt 2023; Umwelt 2024). The implications of results are considered in relation to the performance targets identified in the updated OMP (Umwelt 2021).

FIGURE 1.1

Locality Plan

Legend

- Yarralumla Equestrian Park Boundary
- Road
- Open Space
- Waterbody



0 0.5 1

Kilometres

Scale 1:20,000 at A4
GDA2020 MGA Zone 55

Image Source: ACTMapi (2024) | **Data Source:** NSW DFSI (2025)

2.0 Methods

The survey area comprised the YEP offset area, as defined in the original OMP (RJPL 2014a) (**Figure 2.1**).

2.1 Grassland Condition

2.1.1 Grassland Floristics and Determination of the Extent of Natural Temperate Grassland

Grassland monitoring was conducted over two days on 04 and 05 November 2024. Twelve fixed 20 m x 20 m plots were completed, within which data on floristic diversity and cover was recorded (**Figure2.1**). The location of the plots was consistent with previous monitoring assessments and located via georeferenced points.

Floristic value scores were calculated in accordance with Rehwinkel (2015) and plot data was assessed against condition thresholds (benchmarks) for the natural temperate grassland ecological community (as described in the updated OMP (Umwelt 2021)) and in comparison with monitoring data collected since 2018.

To be consistent with the listing criteria for the natural temperate grassland ecological community each patch assessed must be >0.1 ha within the defined region and altitude, and naturally treeless or sparsely treed, and it must meet criterion A or B:

- Criterion A: contains a foliage cover of more than 50% *Themeda triandra* (kangaroo grass) or *Poa labillardierei* (river tussock) or *Carex bichenoviana* (plains sedge) if the patch is an ephemeral wetland.
- Criterion B: contains a greater percentage cover of native plants (including annual and perennial species but not cryptogams) than of perennial exotic species (including weeds), AND in favourable sampling times (generally spring and early summer, and in non-drought affected seasons) it has:
    - at least eight non-grass native species, or
    - at least two indicator species, or
    - a floristic value score of at least five.
- or at other sampling times, it has:
    - at least four non-grass native species, or
    - at least one indicator species, or
    - a floristic value score of at least three.

Thresholds for favourable sampling times were applied.

Due to the absence of a minimum size criteria for the former EPBC Act listed *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory* endangered ecological community used in the original assessment of the YEP offset area, the minimum size restriction was not considered as part of the thresholds when monitoring the extent of natural temperate grassland at this site. The application of this threshold would result in artificial changes in the extent of natural temperate grassland present.

2.1.2 Grassland Structure

Twelve 25 m transects were completed to assess grassland structure, biomass, weed cover, and abundance of golden sun moth feed species, collected using the *ACT Government Understorey Structure – Step Point App* (ACT Government 2020). Each transect commenced within or adjacent to a 20 m x 20 m plot (**Figure 2.1**). Data on the presence of the following 14 attributes were collected at 50 points along each transect:

- cryptogams
- bare ground
- rock
- litter
- thatch cover
- chilean needlegrass (*Nassella neesiana*)
- serrated tussock (*Nassella trichotoma*)
- annual exotic grass
- perennial exotic grass
- exotic broadleaf
- native wallaby grass (*Rytidosperma* spp.)
- native spear grass (*Austrostipa* spp.)
- perennial native grass
- native broadleaf
- other.

2.1.3 Weeds

An assessment of the extent and density of significant weed species was undertaken within the YEP offset area. Areas dominated by significant weed species (i.e. >50% cover) were mapped. Previous mapping of areas of significant weed species were assessed and updated to reflect changes in area size.

Significant weed species are:

- Serrated tussock.
- African lovegrass (*Eragrostis curvula*).
- Chilean needlegrass.
- Paterson's curse (*Echium plantagineum*).
- St John's wort (*Hypericum perforatum*).

Additional weeds with potential management implications were recorded where applicable. Data collected will assist in determining the effectiveness of weed management actions undertaken by the land managers. Weed surveys are undertaken in conjunction with the floristic surveys as described in **Section 2.1.1**.

2.2 Revised Grassland Mapping

Mapping of the extent and distribution of vegetation types was conducted in November 2024. Mapping was conducted via a meandering traverse throughout the YEP offset area, with close inspection of native pasture and natural temperate grassland areas. The distribution of natural temperate grassland, native pasture, mixed native and exotic pasture, and exotic pasture was mapped. Maps of exotic perennial tussock grasses were also updated.

Native pasture is defined as areas of grassland that are dominated by native plant species but do not contain the required floristic value score or indicator species/non-grass native species to be deemed natural temperate grassland. Native pasture areas continuous with areas of natural temperate grassland are considered as components of the natural temperate grassland. Mixed native and exotic pasture is defined as grassland areas in which coverage is split evenly between native (perennial and annual) and exotic (perennial) cover. Exotic pasture is defined as an area that contains greater exotic perennial cover then native perennial and annual species.

Changes in the extent of vegetation types and golden sun moth habitat was assessed against that mapped in previous years.

2.3 Golden Sun Moth Habitat Condition Mapping

As specified in the OMP (RJPL 2014a), an assessment of golden sun moth habitat was undertaken using a meandering traverse throughout the YEP offset area, covering both exotic and native grass dominated areas. The distribution of golden sun moth habitat was mapped to the following condition classes:

- **High Quality habitat**: natural temperate grassland or native pasture dominated by native larval food plants with low weed cover and some bare ground. Minimum values:
    - 10% cover *Rytidosperma* sp.
    - > 15% cover *Rytidosperma* sp. and *Austrostipa* sp. combined.
    - > 5 % bare ground.

- < 5% broadleaf.
- Low to moderate biomass.
- Moderate to high native plant diversity.

- **Moderate quality habitat**. Primary or secondary grassland, with a moderate component of *Rytidosperma* sp. and/or *Austrostipa* sp., and/or moderate weed cover. Minimum values:
  - > 5% cover *Rytidosperma* sp.
  - > 10% cover *Rytidosperma* sp. and/or *Austrostipa* sp. combined.
  - > 3 % bare ground.
  - < 10% broadleaf.
  - Low to moderate biomass.
  - Moderate native plant diversity.
- **Low quality habitat**. Larval food plants (*Rytidosperma* sp., *Austrostipa* sp. and/or Chilean needlegrass) are a minor component of the ground layer, growing sparsely or in patches among unsuitable vegetation such as:
  - Exotic species (excluding Chilean needlegrass).
  - Native C4 grasses (such as *Themeda triandra*).
  - Other unsuitable native ground cover (e.g. *Poa labillardieri*, rushes/sedges).
  - And the minimum values are met:
    - > 10% cover *Rytidosperma* sp. and/or *Austrostipa* sp. combined.
    - < 20% broadleaf.
- **Chilean needlegrass dominated habitat.** Grassland dominated by Chilean needlegrass, or as a major component.

2.4 Golden Sun Moth Surveys

The start of the golden sun moth flying season within the ACT was confirmed based on the emergence of moths within known reference sites as communicated by a contact group that includes local consultants and ACT Government ecologists.

Golden sun moth surveys were undertaken within the flight season on 06 and 25 November 2024.

Golden sun moth surveys were conducted according to the protocol outlined in the draft updated OMP (Umwelt, unpublished) and in line with the ACT Government protocols for monitoring golden sun moth in offset areas (ACT Government 2010).

Two methods were undertaken to survey golden sun moth in accordance with Umwelt (unpublished), being:

- Rotational point counts at 12 established locations for comparison with surveys conducted from 2013-2023 (RJPL 2014b).
    - Each rotational point count is completed by turning 360 degrees over 30 seconds, repeated a total of 10 times (for a total of 300 seconds of survey time). The average number of golden sun moths seen per rotation in each plot was calculated (total number of golden sun moths counted at each point divided by 10). This calculation was undertaken to compare results within previous reports.
- Timed transects across 15 established 100 m transect locations for consistency with ACT Government Offset golden sun moth survey protocol (ACT Government 2010).

On-site weather data was recorded during all flying golden sun moth field surveys. Incidental golden sun moth observations were also recorded during other site visits and between surveys.

Female golden sun moths and pupa cases were recorded separately from the timed surveys. The records were identified as incidental observations.

The surveys were undertaken on days with suitable conditions for the golden sun moth (**Table 2.1**), specifically:

- warm to hot days (above 20◦C by 10am)
- warmest part of the day (between 10am – 2pm)
- clear mostly cloudless sky
- still or relatively still wind conditions
- no less than two days since rain (>1 mm) or an unusually cold night.

Table 2.1 Weather Conditions during 2024 Golden Sun Moth Surveys

Component	Date	Temp (ºC) (average)	Last rainfall (mm)	Wind speed (Low, Medium, High)	Cloud cover (%)
Transect Survey 1 / Rotational Survey 1	06/11/24	29.3	0.2 (20 October)	low – medium	0 – 10
Transect Survey 2 / Rotational Survey 2	25/11/24	28.0	0.2 (19 November)	low	50

2.5 Meteorological Data

Meteorological data for Canberra Airport (BoM station: #70351) dating from 1 January 2013 to 31 December 2024 was obtained from the Bureau of Meteorology website to assist in the examination of the relationship between observed golden sun moth abundance and meteorological variables such as rainfall. References to climate data within this report predating 2009 pertain to data recorded at the closed Canberra Airport Comparison site (BoM station no. 70014).

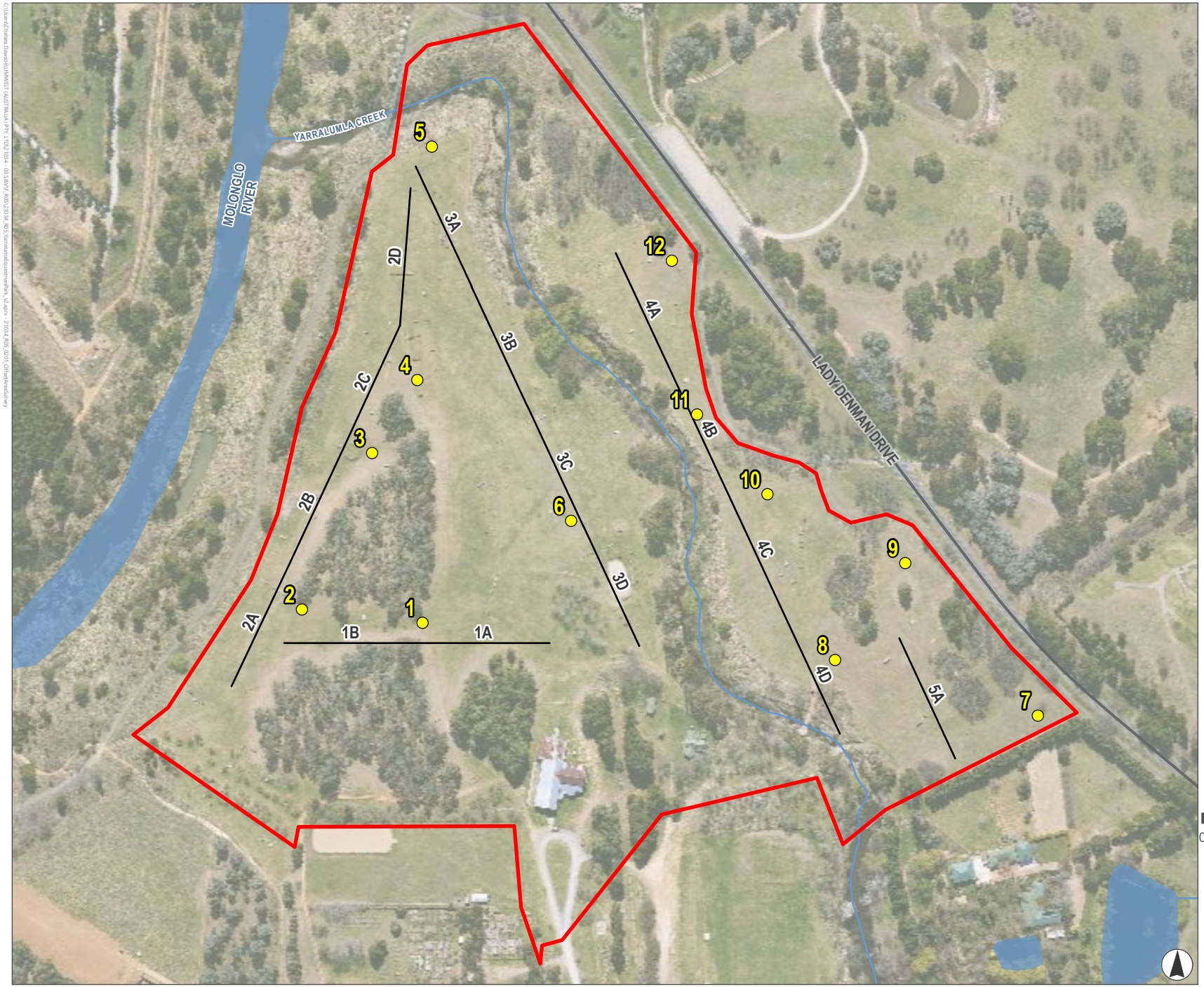
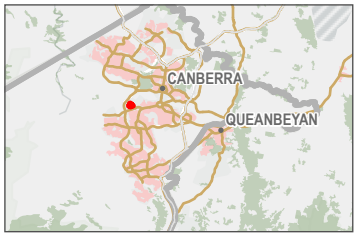


FIGURE 2.1

Yarralumla Equestrian Park Offset Area and Survey Details

Legend

- Vegetation Plots and Rotational Points
- Indicative GSM Transects
- Yarralumla Equestrian Park Boundary
- Road
- Waterbody



0 100 200

Metres

Scale 1:4,000 at A4
GDA2020 MGA Zone 55

Image Source: ACTMapi (2024) | **Data Source:** Umwelt (2025)

3.0 Results

3.1 Grassland Condition (following Rehwinkel 2015) and Structure

A summary of the results of the 2024 floristic surveys, following Rehwinkel (2015) and the results for the comparison of each plot against the benchmark condition for each metric are displayed in **Table 3.1**. Benchmarks include those for grassland structure. Thatch density and grass height was observed to be knee-height in most areas across the YEP offset area (at least 1 m high). Only a small number of sections had grass heights under 40 cm. The high biomass combined with a moderate level of thatch reduced bare ground cover to below benchmark levels in 11 of the 12 plots.

Overall, the number of values that were within benchmark range was low. Five plots met the benchmark FVS and benchmark thatch cover. No plots met the relevant benchmark criteria for proportion of native cover, native species richness or bare ground.

The YEP offset area is dominated by exotic perennial and annual species within 11 of the plots, with only plot three recording greater perennial and annual native cover.

Table 3.1 Assessment of Plots Against Benchmark Condition of each Metric Measured following Rehwinkel (2015) (Benchmark Levels for each Metric in Brackets; Green Cells are within Benchmark)

Plot	Floristic Value Score (FVS) (≥5)	Native plant species richness (≥24)	Proportion native cover (<1m height) (%) (≥50)	Bare ground cover (%) (10-20)	Thatch cover (%) (10-20)	No. of condition metrics within benchmark level
1	0.4	2	4	4	16	1/5
2	5.1	4	24	2	8	1/5
3	8.4	6	24	30	14	2/5
4	3.9	5	0	0	10	1/5
5	1.7	2	0	0	2	0/5
6	4.3	2	0	2	10	1/5
7	3.6	2	2	0	10	1/5
8	6.1	5	6	0	4	1/5
9	0.3	1	0	0	6	0/5
10	3.6	2	2	0	6	0/5
11	6.5	5	4	0	6	1/5
12	14.4	8	20	0	6	1/5

3.1.1 Comparison with Previous Years

The floristic value scores and native plant species richness have been in decline, with all plots recording FVSs below 2021 values and declining year-on-year to the lowest average score for all plots in 2024 (**Table 3.2**). In 2024 two plots (10 and 12) saw a minor increase in the proportion of native cover, however the average across all plots continues to trend down. Bare ground cover has worsened, with no plots recording suitable levels, down from one in 2023. Five plots recorded the benchmark conditions for thatch cover, down from seven plots in 2023. Overall, benchmark conditions and comparisons to previous years indicates a site in poor condition with a downwards trend.

Table 3.2 Comparison of Grassland Condition and Structural Metrics (2021-2024)

Plot	Vegetation type	Floristic Value Score (FVS) (≥5)				Native plant species richness (≥24)				Proportion native cover (<1m height) (%) (≥50)				Bare ground cover (%) (10-20)				Thatch cover (%) (10-20)				No. of condition metrics within benchmark level			
		2021	2022	2023	2024	2021	2022	2023	2024	2021	2022	2023	2024	2021	2022	2023	2024	2021	2022	2023	2024	2021	2022	2023	2024
1	Exotic Pasture	2.4	1.2	0.3	0.4	10	6	1	2	3.4	3.4	5	4	0	4.0	0	4	13	24	26	16	2/5	1/5	0/5	1/5
2	Exotic Pasture	10.5	14.6	3.8	5.1	13	12	5	4	48.1	28.6	42	24	3	1.2	0	2	5	24	18	8	3/5	2/5	1/5	1/5
3	Natural Temperate Grassland	13.8	17.5	8.1	8.4	16	16	5	6	43.6	29.3	29	24	6	0.0	10	30	5	22	42	14	3/5	2/5	1/5	2/5
4	Exotic Pasture	10.6	5.9	10.3	3.9	11	6	5	5	27.3	8.3	42	0	3	0.0	0	0	10	38	8	10	3/5	2/5	1/5	1/5
5	Exotic Pasture	3.5	4.1	3.6	1.7	3	4	2	2	0.0	0.0	11	0	0	0.0	0	0	2	19	22	2	1/5	1/5	0/5	0/5
6	Exotic Pasture	14.9	9.7	8.7	4.3	11	12	7	2	37.7	0.0	7	0	0	3.4	0	2	7	14	10	10	2/5	2/5	2/5	1/5
7	Exotic Pasture	9.9	7.6	3.6	3.6	11	7	2	2	27.6	0.0	9	2	0	2.5	0	0	7	23	18	10	2/5	2/5	1/5	1/5
8	Exotic Pasture	16.3	7.2	4.7	6.1	18	11	4	5	16.7	9.1	17	6	2	1.7	4	0	9	24	12	4	2/5	2/5	1/5	1/5
9	Exotic Pasture	1.6	2.1	0.3	0.3	8	7	1	1	5.3	0.0	10	0	0	0.0	0	0	12	21	14	6	2/57	1/5	1/5	0/5
10	Exotic Pasture	8.5	10.6	1.5	3.6	12	11	4	2	33.9	20.8	0	2	1	3.5	0	0	15	17	22	6	3/5	2/5	0/5	0/5
11	Exotic Pasture	15.9	19.7	4.7	6.5	14	11	4	5	9.6	20.7	5	4	8	8.0	0	0	20	14	12	6	3/5	3/5	1/5	1/5
12	Exotic Pasture	21.4	18.1	12.6	14.4	17	14	9	8	37.5	57.1	7	20	3	8.6	0	0	11	22	14	6	3/5	2/5	2/5	1/5
	Average	10.78	9.86	5.18	4.86	12.00	9.75	4.08	3.67	24.23	14.78	15.33	7.17	2.17	2.74	1.17	3.17	9.67	21.83	18.17	8.17				

*No data recorded

3.2 Assessment Against Criteria for the Critically Endangered Natural Temperate Grassland Community

The assessment of the YEP offset area against the updated criteria for the natural temperate grassland (TSSC 2016) is demonstrated in **Table 3.3**. As a minimum criterion, the percentage cover of native perennial and annual flora species must be higher than the percentage cover of exotic perennial flora species. One plot met this criterion and was subsequently determined to be natural temperate grassland in combination with its floristic value score and presence of indicator species. While the number of indicator species and the FVS for some plots reaches criteria thresholds in 2024 (**Table 3.3**), the overall cover of perennial exotic species within the plots prevents the patches being classified as natural temperate grassland.

Table 3.3 Summarised Assessment Against the Criteria Thresholds (in brackets) for the EPBC Act-listed Natural Temperate Grassland Critically Endangered Ecological Community (20 X 20 m plots), YEP Offset Area, 2024

Plot	Vegetation Type	Native perennial and annual cover (%) > perennial exotic cover (%)			Number of non-grass native species (≥8)	Number of indicator species (≥2)	Floristic value score (≥5)	Meets natural temperate grassland criteria (TSSC 2016)
		Native %	Exotic %	Meets Criteria				
1	Exotic Pasture	4	22	No	1	0	0.4	No
2	Exotic Pasture	24	36	No	3	2	5.1	No
3	Natural Temperate Grassland	24	14	Yes	5	4	8.4	Yes
4	Exotic Pasture	0	30	No	3	2	3.9	No
5	Exotic Pasture	0	32	No	2	1	1.7	No
6	Exotic Pasture	0	16	No	2	1	4.3	No
7	Exotic Pasture	10	12	No	2	1	3.6	No
8	Exotic Pasture	10	22	No	3	2	6.1	No
9	Exotic Pasture	0	36	No	1	0	0.3	No
10	Exotic Pasture	2	30	No	1	1	3.6	No
11	Exotic Pasture	4	50	No	5	3	6.5	No
12	Exotic Pasture	30	40	No	6	6	14.4	No

3.2.1 Comparison with Previous Years

The number of plots that met the revised criteria for the natural temperate grassland community increased by one compared to 2023, which recorded no natural temperate grassland across the YEP offset area (Umwelt 2023). One natural temperate grassland plot was also recorded in 2022, while nine were recorded in 2021 (Umwelt 2022; Umwelt 2021). Floristic value scores are similar between 2023 and 2024, however both years are considerably lower compared to 2022 and 2021 (Table 3.2). The key contributing factor affecting natural temperate grassland in 2024 is the prevalence of perennial exotic grass and forb species.

3.3 Grassland Mapping

Table 3.4 and **Figure 3.1** shows the extent and distribution of vegetation types mapped within the YEP offset area. The YEP offset area was determined to support one patch of natural temperate grassland, with the remaining grassland meeting conditions for exotic grassland. As in 2023, a large component of the perennial exotic coverage included the weeds detailed in **Section 3.4**, as well as paspalum (*Paspalum dilatatum*), festuca (*Festuca arundinacea*), *Hypochaeris* sp., and skeleton weed (*Chondrilla juncea*). Exotic annual species were also widespread including oats (*Avena* sp.), fescues (*Vulpia* sp.), plantain (*Plantago lanceolata*), and fleabane (*Conyza bonariensis*).

Table 3.4 Extent of Vegetation Types within the YEP Offset Area, November 2023

Vegetation Type	Extent (ha)
Natural temperate grassland	0.11
Native pasture	0.00
Mixed native and exotic pasture	0.00
Exotic pasture	13.59
Total extent of surveyed vegetation types in the Project Area	**13.70**

FIGURE 3.1

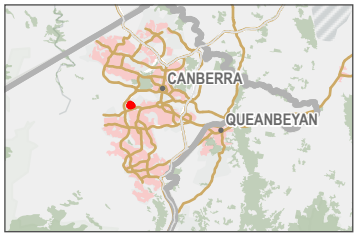
Yarralumla Equestrian Park Offset Area Vegetation Types

Legend

- Yarralumla Equestrian Park Boundary
- Road
- Waterbody

Vegetation Types

- Exotic Pasture
- Natural Temperate Grassland



0 100 200

Metres

Scale 1:4,000 at A4
GDA2020 MGA Zone 55

Image Source: ACTMapi (2024) | **Data Source:** Umwelt (2025)

3.3.1 Comparison with Previous Years

Trends in the extent of natural temperate grassland and other grassland types within the YEP offset area are shown in **Figure 3.2**. A marginal improvement of 0.11 ha of natural temperate grassland in 2024 was recorded in comparison to 0 ha in 2023. This modest improvement is a result of a small increase to native perennial cover in the respective patch. Overall, grassland condition within the YEP offset area is poor.

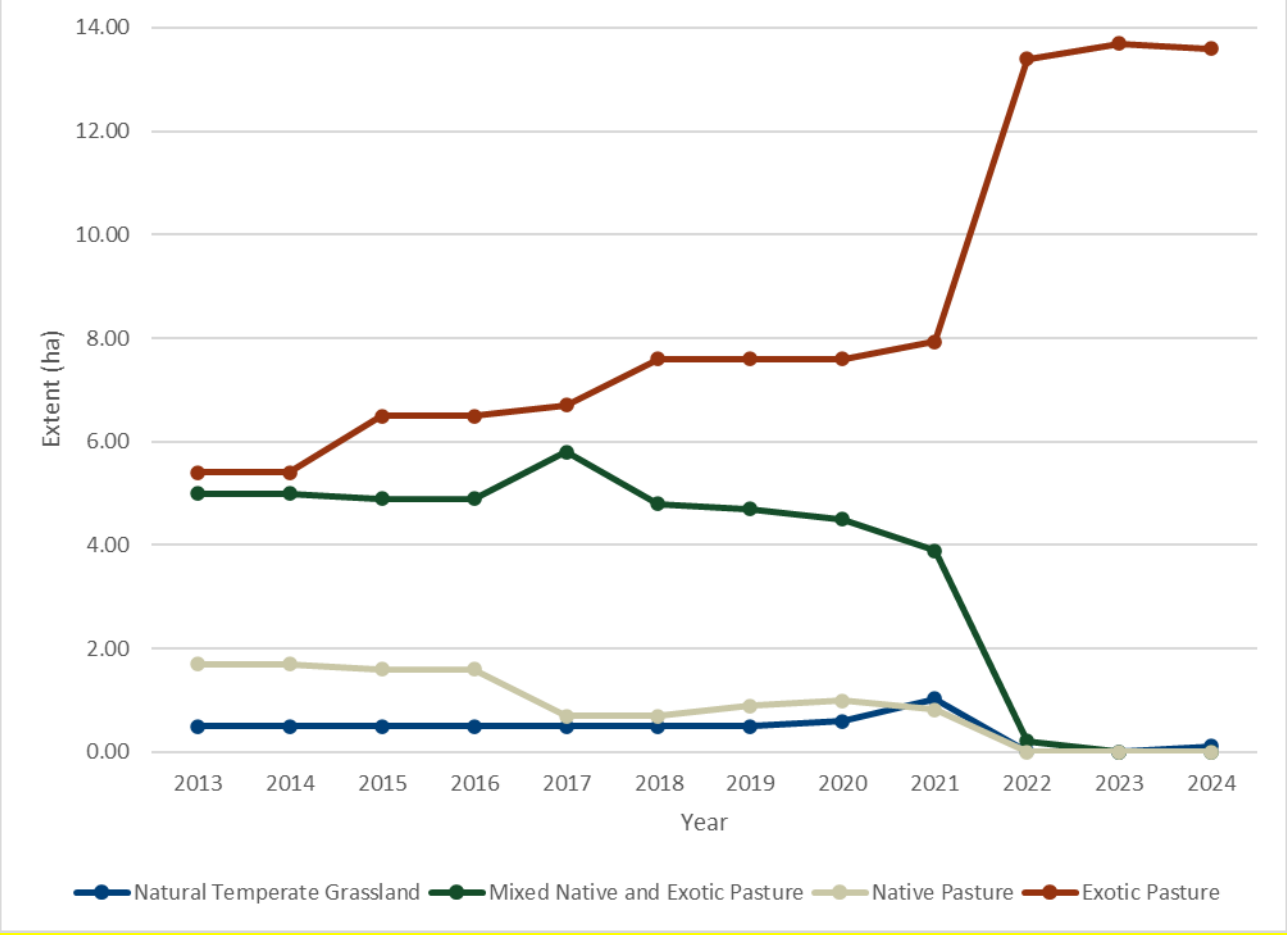


Figure 3.2 Changes in Extent of Vegetation Types, YEP Offset Area (2013 – 2024)

3.4 Weeds

Four species declared under the ACT Government *Pest Plants and Animals Act 2015*, were identified and mapped within the YEP offset area, including two Weeds of National Significance (WoNS) (**Table 3.5**). While Chilean needlegrass is identified as a WoNS, it remains an important habitat component for the golden sun moth. A discussion on the approach to control this species and maintain habitat for the golden sun moth is included in **Section 4.3.**

Table 3.5 Pest Plants and Class, YEP Offset Area, 2024

Pest Plant	WoNS	Class
Chilean needlegrass (*Nassella neesiana)*	Yes	Class 3 – must be contained Class 4 – prohibited
Serrated tussock (*Nassella trichotoma)*	Yes	Class 3 – must be contained Class 4 – prohibited
African lovegrass (*Eragrostis curvula)*	No	Class 3 – must be contained
St John's wort (*Hypericum perforatum)*	No	Class 3 – must be contained

3.4.1 Weed Extent

The distribution of significant weeds within the YEP offset area is shown in **Figure 3.3** and **Figure 3.4**, and the calculated extent of weed infestations across 2024 is summarised in **Table 3.6**. The extent of weeds is greater than the total area, noting the overlap in the extent of different species. Information on the extent of each species is provided to support weed control planning and implementation.

African lovegrass increased slightly on the previous year by 0.12 ha. It now dominates a total of 4.03 ha or 29.5% of the YEP offset area. The species is the leading cause for degradation of native grassland across the YEP offset area.

The extent of Chilean needlegrass (1.70 ha) has also increase slightly since 2023 by 0.06 ha. Chilean needlegrass has the second greatest extent of all weed species within the YEP offset area.

St John's wort is found scattered across the entirety of the YEP offset area, with densities insufficient to map in discrete patches. Two isolated patches of serrated tussock were observed constituting 0.02 ha in total.

Caltrop (*Tribulus terrestris*) was found occasionally scattered throughout the Project Area. This was observed to be establishing in 2020 within the YEP offset area after being introduced via the importation of sand that is used to support the management of the equestrian tracks. The 2024 survey observed this species in one discrete patch for a total of 0.04 ha.

3.4.2 Comparison with Previous Years

Trends in the extent of African lovegrass and Chilean needlegrass since 2013 are shown in **Figure 3.3**.

Extensive areas of African lovegrass continue to dominate much of the central and eastern parts of the YEP offset area. In 2013-2015, the YEP offset area had no recorded presence of African lovegrass. However, over the next nine years, it has expanded to cover 4.03 ha by 2024. Increased weed management in 2020 reduce its extent to 1.39 ha, however subsequent reduced efforts as resulted in the species' now having the largest recorded extent within the YEP offset area.

In 2013, 1.2 ha of Chilean needlegrass was recorded. The extent of this species gradually increased, peaking at 3.2 ha in 2019. Increased weed management in 2020 resulted in a decrease in extent (to 1.50 ha), with the species remaining relatively stable since that time.

St John's wort is extensively spread across the YEP offset area in moderate densities. In 2024, two serrated tussock patches were identified, covering an extent of 0.02 ha. Caltrop extent has decreased slightly (-0.01 ha) relative to the 2023 survey season to a total of 0.04 ha in one discrete patch.

Table 3.6 Changes in the Extent of Significant Weeds, YEP Offset Area, 2020 vs 2024

Vegetation Type	2020 Extent (ha)	2021 Extent (ha)	2022 Extent (ha)	2023 Extent (ha)	2024 Extent (ha)	Change in Extent 2020 – 2021 (ha)	Change in Extent 2021 – 2022 (ha)	Change in Extent 2022 – 2023 (ha)	Change in Extent 2023 – 2024 (ha)
Chilean needlegrass	1.50	1.71	1.41	1.64	1.70	+ 0.21	-0.30	+0.23	+0.06
Serrated tussock	Isolated plants	Isolated plants	Isolated plants	Isolated plants	0.04	Isolated plants	Isolated plants	Isolated plants	+0.04
African lovegrass dominant	1.39	1.71	2.95	3.91	4.03	+ 0.32	+ 1.24	+ 0.96	+0.12
St John's wort	0.18	Scattered throughout	Scattered throughout	Scattered throughout	Scattered Throughout	Scattered throughout	Scattered throughout	Scattered throughout	Scattered throughout
Caltrop	0.94	0.05	0	0.05	0.04	-0.94	-0.05	+0.05	-0.01

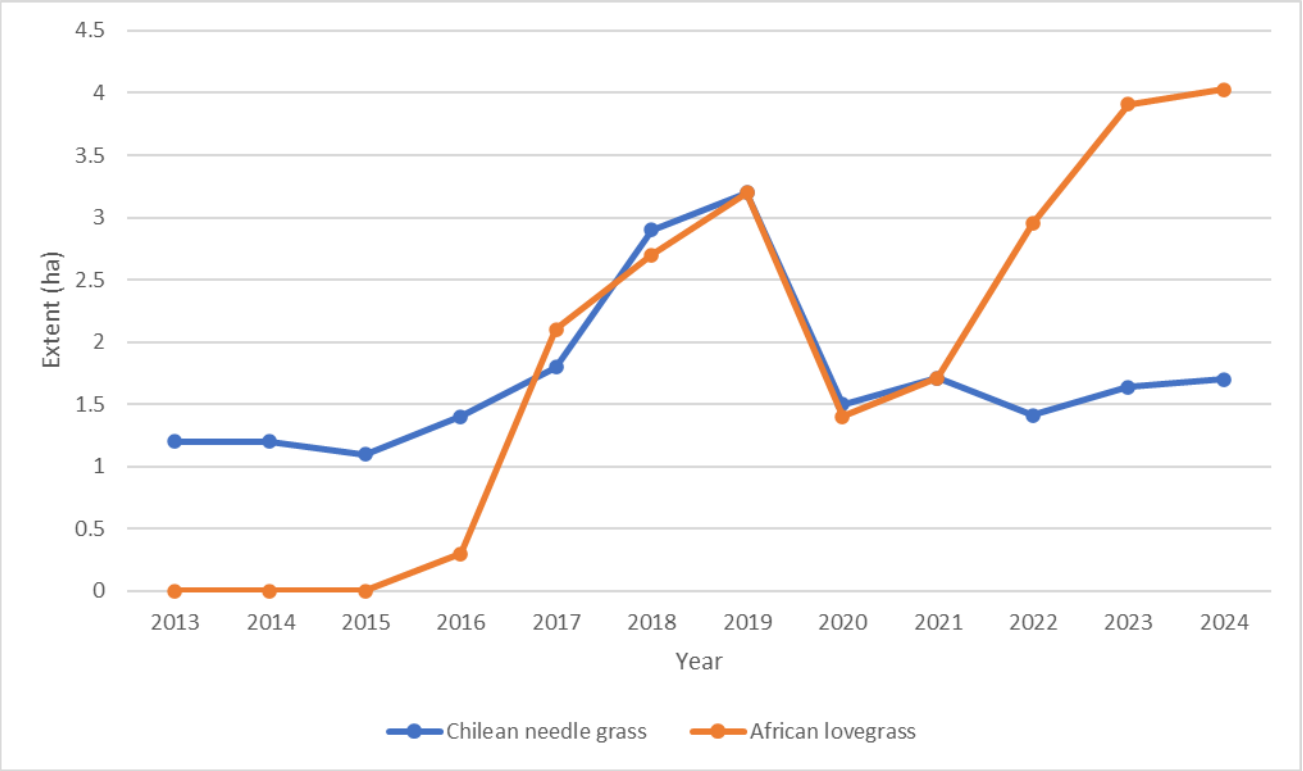


Figure 3.3 **Change in the Extent of Chilean Needlegrass and African Lovegrass, YEP Offset Area (2013-2024)**

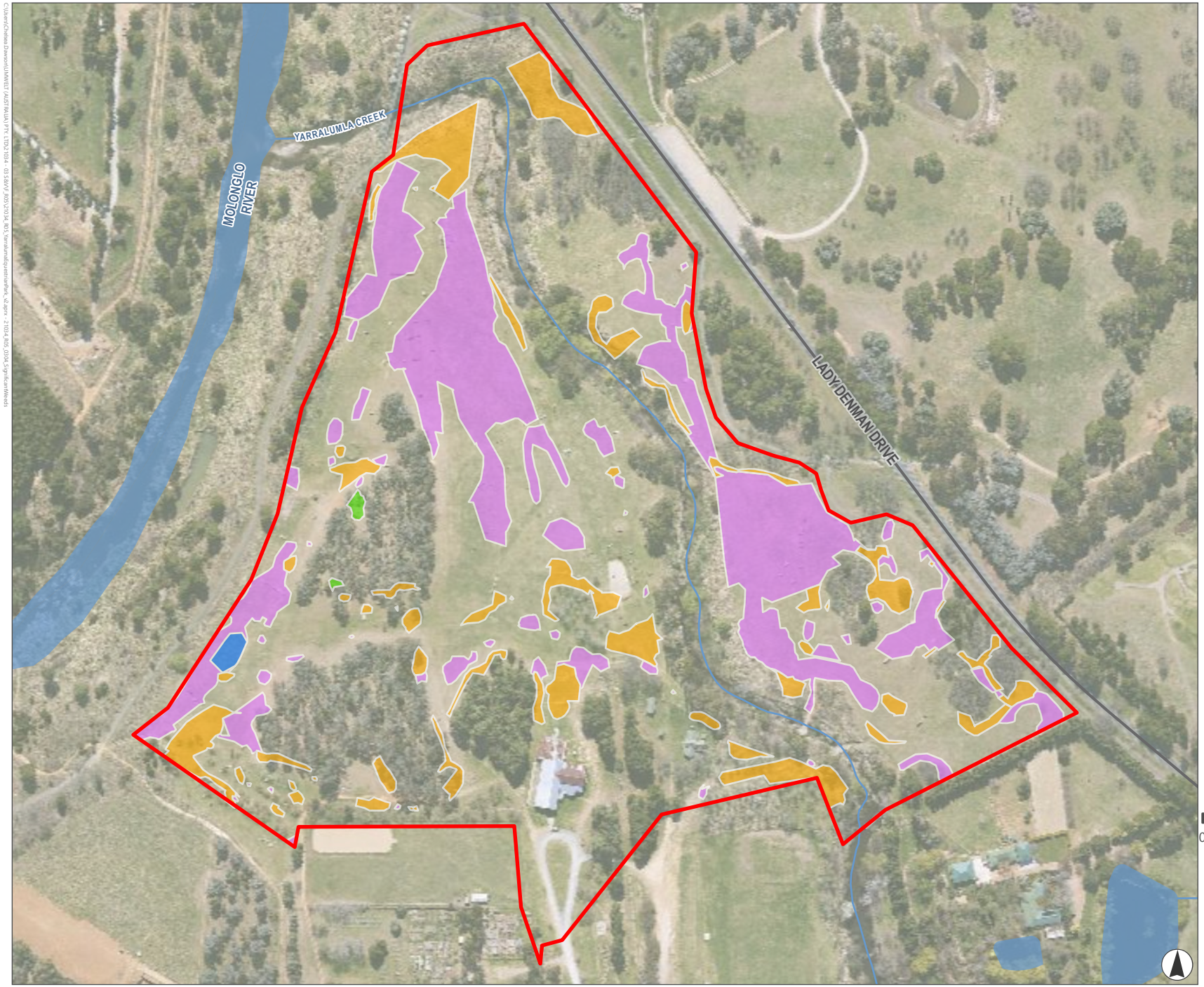


FIGURE 3.4

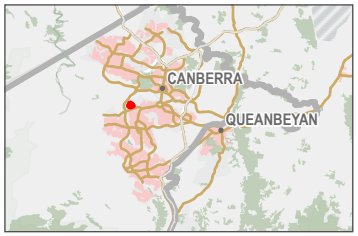
Yarralumla Equestrian Park Offset Area Significant Weeds

Legend

- Yarralumla Equestrian Park Boundary
- Road
- Waterbody

Weed Distribution

- African Lovegrass
- Caltrop
- Chilean Needlegrass
- Serrated Tussock



0 100 200

Metres

Scale 1:4,000 at A4
GDA2020 MGA Zone 55

Image Source: ACTMapi (2024) | **Data Source:** Umwelt (2025)

3.4.3 Weed Density

The weed value score and percentage cover of significant weed species at each plot are shown in **Table 3.7**. Key observations for each of the invasive tussock grasses comprises:

- African lovegrass had the greatest average cover (15.4%) of all significant weed species across all plots. African lovegrass control continues to be a very high priority within the YEP offset area.
- Chilean needlegrass had an average cover of 2.2%.
- St John's wort had an average cover of 0.9%.
- The weed value score is high and broadly consistent across all plots.

No serrated tussock was observed within the plots; however, this species is present in the wider area of the YEP offset area and could potentially re-occupy areas should weed control be discontinued.

Table 3.7 Weed Value Score and Percentage Cover of Significant Tussock Weeds per Plot for the YEP Offset Area, 2024

Plot	Vegetation Type	Weed Value Score	% Cover – Chilean needlegrass	% Cover – African lovegrass	% Cover – St John's wort
1	Exotic Pasture	8.35	0	10	0.5
2	Exotic Pasture	12.11	0	15	0.5
3	Natural Temperate Grassland	11.21	1	25	0.1
4	Exotic Pasture	9.45	15	15	0.2
5	Exotic Pasture	16.44	5	15	1
6	Exotic Pasture	13.72	0	10	0
7	Exotic Pasture	8.56	0	20	0.2
8	Exotic Pasture	12.19	0	5	0
9	Exotic Pasture	17.23	5	15	5
10	Exotic Pasture	15.61	0	25	2
11	Exotic Pasture	10.98	0	15	0.5
12	Exotic Pasture	15.09	0	15	0.2
	Average	**12.57**	**2.2**	**15.4**	**0.9**

3.4.3.1 Comparison with Previous Years

African lovegrass average percentage cover (within plots) saw a slight decrease compared to 2023 (**Table 3.8**), however 2024 was still the second highest amount recorded. St John's wort has seen a decrease on the previous year. Chilean needlegrass coverage remained the same, with only moderate fluctuation between 2021-2024.

Table 3.8 Average Percent Cover of Significant Weed Species (Across All Plots) Between 2020-2023, YEP Offset Area, 2024

Year	2020	2021	2022	2023	2024
African lovegrass	8	14.2	2.5	16.3	15.4
Chilean needlegrass	3.75	2.5	1.82	2.2	2.2
St John's wort	Not recorded	0.16	3	4.2	0.9

3.5 Golden Sun Moth Habitat Mapping

The extent of golden sun moth habitat is summarised in **Table 3.9**, **Figure 3.5**, and **Figure 3.6**. Golden sun moth habitat exists in the form of one patch of moderate quality habitat, 13 patches of low-quality habitat and 46 patches of low-quality habitat dominated by Chilean needlegrass. No areas of high-quality habitat were recorded during the field surveys.

Table 3.9 Extent of Golden Sun Moth Habitat Condition Classes within the YEP Offset Area, 2024

Golden Sun Moth Habitat Condition Classes	Extent (ha)
Low quality habitat	0.43
Moderate quality habitat	0.37
High quality habitat	0.00
Low quality habitat dominated by Chilean needlegrass	1.71
Total	**2.51**

3.5.1 Comparison with Previous Years

The total extent of golden sun moth habitat remained relatively consistent from 2013 to 2021 but decreased substantially between 2021 and 2022 (**Figure 3.5**). This reduction was due primarily to the decrease in the extent of low-quality native habitat. In 2023 a slight rebound of low-quality habitat was recorded primarily resulting from the downgrade of existing moderate-quality habitat. In 2024 the total extent of all habitats declined again, albeit with one patch meeting the criteria for moderate-quality habitat because of sufficient biomass and bare ground conditions. A slight increase of Chilean needlegrass dominated habitat was seen in 2024 compared to the previous year, however it remains lower than the peak in 2019.

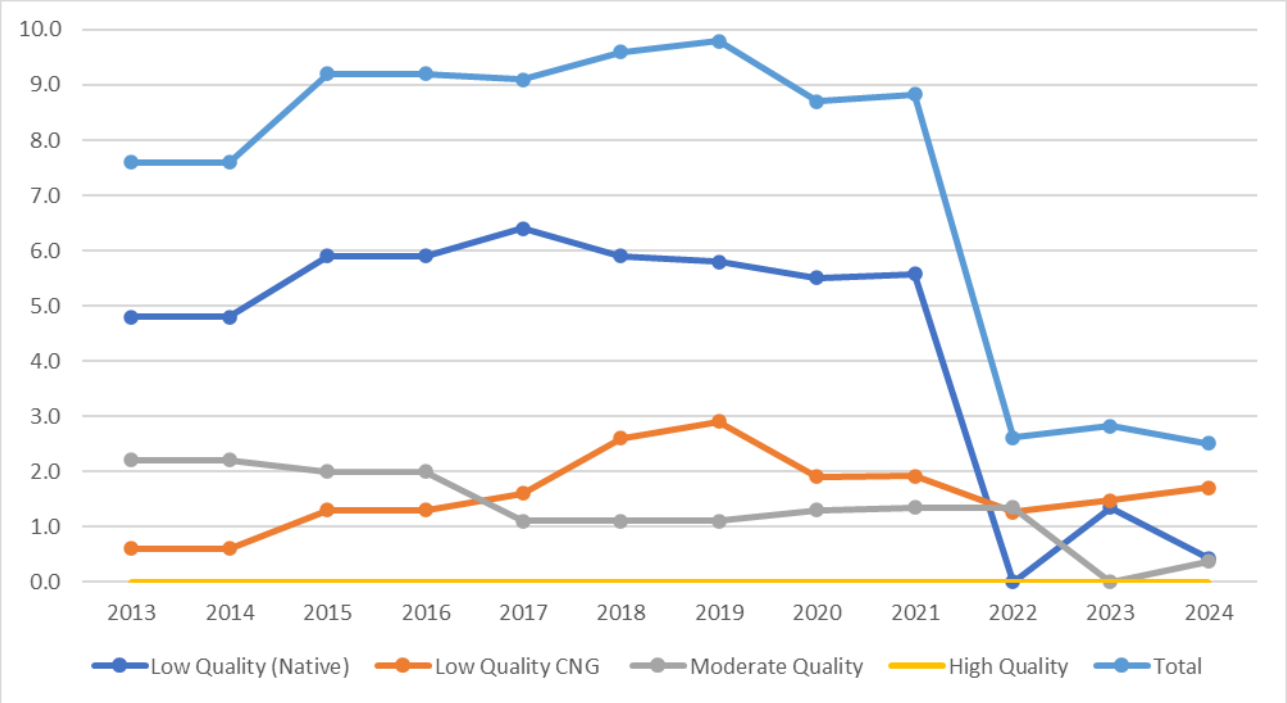
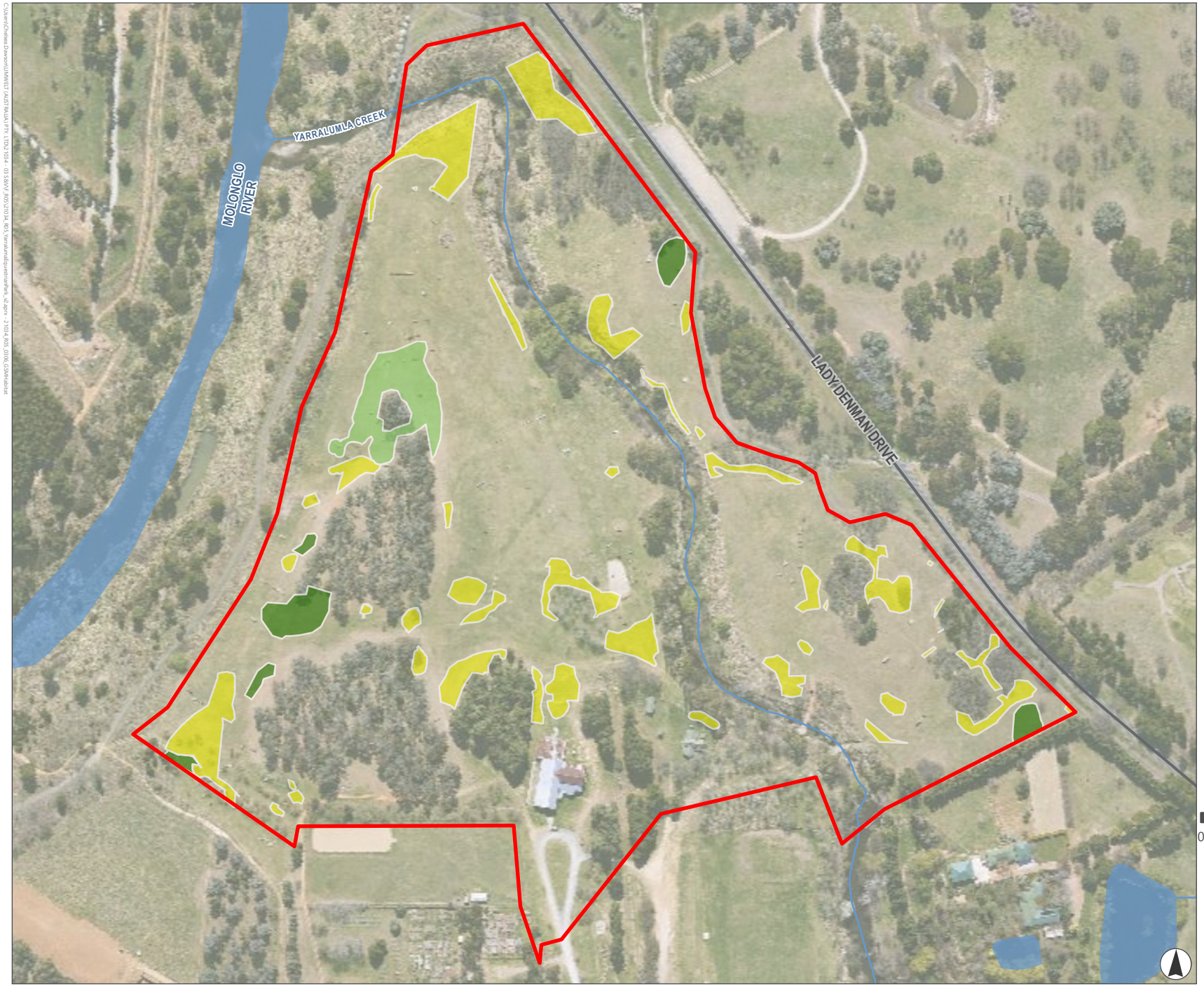


Figure 3.5 Change in the Extent (ha) of Golden Sun Moth Habitat, YEP Offset Area (2013-2024)

FIGURE 3.6

Yarralumla Equestrian Park Offset Area Golden Sun Moth Habitat

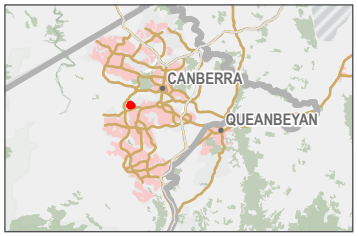


Legend

- Yarralumla Equestrian Park Boundary
- Road
- Waterbody

Golden Sun Moth Habitat

- Low Quality Habitat
- Moderate Quality Habitat
- Chilean Needlegrass Dominated Habitat



0 100 200

Metres

Scale 1:4,000 at A4
GDA2020 MGA Zone 55

Image Source: ACTMapi (2024) | **Data Source:** Umwelt (2025)

3.6 Golden Sun Moth Surveys

3.6.1 Rotational Point Counts

Twenty-two golden sun moths were observed during the rotational point counts with an average of 1.1 per rotational survey. One golden sun moth was recorded at point one and two, seven golden sun moths were recorded at point three, and 13 golden sun moths were recorded at point four. Zero golden sun moths were observed at the remaining points (**Table 3.10** and **Figure 3.7**).

Table 3.10 Summary of Results for the Golden Sun Moth Rotational Point Counts, YEP Offset Area, 2024

Point	1	2	3	4	5	6	7	8	9	10	11	12	Total
Average of 1st Rotational Count	0.1	0.1	0.7	1.3	0	0	0	0	0	0	0	0	**2.2**
Average of 2nd Rotational Count	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	0.1	0.1	0.7	1.3	0	0	0	0	0	0	0	0	**2.2**
Average	0.05	0.05	0.35	0.65	0	0	0	0	0	0	0	0	**1.1**

3.6.2 Transect Counts

Nine golden sun moths were detected across the 15 transects for both survey days (**Table 3.11; Figure 3.7**).

Table 3.11 Summary of Results for the Golden Sun Moth Transect Counts, YEP Offset Area, 2023

Transect	1A	1B	2A	2B	2C	2D	3A	3B	3C	3D	4A	4B	4C	4D	5A	Total
Survey 1	2	0	0	1	4	2	0	0	0	0	0	0	0	0	0	**9**
Survey 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	2	0	0	1	4	2	0	0	0	0	0	0	0	0	0	**9**
Average	1	0	0	0.5	2	1	0	0	0	0	0	0	0	0	0	**4.5**

3.6.3 Incidental Observations

No male or female golden sun moths or pupal cases were recorded incidentally.

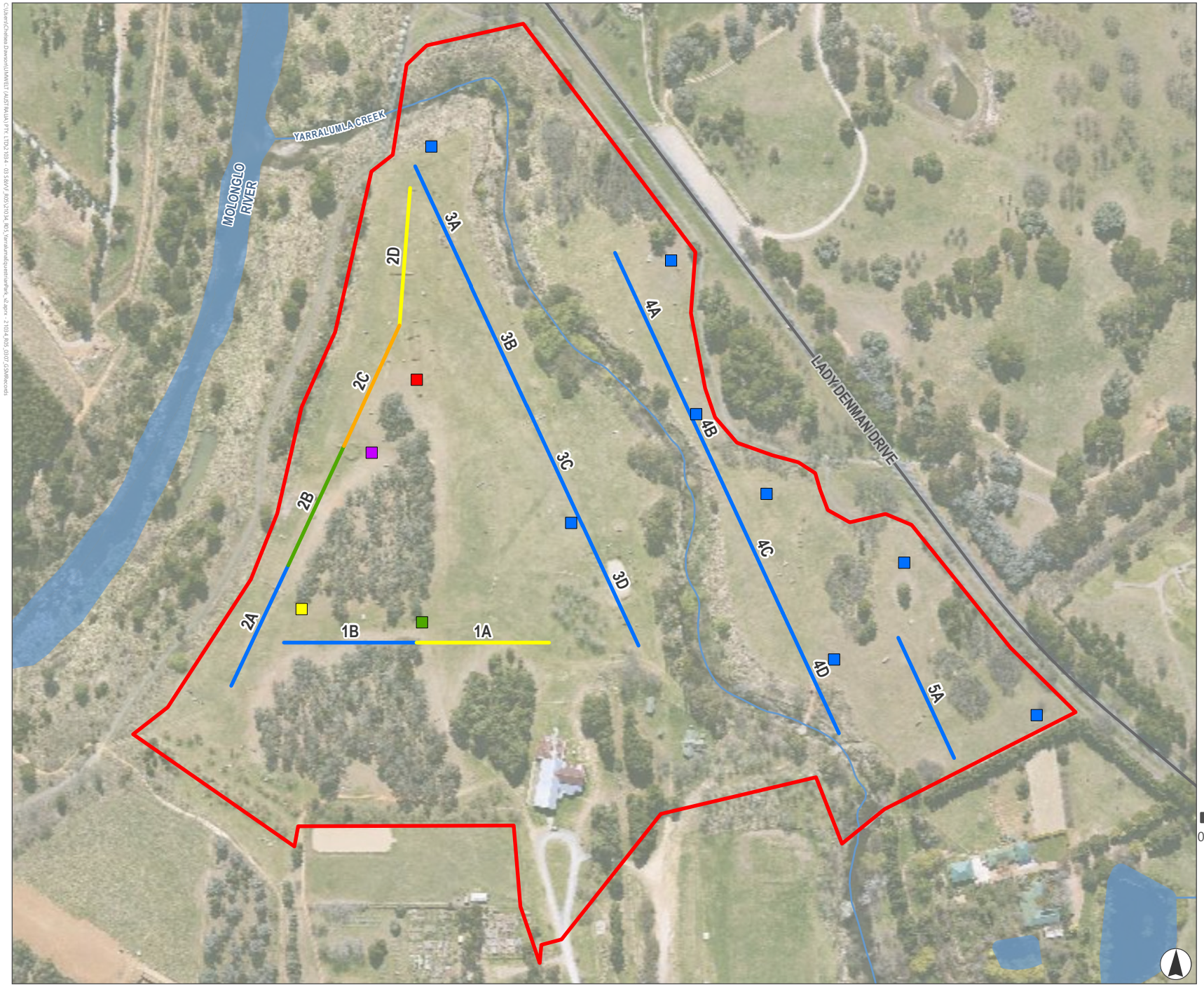


FIGURE 3.7

Yarralumla Equestrian Park Offset Area Golden Sun Moth Records (Transect + Rotational)

Legend

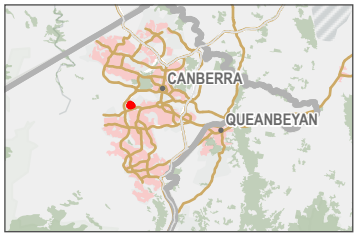
- Yarralumla Equestrian Park Boundary
- Waterbody
- Road

Total Golden Sun Moths per 100 m (2025)

- 0
- 1
- 2
- 4

Rotational (2025)

- 0
- 1
- 2
- 7
- 13



0 100 200

Metres

Scale 1:4,000 at A4
GDA2020 MGA Zone 55

Image Source: ACTMapi (2024) | **Data Source:** Umwelt (2025)

3.6.4 Comparison with Previous Years

3.6.4.1 Rotational Point Counts

The total of the average number of golden sun moths recorded per rotational survey within the YEP offset area (**Table 3.12**) demonstrates a slight increase in 2024 compared to the previous three years of monitoring. Despite a marginal increase in observations this year, the last four years show a large decline in observed gold sun moths. The 2024 average is significantly below the baseline average (2013-2015).

Table 3.12 Total of the Average Number of Moths Observed per Year per Rotational Survey within the YEP Offset Area, 2024

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Baseline (Average 2013-2015)
Total average number of golden sun moths	13.1	26.1	19.8	83.5	9.6	95.6	15	30	1.05	0.2	0.3	1.1	19.7

3.6.4.2 Transect Counts

As noted in the OMP (Umwelt, unpublished), the average of the transect counts collected between 2018-2020 is considered the baseline against which future changes in the population of golden sun moths will be assessed. Monitoring in 2024 saw the same number of golden sun moths as the previous year (9 total). Compared to the baseline numbers, golden sun moth sightings remain significantly down (**Table 3.13**).

Table 3.13 Total and Average Golden Sun Moth Transect Count Per Year and Compared to Baseline (2018-2020), YEP Offset Area, 2023

Year	2018	2019	2020	2021	2022	2023	2024	Baseline (2018-2020)
Total number recorded across the YEP offset area	1312	248	41	8	1	9	9	533.67
Average number per transect	29.1	5.5	1.3	0.27	0.03	4.5	4.5	11.96

3.7 Meteorological Data

Canberra in 2024 experienced a slightly warmer and drier winter than average (BoM, 2024a). The June and July average maximum temperatures were below the long term average temperatures, with the average minimum temperature for June and July were below and above the long term averages, respectively. August was warmer than average with both the mean maximum and minimum temperatures above the long term averages (**Table 3.14** and **Table 3.15**). The total winter rainfall (as measured at Weather Station #070351) of 75.2 mm was 60% of the long-term average of 125.5 mm. The average winter maximum (14.0°C) and minimum (1.0°C) temperatures were above the long-term averages, 13.5°C and 0.8°C, respectively (BoM 2024a).

Canberra also experienced warmer, drier days in September and October, with October also experiencing colder than average days (**Table 3.14** and **Table 3.15**). Total rainfall for September (20.8 mm) was 42% of the long-term monthly average and October rainfall (21.8 mm) was 40% of the long-term monthly average. The average daily maximum temperature for September (18.6°C) and October (22.3°C) was above the long-term averages of 18.1°C and 21.3°C, respectively (BoM 2024b; BoM 2024c).

November was drier and December wetter than average (**Table 3.14** and **Table 3.15**), with rainfall events occurring in both months resulting in 40.6 mm and 101.8 mm, respectively, over their long-term averages of 75.6 mm and 77.4 mm. The average daily maximum temperature for November (27.5°C) and December (29.4°C) was above the long- term averages of 24.9°C and 27.3°C, respectively. The average daily minimum temperatures for November (11.9°C) and December (12.7°C) were also above the long-term averages of 9.9°C and 12.0°C, respectively (BoM 2024d; BoM 2024e).

Table 3.14 2024 Rainfall (taken from Bureau of Meteorology (BoM) Canberra Airport Weather Station #070351)

Month	Rainfall (mm)	Long-term Average Rainfall (mm)	2024 Rainfall Compared to Long-term Average
June	40.8	47.8	85% of the long-term average
July	21.8	30.5	71% of the long-term average
August	12.6	47.2	27% of the long-term average
September	20.8	49.3	42% of the long-term average
October	21.8	53.9	40% of the long-term average
November	40.6	75.6	54% of the long-term average
December	101.8	77.4	132% of the long-term average

Table 3.15 2024 Temperature (taken from BoM Canberra Airport Weather Station #070351)

Month	Maximum Temperature (°C)			Minimum Temperature (°C)		
	2024	Long-term Averages	2024 Compared to Long-term Average	2024	Long-term Averages	2024 Compared to Long-term Averages
June	12.9	13.2	0.3 below	0.1	1.1	1.0 below
July	12.5	12.8	0.3 below	0.4	0.1	0.3 above
August	16.7	14.4	2.3 above	2.5	1.1	1.4 above
September	18.6	18.1	0.5 above	3.6	3.2	0.4 above
October	22.3	21.3	1.0 above	5.9	6.2	0.3 below
November	27.5	24.9	2.6 above	11.9	9.9	2.0 above
December	29.4	27.3	2.1 above	12.7	12.0	0.7 above

4.0 Discussion

4.1 Grassland Mapping and Condition

The extent of natural temperate grassland has been verified based on the updated criteria for the *Natural Temperate Grassland of the South- Eastern Highlands* critically endangered ecological community (**Figure 3.2** and **Table 3.3**).

The extent of natural temperate grassland has increased slightly from the previous year by 0.11 hectares. This follows a major negative trend in the extent recorded over the previous three years from 1.03 ha in 2021, 0.01 ha in 2022 and 0 ha in 2023. This marginal increase is a result of a reduction in perennial exotic species in the respective patch compared to 2023.

Native pasture and mixed native and exotic pasture were not recorded within the YEP offset area, as in 2023. The change in the floristic composition of areas, which in previous years supported natural temperate grassland and native pasture, continues to reflect the trend of increased exotic species cover, particularly perennial exotic grass species.

Exotic pasture continues to be the dominant vegetation type within the YEP offset area, with exotic perennial and annual species are now well established. African lovegrass is the most common species, with the extent of African lovegrass increasing by 3% from 3.91 ha in 2023 to 4.03 ha in 2024. This continues a trend of yearly increases in the extent of this invasive species since monitoring began in 2013 (**Figure 3.3**). It should be noted that 2024 saw the smallest increase in extent since 2020. The extent of Chilean needlegrass increased by 1.6% from 1.64 ha in 2023 to 1.70 ha in 2024. These increases contribute to the expansion of exotic grassland and subsequent decrease in native vegetation types.

The management of grasslands structure within the YEP offset area is not consistent with the listing requirements of the natural temperate grassland community. Consistent with the findings of the previous monitoring events, bare ground was below benchmark across the YEP offset area outside of one plot. Thatch cover met the criteria in five plots, a decrease compared to the seven that met the criteria in 2023. The remaining plots that did not meet the thatch criteria were all lower than the required 10% coverage indicating that more frequent biomass management is required. Field observations of large extents of grassland areas with grass heights exceeding 1m also suggest more biomass management is needed.

The YEP offset area is mown at least twice a year in April/May and in October/November to coincide with planned equestrian events. While this is sufficient in most years, regular monitoring of thatch cover, density and bare ground is required throughout the year to determine if additional management responses are required from an ecological perspective. This is especially important in times of increased growth due to higher than average rainfall and changes in volunteer capacity to manage the YEP offset area.

Grassland condition is unlikely to change unless there is a major shift in site management. In addition to more responsive mowing to maintain adequate grassland structure, monitoring suggests that improvement in species diversity are possible. The most recent monitoring determined that six plots had enough indicator species and /or a floristic value score above that required to meet the condition criteria for the listed natural temperate grassland community (**Table 3.3**). These plots were however, defined as exotic grasslands as they had a greater cover of exotic compared to native species. Immediate and on-going weed control (exotic grasses and broadleaf weeds) could see the classification of some patches reverting to native pasture. The level of effort to achieve this would be high and would need to be sustained in perpetuity. It is unlikely that natural temperate grassland community can be established without restoration efforts that include revegetation with native grasses and forbs.

Section 4.2 provides further discussion on the management of weeds within the YEP offset area.

4.2 Weed Distribution and Management

The persistence in extent of significant weed species, including African lovegrass and Chilean needlegrass are a leading cause of poor grassland quality within the YEP offset area. Without improvements to exotic species coverage, large increases to grassland quality are unlikely to occur and exotic pasture will remain the dominant condition type.

Large areas are dominated by the tussock forming perennial exotic grasses festuca and paspalum, particularly in the low-lying areas that collect higher moisture. Paspalum could be considered a high threat weed and on-going monitoring for this species is recommended.

Weed management actions in 2023/24 were insufficient, leading to a small year-on-year increase in the extent and density of African lovegrass and Chilean needlegrass across the site. This is likely due to the below average precipitation in 2024, and thus lower soil moisture, which may have reduced the potential spread of weed species across the YEP offset area.

A higher level of soil moisture, similar to 2023, is likely to promote further spread of weed species given their current widespread extent. Urgent and regular weed control program (consistent with Umwelt (2018)) is required to more effectively control weeds and further reduce weed species in the soil seed bank.

As reported in Umwelt (2021a) early measures to control the outbreak of caltrop across the YEP offset area were successful. However, due to insufficient maintained weed control efforts the species has re-established. While it is recognised that equestrian activities are potential vectors for exotic weeds, the increase in extent of caltrop in 2024 highlights the need for sustained and targeted monitoring and outbreak control.

4.3 Golden Sun Moth Habitat Extent

The extent of golden sun moth habitat decreased in 2024 to its lowest level (2.51 ha) since monitoring began (from 7.6 ha in 2013 and from 2.87 ha in 2023). Most golden sun moth habitat is low quality Chilean needlegrass habitat (1.71 ha). The remaining habitat was classified as low quality native habitat (0.43 ha) with just one moderate-quality patch (0.37 ha). This patch had a lower biomass and reduced cover of broadleaf species compared to 2023. The improvement in the condition of this patch was not reflective of the wider YEP offset area.

Overall loss of golden sun moth habitat is most likely a result of the increased cover of exotic species, particularly African lovegrass. The ongoing control of African lovegrass is vital to reduce further loss of golden sun moth habitat within the YEP offset area.

The control of Chilean needlegrass also remains a priority. While golden sun moth populations persist in Chilean needlegrass dominated habitat, this grass species is a leading cause in the loss of natural temperate grassland.

4.4 Golden Sun Moth Population Monitoring

A total of 31 golden sun moths were counted across the YEP offset area during the 2024 flying season, with 22 recorded for rotational point count surveys, and 9 recorded for transect counts. Transect numbers were the same as recorded in 2023, and rotational point observations were marginally improved from 2023. However, both survey methods are still significantly down from the initial years of respective monitoring, in addition to the baseline levels.

Despite the warmer and drier conditions in 2024, golden sun moth counts across both survey types were low and consistent with the poor results experienced between 2021-2013.

2021-2023 experienced decreased levels of emergence throughout the Canberra region, which was attributed to the wetter and milder conditions (A. Rowell pers. comm. 2023). The golden sun moth are thought to have a 2-3 year life cycle, with the vast majority as larvae in the soil. They emerge for only a short period (a few days) at the end of their life cycle to breed. Due to the short life cycle and poor emergence between 2021-2023, breeding success is likely to have been affected sufficiently to contribute to an overall decline in the population at the site.

The overall decline in the extent and quality of golden sun moth habitat within the YEP offset area since 2019 (despite the marginal improvement in 2024 of one patch of moderate quality habitat) is also a likely to have contributed to the reduced population counts. Increased competition from weeds has reduced the cover of larval food species (*Rytidosperma* sp. and *Austrostipa* sp.) and excessive levels of biomass and insufficient levels of bare ground would have made it difficult for male moths to locate females with which to breed. An increase in the cover of Chilean needlegrass may be partly filling that gap (where African lovegrass is not already dominating), however relying on the cover of Chilean needlegrass to support the golden sun moth within the YEP offset area is not consistent with site management objectives. African lovegrass may outcompete Chilean needlegrass in the future, further reducing golden sun moth habitat.

5.0 Compliance with the Offset Management Plan

5.1 Survey Requirements

Detailed monitoring has been completed to meet requirements as described in the OMP (RJPL 2014a) and consistent with changes that were made in previous years to align methods used in offset sites elsewhere in the ACT.

Natural temperate grassland and golden sun moth monitoring surveys were conducted according to the methods specified in the OMP (RJPL 2014a), with the following amendments documented in the updated OMP (Umwelt, in prep):

- '*Meandering traverse'* monitoring was not completed when assessing golden sun moth habitat condition, and replaced with sampling of 100 m transects, as '*meandering traverse'* surveys proved uninformative and difficult to compare between seasons. Data along the 100 m transects has been collected since 2020. The baseline from which golden sun moth habitat condition is measured is now the average of 2020-2022.
- Two targeted surveys for golden sun moth were completed, rather than three, in accordance with standards required for ACT Government monitoring of Commonwealth offsets elsewhere in the ACT.
- Habitat structure assessments are now completed in accordance with standards required for ACT Government monitoring of Commonwealth offsets elsewhere in the ACT.
- Quadrats were located at co-ordinates specified in the 2013 monitoring report (RJPL 2014b), which are consistent with Figure 5 of the OMP (RJPL 2014a), rather than at the incorrect co-ordinates reported in Appendix B of the original OMP ((RJPL 2014a)).
- Grassland condition was assessed using 20 x 20 m plots (following Rehwinkel 2015) only. An assessment based on 4 x 4 m plots (following Rehwinkel 2007) is no longer deemed necessary noting that more than three years of data has been collected following Rehwinkel (2015) from which changes in the trajectory of grassland quality can be determined.

5.2 Reporting Requirements

The OMP (RJPL 2014a) requires that annual monitoring reports:

- provide and assess the monitoring data for the previous twelve months against the previous monitoring results
- conclude whether there has been a lack of increase or a decline in the golden sun moth population within the YEP offset area due to equestrian activities, considering regional population trends and local ecological conditions

- conclude whether there has been no improvement or a decline in golden sun moth habitat, and natural temperate grassland quality and extent within the YEP offset area due to equestrian activities, considering local ecological conditions

- the preparation of this report fulfils the reporting requirements for monitoring during the 2024 flying season, as specified in the OMP (RJPL 2014a).

5.3 Management Response

It is understood that the recommended management responses outlined in the *2017 Yarralumla Equestrian Park Offset Report* have been acted upon with weed spraying being carried out all years (except in 2021 due to Covid related restrictions). Current management of the offset area is not considered appropriate, especially related to the control of weeds and biomass. This is evident by the increase of exotic grassland and widespread loss of natural temperate grassland within the YEP offset area compared to previous years.

A consistent effort to monitor and control significant weeds (i.e. African lovegrass and Chilean needlegrass), outbreaks of existing weeds (i.e. serrated tussock and St John's wort), and incursions of new weeds (e.g., caltrop) is required. An improved weed monitoring and control program will likely result in an increase in native species cover and will reduce the impacts of African lovegrass and other perennial exotic species on golden sun moth habitat.

There is, however, potential for grassland diversity to decline because of off-target herbicide application for weed control activities. Application of herbicide must be undertaken in a manner that is sensitive to the grassland values and be undertaken by contractors who are experienced in controlling weeds in areas of high conservation value.

The likelihood is that rehabilitation works (including the possible need to revegetate with native species) will be required if the extent of invasive weeds is not adequately controlled. Potential actions should be included in an updated OMP.

The lack of bare ground, dense thatch and high grasses could also impact the viability of the YEP offset area to support the golden sun moth populations. Low counts combined with habitat that is not suitable for the moths to breed, may result in a continued decline in the population. The overall quality of the golden sun moth habitat is in decline.

The amount of mowing needs to increase, especially in the lead up to the flight season. The mowing regime should be consistent with that in the revised OMP (Umwelt, in prep). The removal of grass clippings during the golden sun moth flying season would be beneficial to the emergence of golden sun moths as it would reduce thatch density and cover.

5.4 Impact Thresholds

Assessments were completed against updated thresholds in the current OMP (Umwelt, in prep) (Table 5.1) from which responses are required to address potential declines in the condition of the YEP offset area and trigger consultation between the ACT Government and the Commonwealth Government.

Following SMEC (2018) and Umwelt (2020) the threshold relating to change in qualitative habitat assessments has been removed due to the demonstrated high level of observer bias evident in monitoring.

Table 5.1 Impact Response Thresholds from OMP (Umwelt 2021b)

No.	Revised Threshold
1	No increase or a decline in spatial extent of natural temperate grassland and/or golden sun moth habitat over at least three consecutive seasons, that cannot be attributed to biological influences and seasonal conditions.
2	A statistically significant lack of increase or decline in native grassland and natural temperate grassland floristic value scores over at least three consecutive seasons that cannot be attributed to biological influences and seasonal conditions.
3	A statistically significant lack of increase or a decline in flying moth numbers over at least three consecutive seasons that cannot be attributed to biological influences and seasonal conditions.
4	No threshold. *Qualitative grassland ranking scores and golden sun moth habitat ranking scores removed due to high level of observer variation and lack of consistency with standard ACT Government approaches.*

5.4.1 Threshold 1

The extent of natural temperate grassland has increased slightly and was recorded as 0.11 ha in 2024. The overall decline in the extent, which occurred over two years (following an increase in extent in 2021) was very rapid. While this threshold is based on three years of data, due to the lack of an increase that would provide confidence in the recovery of the natural temperate grassland community, **this threshold has been triggered.**

The overall extent of golden sun moth habitat has declined in 2024 and over the past three years. The overall extent and quality of the habitat decreased substantially during 2022 with a minor increase in 2023. This threshold has not been triggered on the basis that the decline in the extent of golden sun moth habitat, whilst substantial, does not span at least three consecutive seasons.

5.4.2 Threshold 2

The extent of natural temperate grassland increased slightly compared to 2023, **however the floristic value scores recorded indicate a decline across three consecutive seasons**. The extent of native pasture first declined in 2001 and has not been recorded since (i.e. three consecutive years). Threshold two has now been triggered. This decline is largely a result of insufficient weed and biomass management.

5.4.3 Threshold 3

The results from 2024 are similar to those from 2021 and remain low compared to baseline levels. While a decrease in three consecutive years has not been recorded, urgent action is needed to ensure habitat quality (both in terms of securing the availability of food plants and ensuring that the biomass is management appropriately during the flight season) is improved so that the species has a good chance to persist within the YEP offset area irrespective of seasonal climatic conditions (i.e. even when the seasons are not conducive to high emergence rates that those that do emerge are provided with the best opportunity to breed and that any larvae have sufficient resources to develop and complete their life cycle).

6.0 Conclusions and Recommendations

6.1 Outcomes

The key results of the 2024 monitoring program are:

- Completion of floristic assessment and vegetation structure assessment at 20 x 20 m plots has identified a total of one plot within areas identified as natural temperate grassland meeting criteria for inclusion in the EPBC Act listed *Natural Temperate Grassland of the South Eastern Highlands* critically endangered community.
- The extent of natural temperate grassland increased from 0 ha in 2023 to 0.11 ha in 2024. Despite this small improvement, overall there is a continuing a major negative trend in extent and quality of grassland recorded since 2021. The extent of native pasture and mixed native exotic pasture has remained at 0 ha in 2023 as a result of an increase in the extent of perennial exotic species, particularly African lovegrass.
- The surveys following Rehwinkel (2015) confirmed that five of the 12 plots surveyed had a floristic value score greater than benchmark level. Native species richness and proportion of native cover were all below benchmark level. Bare ground requirements were below the benchmark for 11 of the 12 plots. Encouragingly five of the 12 plots met requirements for thatch cover however this is related closely to the mowing regime and plot observation time. The presence of persisting indicator species suggests that with urgent and intensive weed control some areas may be restored to natural temperate grassland.
- African lovegrass saw an increase in extent by 0.12 ha from the previous year, to a total extent of 4.03 ha. This is the highest recorded extent across the monitoring period (2013-2025), with year-on-year increases in extent coverage. Chilean needlegrass saw a slight increase compared to 2023, with an increase of 0.06 ha to a total of 1.70 ha and is on an upward trend in extent size following management activity that curtailed its extent in 2020.
- The total extent of golden sun moth habitat decreased from 2.87 ha to 2.51 ha as a result of a decreasing low quality native habitat. The decline in native habitat is primarily a result of the increase in the prevalence of African lovegrass, phalaris, paspalum, and other perennial exotic species in this monitoring period. This is a continuation of trends seen in 2023, which noted a decrease of native feed species, increase in exotic flora species, and reduction in golden sun moth favourable physical attributes (bare ground, biomass extent, broadleaf increase).
- Nine and 22 golden sun moth in total were recorded during the transect and rotational counts, respectively. The average total for rotational point counts (0.3) is significantly below the baseline average of 19.7. The transect count average (4.5) for 2024 is the same recorded average for 2023. However, this average is also below the baseline average of 11.96. Decline in golden sun moth habitat and inadequate biomass management are likely contributing factors leading to a long-term decline in golden sun moth populations across the YEP offset area.

6.2 Recommendations and Requirements

The key recommendations of this are:

- Continued control of perennial exotic tussock grasses, specifically African lovegrass and Chilean needlegrass as a priority. The weed control program should be implemented following Umwelt (2018). This includes regular monitoring and control of weeds across the YEP offset area to ensure that new incursions are controlled as soon as possible.
- The current management of grassland structure (mowing at least twice a year in April/May and in October/November to coincide with planned equestrian events) should continue, however also needs to be increased as needed to ensure that biomass is managed to be consistent with the ecological requirements of golden sun moth habitat and native grassland communities.
- With threshold one being partially triggered and threshold 2 being triggered, plans to restore the site to re-establish the natural temperate grassland are urgently required.

7.0 References

ACT Government. (2010). *Survey guidelines for golden sun moth*. Conservation Planning and Research, Canberra.

ACT Government. (2020). *Environmental Offsets Monitoring Method.* ACT Parks and Conservation Service, Canberra.

Brown, G., Tolsma, A. and McNabb, E., 2012. Ecological aspects of new populations of the threatened Golden sun moth *'Synemon plana'* on the Victorian Volcanic plains. *The Victorian Naturalist, 129*(3), pp.77-85.

Bureau of Meteorology (BoM). (2024a). *Australian Capital Territory in winter 2024*. Available at: http://www.bom.gov.au/climate/current/season/act/archive/202408.summary.shtml. [Accessed 21 March 2024].

Bureau of Meteorology (BoM). (2024b). *Australian Capital Territory in September 2024*. Available at: http://www.bom.gov.au/climate/current/month/act/archive/202409.summary.shtml. [Accessed 21 March 2024].

Bureau of Meteorology (BoM). (2024c). *Australian Capital Territory in October 2024*. Available at: http://www.bom.gov.au/climate/current/month/act/archive/202410.summary.shtml. [Accessed 21 March 2024].

Bureau of Meteorology (BoM). (2024d). *Australian Capital Territory in November 2024*. Available at: http://www.bom.gov.au/climate/current/month/act/archive/202411.summary.shtml. [Accessed 21 March 2024].

Bureau of Meteorology (BoM). (2024e). *Australian Capital Territory in December 2024*. Available at: http://www.bom.gov.au/climate/current/month/act/archive/202412.summary.shtml. [Accessed 21 March 2024].

Dempster, J.P. 1983. The natural control of populations of butterflies and moths. *Biological Reviews*, *58*(3), pp.461-481.

Department of Agriculture, Water, and the Environment. (2009). *Conservation Advice for* Synemon plana (*Golden Sun Moth).* Canberra: Department of Agriculture, Water, and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/25234-conservation-advice-07122021.pdf. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/25234-conservation-advice-07122021.pdf.

Gregg, P.C., Fitt, G.P., Coombs, M. and Henderson, G.S. 1994. Migrating moths collected in tower-mounted light traps in northern New South Wales, Australia: influence of local and synoptic weather. *Bulletin of Entomological Research*, 84(1), pp.17-30.

Kutt, A.S., McKenzie, V.J., Wills, T.J., Retallick, R.W.R., Dalton, K., Kay, N. and Melero-Blanca, E., 2015. Spatial and temporal determinants of golden sun moth *Synemon plana* distribution. *Austral Ecology*, *40*(1), pp.100-107.

Rehwinkel, R. (2007). A method to assess grassy ecosystem sites: Using floristic information to assess a site's quality. NSW Department of Environment and Climate Change, Sydney.

Rehwinkel, R. (2015). A revised floristic value scoring method to assess grassland condition.

Robert Jessop Pty Ltd. (RJPL) 2014a). *Yarralumla Equestrian Park offset. 2013 Monitoring Report*. Report prepared for the ACT Government. Robert Jessop Pty Ltd. Canberra, ACT. 33 p.

Robert Jessop Pty Ltd. (RJPL) (2014a). *Yarralumla Equestrian Park Offset Management Plan*. Report prepared for the Land Development Agency, ACT Government. Robert Jessop Pty Ltd. Canberra, ACT.

Robert Jessop Pty Ltd. (RJPL) (2015). *Yarralumla Equestrian Park offset management plan. 2014 monitoring report.* Report prepared for the Land Development Agency, ACT Government. Robert Jessop Pty Ltd. Canberra, ACT.

SMEC. (2016). *Yarralumla Equestrian Park Offset. 2015 Monitoring Report.* Report prepared for the ACT Government. Snowy Mountains Engineering Corporation, ACT.

SMEC. (2017). *Yarralumla Equestrian Park Offset. 2016 Monitoring Report.* Report prepared for the ACT Government. Snowy Mountains Engineering Corporation, ACT.

SMEC. (2018). *Yarralumla Equestrian Park Offset. 2017 Monitoring Report*. Report prepared for the ACT Government. Snowy Mountains Engineering Corporation, ACT.

Threatened Species Scientific Committee (TSSC). (2016). Approved Commonwealth Conservation Advice (including listing advice) for Natural Temperate Grassland of the South Eastern Highlands. Prepared for the Department of the Environment, Canberra.

Umwelt. (2018). *Yarralumla Equestrian Park Interim Weed Management Plan 2018*. Draft Report prepared for the ACT Government. Umwelt (Australia) Pty Ltd, ACT.

Umwelt. (2019). *Yarralumla Equestrian Park Offset 2018 Monitoring Report*. Report prepared for the ACT Government. Umwelt (Australia) Pty Ltd, ACT.

Umwelt (2020). *Yarralumla Equestrian Park Offset 2019 Monitoring Report*. Report prepared for the ACT Government. Umwelt (Australia) Pty Ltd, ACT.

Umwelt. (2021a). *Yarralumla Equestrian Park Offset 2020 Monitoring Report*. Report prepared for the ACT Government. Umwelt (Australia) Pty Ltd, ACT.

Umwelt. (2021b). *Offset Management Plan – Yarralumla Equestrian Park*. Report prepared for the ACT Government. Umwelt (Australia) Pty Ltd, ACT.

Umwelt. (2022). *Yarralumla Equestrian Park Offset 2021 Monitoring Report*. Report prepared for the ACT Government. Umwelt (Australia) Pty Ltd, ACT.

Umwelt. (2023). *Yarralumla Equestrian Park Offset 2022 Monitoring Report*. Report prepared for the ACT Government. Umwelt (Australia) Pty Ltd, ACT.

Umwelt. (2024). *Yarralumla Equestrian Park Offset 2023 Monitoring Report*. Report prepared for the ACT Government. Umwelt (Australia) Pty Ltd, ACT.

umwelt
Environmental & Social Consultants

Umwelt (Australia) Pty Limited

T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au