



**ACT**  
Government

Transport Canberra  
and City Services

**MONITORING OF GOLDEN SUN MOTH  
(SYNEMON PLANA) AND ITS HABITAT AT  
RESERVOIR HILL**

Lawson South Open Space

**FINAL**

May 2022



# MONITORING OF GOLDEN SUN MOTH (SYNEMON PLANA) AND ITS HABITAT AT RESERVOIR HILL

Lawson South Open Space

## FINAL

Prepared by  
Umwelt (Australia) Pty Limited  
on behalf of  
Transport Canberra City Services Directorate

Project Director: David Moore  
Project Manager: Mark Allen  
Report No. 21739/R01  
Date: May 2022



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.*

### **Disclaimer**

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied, or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

**©Umwelt (Australia) Pty Ltd**

### **Document Status**

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	Clare McInnes	04/03/2022		
V2	Clare McInnes	25/5/2022	David Moore	26/5/2022

# Executive Summary

The 2022 monitoring for Golden Sun Moth (GSM) populations and habitat condition found that while the population was stable across the site, an increase in the proportion of exotic species across the habitat transects was recorded. Previous monitoring methodology was used to survey the GSM population across the site to allow direct comparison of the data from previous years. Data for habitat condition was collected using a different method, so is not directly comparable.

The wetter and warmer growing season during late Winter and early spring 2021 saw vigorous growth in exotic grasses and broadleaf weeds, which has created a high biomass in the southern and eastern slopes of Reservoir Hill. While there has been an overall reduction in bare ground and some recovery in native species abundance, increased cover of exotic species has led to the grass height and thatch depth significantly exceeding the levels prescribed in the Environment Management Plan (EMP) (Rowell 2013). This is both crowding out native species, and potentially reducing the breeding success of GSM by obscuring females at ground level.

Umwelt have made several recommendations to assist in site management. The management guidelines (**Appendix A**) include actions that are necessary to support the GSM population and improve the quality of the GSM habitat, pursuant to the EPBC Act approval conditions. This includes increasing the level of weed control, focusing on both broad-leaf weeds and exotic grasses, and managing biomass to level that are required for GSM, especially in southern portions of the site leading up to the breeding season (spring and early summer).

# Table of Contents

## Executive Summary

<b>1.0</b>	<b>The Project</b>	<b>1</b>
1.1	Scope of Report	1
<b>2.0</b>	<b>Methods</b>	<b>3</b>
2.1	Monitoring the Golden Sun Moth Population and Habitat	3
2.1.1	Golden Sun Moth	3
2.1.2	Habitat Monitoring	3
<b>3.0</b>	<b>Golden Sun Moth Monitoring</b>	<b>6</b>
3.1.1	Survey Conditions	6
3.1.2	Golden Sun Moth Survey Results 2021/2022	7
3.2	Golden Sun Moth Habitat Monitoring	10
3.2.1	Golden Sun Moth Habitat Conditions	10
3.2.2	Photo Monitoring	11
<b>4.0</b>	<b>Discussion</b>	<b>15</b>
4.1	Golden Sun Moth Population and Habitat Conditions	15
4.2	Weed Management	15
4.3	Biomass Management	16
<b>5.0</b>	<b>Recommendations</b>	<b>18</b>
<b>6.0</b>	<b>References</b>	<b>19</b>

## Figures

Figure 1.1	Golden Sun Moth Protection Zone within Reservoir Hill	2
Figure 2.1	Location of Vegetation and Golden Sun Moth Monitoring Transects, Lawson South 2022	5
Figure 3.1	Rainfall data for months of 2021 (Bureau of Meteorology, 2022)	6
Figure 3.2	Mean temperature data for months of 2021 (Bureau of Meteorology, 2022)	7
Figure 3.3	Weather data for January 2022	7
Figure 3.4	Golden Sun Moth Records at Lawson South, 2022	9
Figure 4.1	Reservoir Hill Land Management Zones	17

## Photos

Photo 2.1	Example of habitat assessment and predominant habitat feature present at each metre mark at each step along the transect and measuring thatch depth	4
-----------	---	---

## Tables

Table 2.1	Vegetation Transect Coordinates (GDA 94)	4
Table 3.1	Weather Conditions During Golden Sun Moth Surveys at Lawson South, 2020	6
Table 3.2	Golden Sun Moth Results at Lawson South, 2022	8
Table 3.3	Grass length and thatch depth on habitat transects	10
Table 3.4	Vegetation transects results at Lawson South	12
Table 3.5	Density of native larval food plants on habitat transects within vegetation transects	13
Table 3.6	Photo monitoring photos of each transect	14

## Appendices

Appendix A	Management Guidelines for Golden Sun Moth Habitat at Reservoir Hill
------------	---

# 1.0 The Project

Transport Canberra City Services Directorate (TCCS) has engaged Umwelt to undertake monitoring of GSM (*Synemon plana*) populations at Reservoir Hill, Lawson, ACT (the site). Golden Sun Moth (GSM) is listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and as Endangered under the *Nature Conservation Act 2014*.

The ACT Government was granted approval on 13 September 2012 to develop a new residential estate at Lawson South, Belconnen (EPBC Act referral 2010/5549). The approval conditions included a requirement to protect GSM and the critically endangered Natural Temperate Grassland of the South Eastern Highlands ecological community.

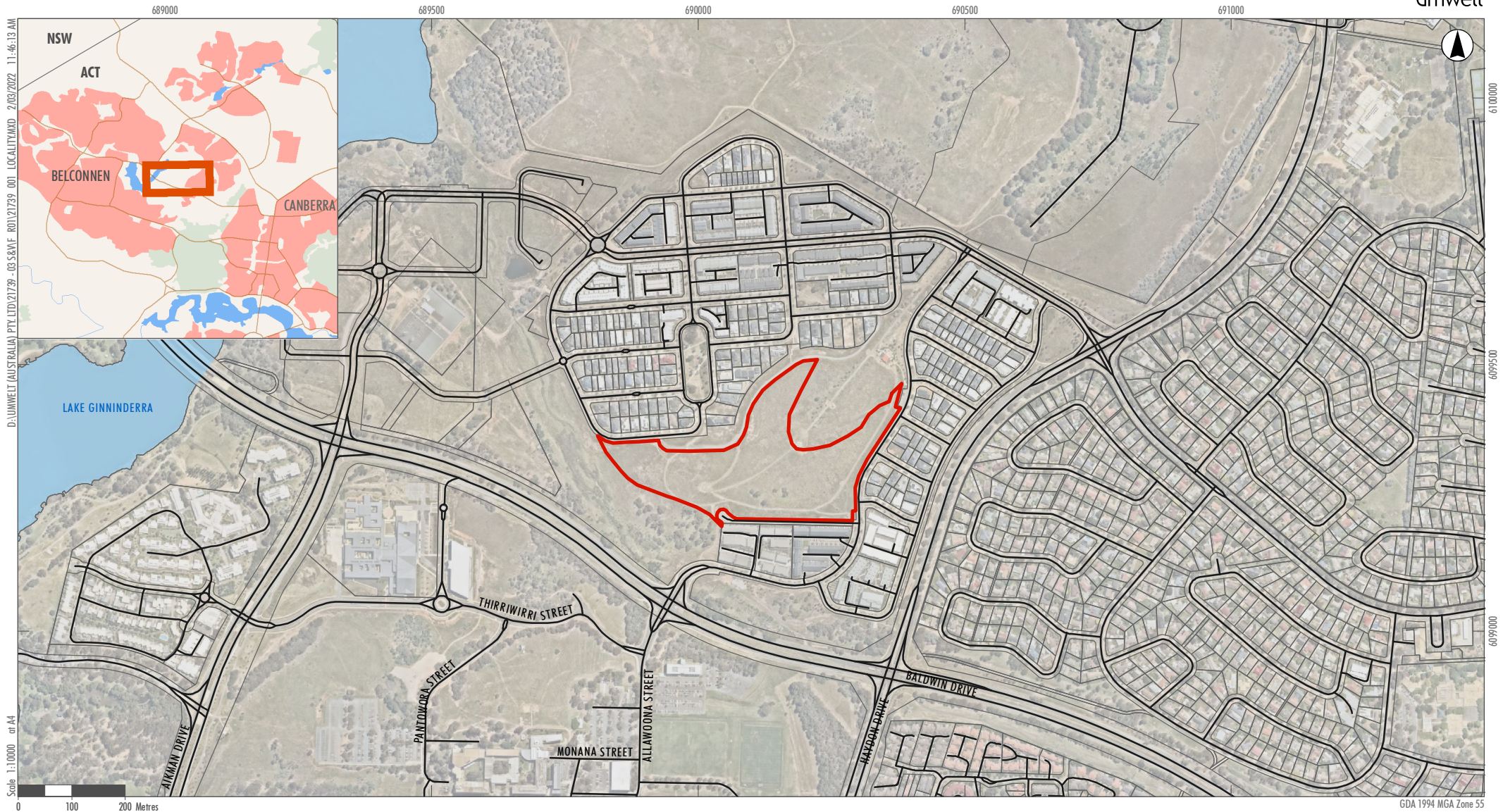
A variation to EPBC approval conditions was approved on 4 April 2013 to amend Condition 5 which was to improve the GSM habitat on Reservoir Hill (refer to **Figure 1.1**) following the Environment Management Plan (EMP) (Rowell 2013). The requirements of Condition 5 of the approval include the completion of ongoing monitoring and management.

## 1.1 Scope of Report

This project gives effect to the monitoring and management planning requirements of the Conditions of Approval (EPBC 2010/5549). The report includes:

- A description of the GSM population and habitat extent and condition monitoring program within the site. Monitoring was undertaken by qualified ecologists at a time consistent with the GSM breeding emergence period (spring / summer 2021).
- An evaluation of the results of the monitoring program to inform the effectiveness of site management to deliver the improvement objectives, as defined in the EPBC Act approval conditions and measured against the baseline habitat and condition levels.
- An updated annual environmental management plan to support the delivery of the improvement objectives. Actions in the management plan will include but not be limited to weed control and biomass management.

This report provides both a report of ongoing monitoring and recommended approaches for future management of the site.



- Legend
- Golden Sun Moth Protection Zone
  - Property Boundaries
  - Watercourses
  - Roads

FIGURE 1.1

Golden Sun Moth Protection Zone at Reservoir Hill

## 2.0 Methods

The GSM population was monitored during the 2021/22 flight season. Individual moths were counted within the survey site along with habitat conditions parameters (grass height, thatch depth and floristic composition). The location of transects were consistent with previous years to allow for a direct comparison of result although the habitat monitoring consisted of a different method to previous monitoring years and is not directly comparable.

### 2.1 Monitoring the Golden Sun Moth Population and Habitat

#### 2.1.1 Golden Sun Moth

The site was surveyed by two ecologists on two days of suitable weather on 13 and 17 January 2022. The GSM are most likely to emerge between 10.00 am and 2.00 pm in warm sunny weather with little wind, and more than two days since significant rainfall or an unusually cold night (DAWE 2009).

Transect counts were carried out as prescribed in the EMP. This involved walking along (approximately) north-south transects 50 metres (m) apart across the whole site and recording the number of flying male moths seen in each 50 m segment of the transects. Concurrent ground searches were made for female moths and pupal cases. The GSM monitoring transects are shown in **Figure 1.1**. The direction of travel was alternated between surveys to reduce the effect of time of day on survey results.

Results were not directly compared with the results of previous monitoring due to weather constraints and timing of surveys, although the numbers found were not unlike previous years monitoring.

#### 2.1.2 Habitat Monitoring

The vegetation was monitored as prescribed in the EMP and involved measuring vegetation and other habitat parameters on three fixed 100 metre step-point transects on the same day as the GSM count. The ground was also searched for GSM pupal cases during the vegetation transect survey. Transect results were compared with previous monitoring and the desirable range of habitat parameters in the EMP. The locations of the vegetation monitoring transects are shown in **Figure 2.1** and **Table 2.1**.

In previous monitoring surveys the predominant habitat feature present at each metre mark along a transect was recorded ('single hit' method). Plant species or other features that are uncommon on a site are not likely to be recorded using this method, but it is adequate in defining the structure of GSM habitat.

In 2022 a different methodology was adopted with all habitat features present at each meter mark along a transect being recorded. More data points were therefore collected along the transects in 2022. The increased data points were collected to assist in understanding the species assemblages across the site with the dominating habitat type still observed by the highest total number recorded.

The features measured were placed in the following categories derived from ACT Government guidelines in 2012: Cryptogams, bare ground, rock, litter (detached dead vegetation), potential larval food plants (native or exotic), other perennial native grasses, other native species, perennial exotic grass, exotic annual grass, and exotic broadleaf species.

- Using the ‘Detailed method for measuring average grass height and thatch depth’ (ESDD 2019) methodology a 1 m quadrat is placed every at each 10 m point along a 100 m transect. The average grass height was measured in each quarter of the 1 metre quadrat and those measures are averaged. Grass height was measured as the average leaf height of the grass in centimetres (**Photo 2.1**).



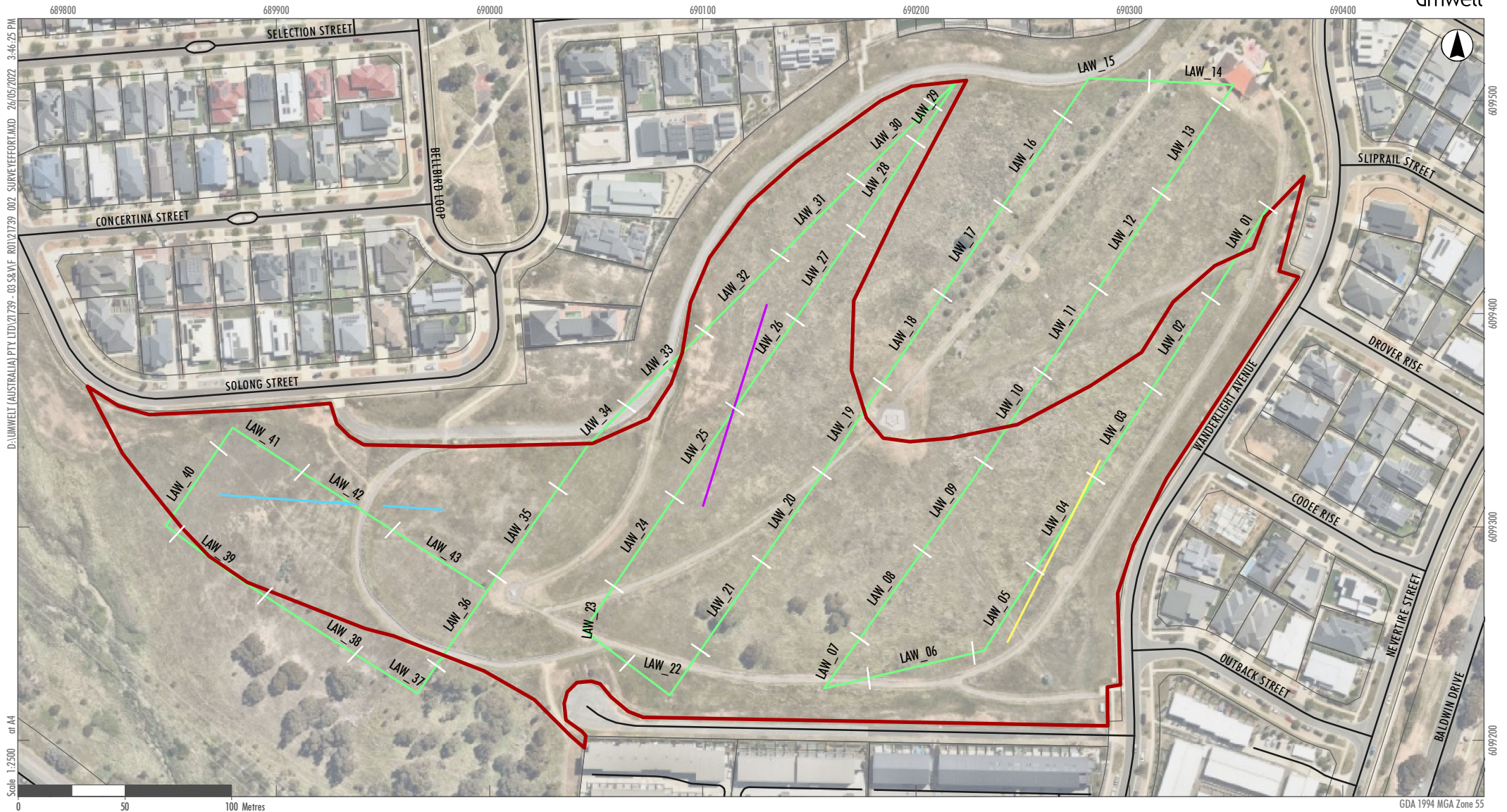
**Photo 2.1** Example of habitat assessment and predominant habitat feature present at each metre mark at each step along the transect and measuring thatch depth

Thatch depth in the same one square metre quadrats was measured by placing a ruler against the soil and recording the average depth of thatch (dead detached grass material) in 0.5 cm increments.

A photographic record of the transects was made as described in the *Draft ACT GSM Monitoring Plan* (Rowell & Evans 2014). This requires a close-up plan view at the zero point and a landscape view of the transect from the zero point with a measuring stick at the three-metre mark. However, based on the data collection template used, landscape photos of the transect start and end points were taken without inclusion of the measuring stick.

**Table 2.1** Vegetation Transect Coordinates (GDA 94)

	Transect 1	Transect 2	Transect 3
Start	690250 E 6099240 N	689978 E 6099308 N	690100 E 6099310 N
Finish	690297E 6099325 N	689882 E 6099314 N	690130 E 6099404 N



- Legend**
- ▭ Golden Sun Moth Protection Zone
  - Property Boundaries
  - Roads
  - GSM Mointoring Transects
  - Transect 1
  - Transect 2
  - Transect 3

**FIGURE 2.1**  
**Location of Vegetation and GSM Monitoring Transects (2022)**

## 3.0 Golden Sun Moth Monitoring

### 3.1.1 Survey Conditions

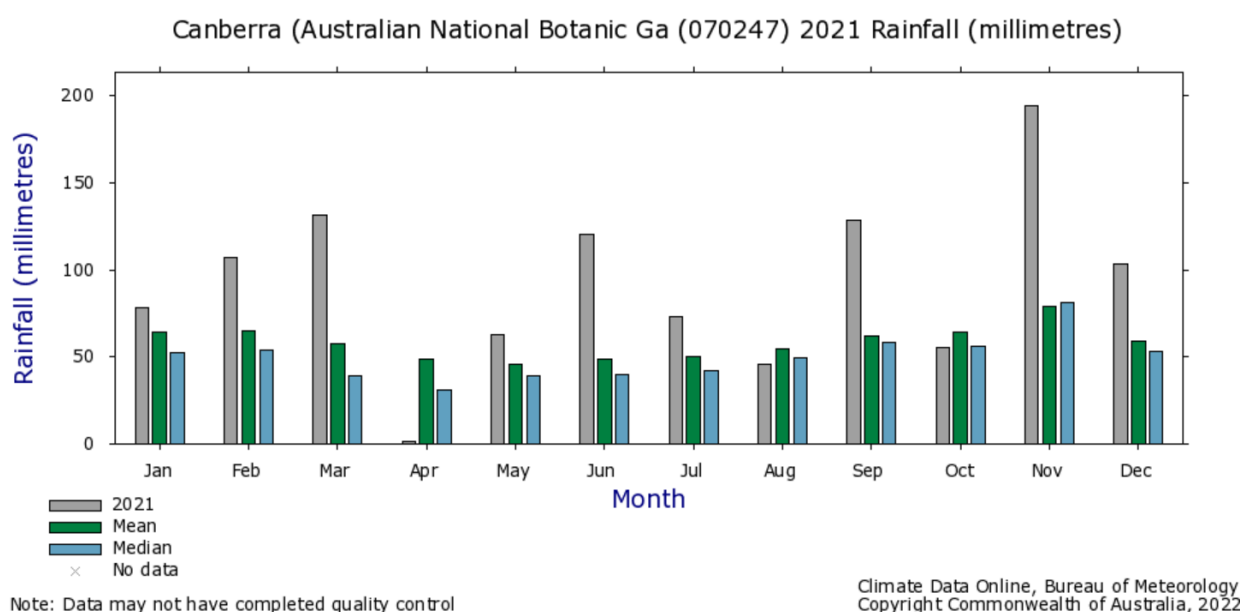
The climate data was collected from the Australian National Botanic Garden weather station (Station number 070247) and the temperature data was collected from the Canberra Airport weather station (Station number 070351).

Overall rainfall for 2021 was well above the median with November containing the highest amount of rainfall for the year (**Figure 3.1**). Late spring featured above average rainfall and a rise in mean maximum temperature towards summer (**Figure 3.2**). January 2022 saw a continuation of warm conditions and higher than average rainfall. The mean maximum temperatures in spring 2021 were down by approximately 2°C below the long-term average for those months and staying below the mean maximum temperature overall years into 2022 (**Figure 3.3**) (Bureau of Meteorology, 2022).

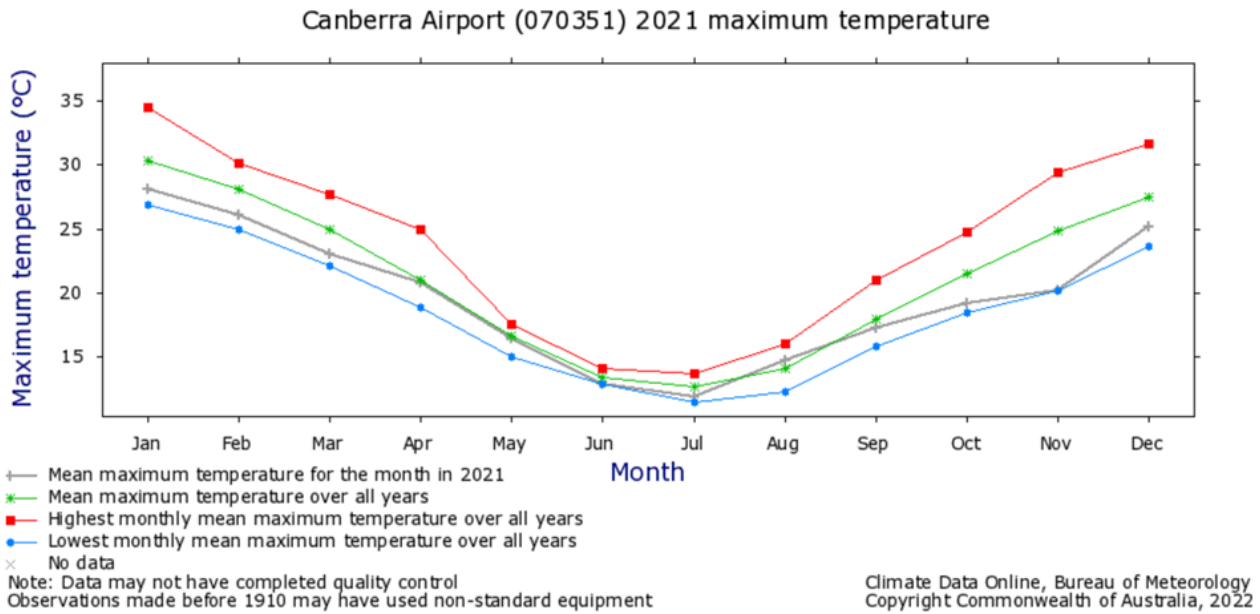
The weather on the survey days was cloudy with a slight breeze and in the high 20°C with no rainfall (**Table 3.1**).

**Table 3.1 Weather Conditions During Golden Sun Moth Surveys at Lawson South, 2020**

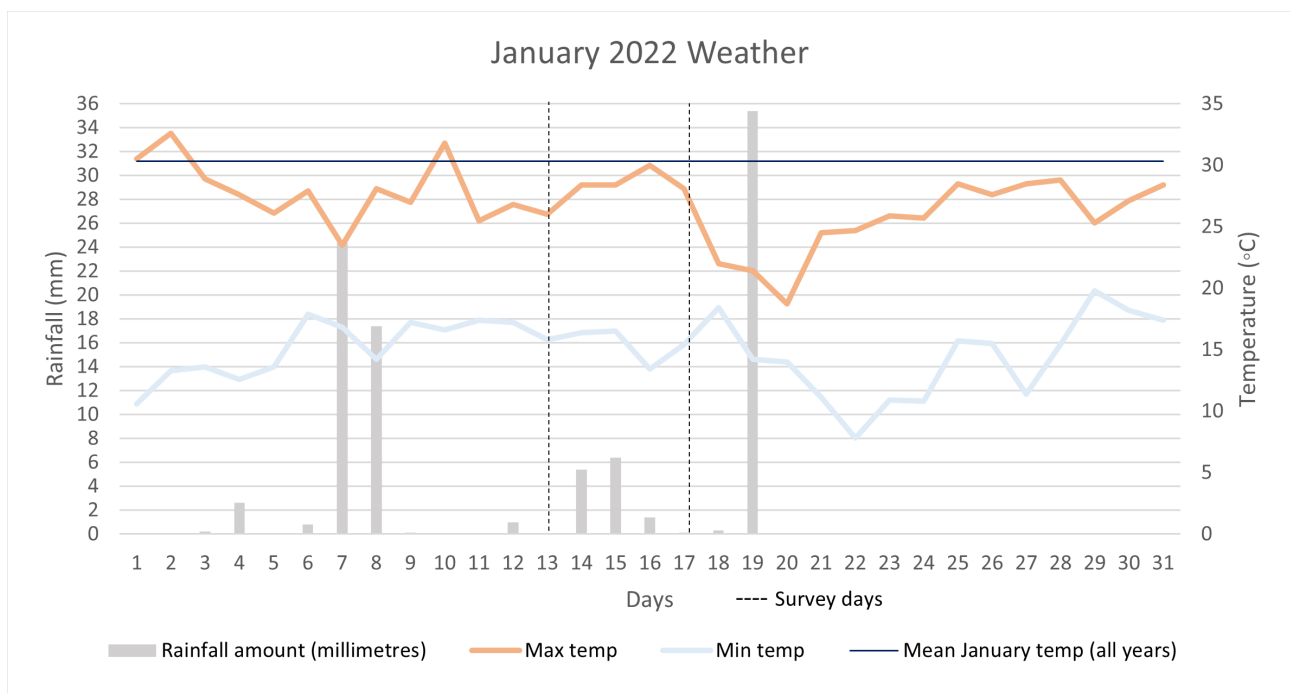
Survey	Date	Survey Time	Temperature (°C)	Weather
1	13 January 2022	1:27 pm–1:49 pm	26	Gentle to moderate wind (11-28 km/h), cloudy (>90% cover)
2	17 January 2022	1:27 pm – 2:24 pm	28	Gentle to moderate wind (11-28 km/h), cloudy (>90% cover)



**Figure 3.1 Rainfall data for months of 2021 (Bureau of Meteorology, 2022)**



**Figure 3.2 Mean temperature data for months of 2021 (Bureau of Meteorology, 2022)**



**Figure 3.3 Weather data for January 2022**

### 3.1.2 Golden Sun Moth Survey Results 2021/2022

A total of 20 male GSMs were observed in 2022. The two surveys resulted in 11 and seven observations, respectively (**Figure 3.4**). The remaining two GSMs were recorded incidentally while performing habitat surveys. As with previous surveys, no females or pupal cases were observed, and this is most likely due to a combination of tall grasses obscuring some sections of the site, and the generally sparse population of

moths. The observations of GSM were mainly of single moths and were restricted to habitat degraded by weeds in the north-eastern edge and the higher quality remnant patch of native grassland western corner of the site.

During the previous 2020 survey, 43 GSM were recorded. These were also recorded particularly in the north-western portion of the site, at the time representing a small extension of the population across the site (Umwelt 2020).

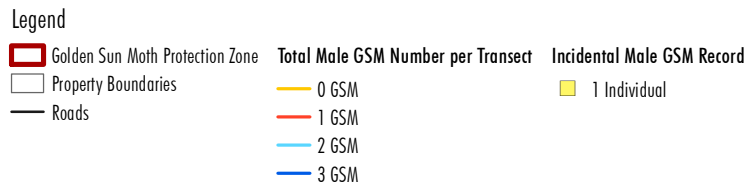
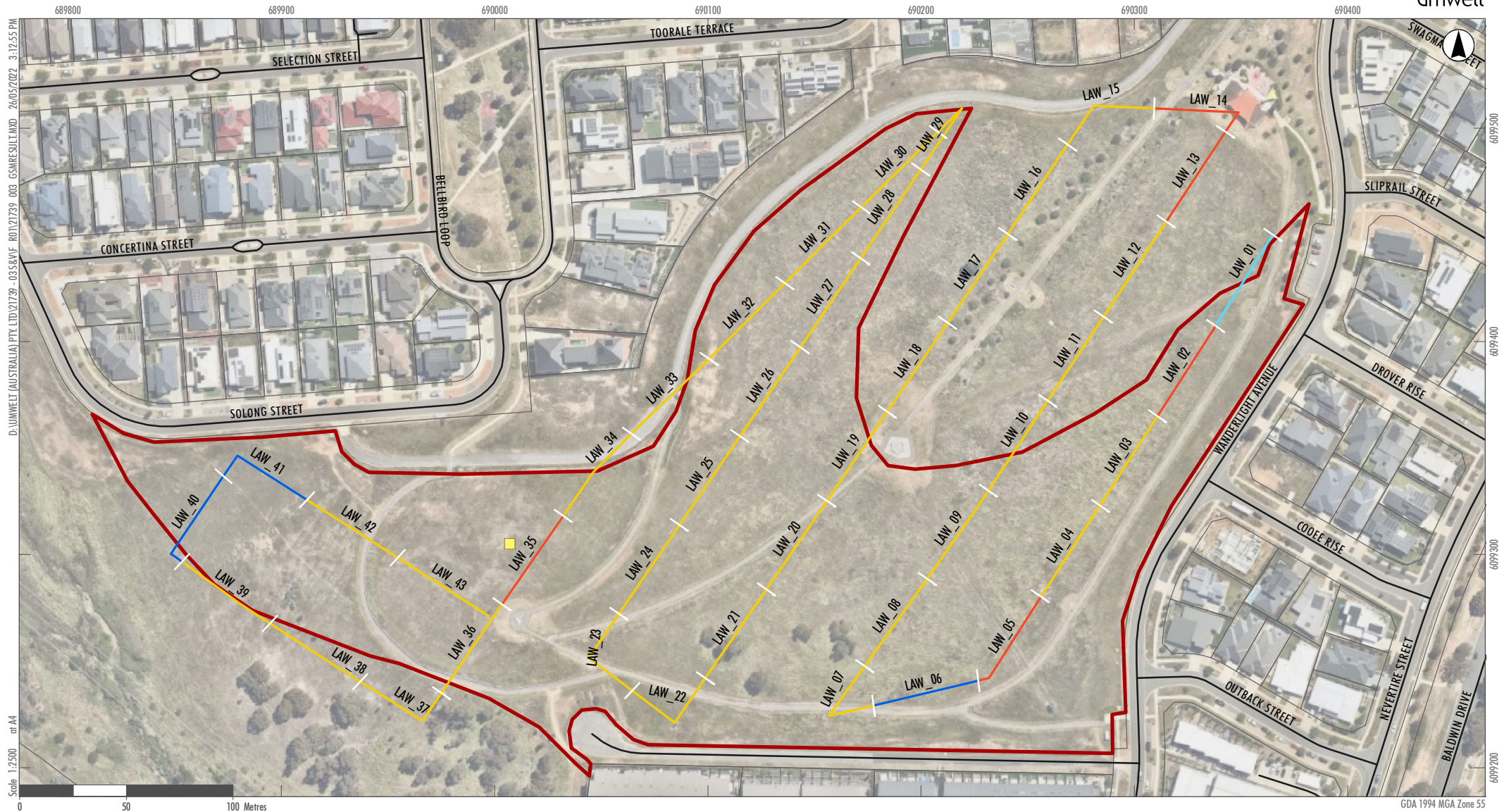
**Table 3.2 Golden Sun Moth Results at Lawson South, 2022**

Survey	Date	Total Males	Total Females	Total
1	13 January 202	11	0	11
2	17 January 2022	7	0	7
Incidental	-	2	0	2
<b>Total</b>	-	<b>20</b>	<b>0</b>	<b>20</b>

Although the flying moth surveys were conducted on days with suitable weather conditions in accordance with the survey guidelines (DoWHA 2009), the season was characterised by extremely low numbers of flying moths across Canberra. Due to the prevailing cool and wet conditions during October- December 2021 and through to January 2022 the number of suitable survey days was far lower than average, as was GSM activity on the few days where the weather conditions were conducive for flying moths. Moths were however still active in January permitting surveys at that time.

The regularity of rain during November – January 2022 combined with low soil temperatures likely contributed to low emergence of GSM and a small number of suitable days for the moth to fly. Hence, there may have been a higher-than-average likelihood of not detecting moths during the 2021 flying season at sites where few moths occur.

Surveys were not completed after 17 January 2022 due to a prolonged period of unsuitable weather and no further regional observations.



**FIGURE 3.4**  
Golden Sun Moth Survey Results (January 2022)

Image Source: Nearmap (2022) Data source: ACTMapi (2021); Rowell (2019)

## 3.2 Golden Sun Moth Habitat Monitoring

### 3.2.1 Golden Sun Moth Habitat Conditions

**Table 3.3** shows the average grass height and thatch depth measurements recorded in January 2022, along with three previous years. There was a significant increase, compared to previous years, in both the average grass height and thatch depth within all three of the transects. This is likely the consequence of the wetter than average seasonal conditions, which resulted in higher height and biomass of both native and exotic grasses, and generally increases biomass particularly in areas of high cover of exotic annual grasses and broadleaf weeds. Increased grass height was most evident in Transect 1, while increased thatch depth is most evident in Transect 3. The high thatch depth at Transect 3 corresponded with high cover of exotic annual grasses, predominantly wild oats.

**Table 3.3** Grass length and thatch depth on habitat transects

Transect	Average grass height (cm)				Average thatch depth (cm)			
	Jan 19	Jan 20	Dec 20	Jan 22	Jan 19	Jan 20	Dec 20	Jan 22
1	10.2	6.4	19.2	26.7	1.4	1.0	2.6	3.1
2	Not available	5.7	6.5	10.4	Not available	0.5	0.4	1.8
3	11.4	9.4	11.1	18.7	0.8	1.2	1.1	4.8
Average	10.8	7.2	12.3	18.6	1.1	0.9	1.4	3.2

**Table 3.4** and **Table 3.5** show the cover of vegetation categories compared to data from previous years. Previous years indicated a decline in the cover of native species compare to the first monitoring even in 2013. Substantial differences are evident in the total number of hits for some categories in January 2022 relative to previous years, however this is, in most cases, likely to be due to the different approach to data collection, where multiple hits were recorded at each point along the transect.

Changes in observations of cover categories at Transect 1 and Transect 2 are small in overall native hits, and likely to be primarily the result of differences in the method. However, the decrease of native species and increase in annual exotic grasses and broadleaf weeds at Transect 3 was substantial and is likely to reflect changed condition. Transect 1 had a decrease in the foraging species (*Austrostipa* spp. and *Rytidosperma* spp.) from 42 out of 100 observations (42%) in 2020 to seven out of 200 observations (3.5%) in 2022 and a large increase in exotic grasses. Transect 2 had an increase from 34 out of 100 observations (34%) in 2020 to 105 out of 200 observations (52.5%) in 2022. Transect 3 had also decreased in the foraging species with 58 out of 100 observations (58%), when compared with 2022 results of 100 out of a potential 200 observations which is 50% of the transect, therefore the native species has slightly dropped.

Based on observations in the field, the vegetation at Transect 1 was dominated by fast growing annual grass, primarily Wild Oats (*Avena fatua*), and broadleaf weeds such as Flatweed (*Hypochaeris radicata*), Patterson's Curse (*Echium plantaginium*) and Saffron Thistle (*Carthamus lantanus*). These exotic species have created a dense sward of tall grasses, as well as an increased thatch depth at ground level. This increased cover of biomass and thatch, if allowed to persist for multiple years is likely to disadvantage the native grasses.

### **3.2.2 Photo Monitoring**

The photos were taken at the start and end of each transect for a general overview of the sites (**Table 3.6**). These photos show at each transect that the grass is tall and consistently so across each of the three transects.

**Table 3.4** Vegetation transects results at Lawson South

Category	Desirable range EMP/ESDD 2019	Transect 1 (% cover)							Transect 2 (% cover)							Transect 3 (% cover)						
		Jan 13	Dec 15	Jan 17	Feb 18	Jan 20	Dec 20	Jan 22	Jan 13	Dec 15	Jan 17	Feb 18	Jan 20	Dec 20	Jan 22	Jan 13	Dec 15	Jan 17	Feb 18	Jan 20	Dec 20	Jan 22
Cryptogams	-	0	0	0	1	0	0	0	14	18	14	12	15	14	36	0	6	3	4	3	2	0
Bare ground	5-15/5-25%	1	1	7	4	7	1	3	6	10	7	12	9	2	2	11	13	11	10	10	2	3
Rock	-	0	0	0	0	0	2	0	3	6	2	0	5	4	2	1	3	1	0	0	3	1
Litter/dead vegetation	5-15/<30%	25	17	20	11	31	2	0	5	12	6	7	9	3	0	16	24	16	36	35	21	0
Non-vegetation hits		26	18	27	16	38	5	3	28	46	29	31	38	23	40	28	46	31	50	48	28	4
Annual exotic grass	-	4	30	8	23	20	9	46	4	1	3	0	0	0	8	4	7	7	4	3	3	31
Perennial exotic grass	-	4	7	7	2	0	1	9	0	0	0	0	0	0	0	0	0	0	0	2	3	6
Exotic broadleaf	<5%	5	15	10	22	6	43	49	2	3	1	1	2	8	27	3	4	3	1	1	4	56
Total exotic hits		13	52	25	47	26	53	104	6	4	4	1	2	8	35	7	11	10	5	6	10	93
All perennial native grasses	-	59	29	47	37	36	41	51	65	50	64	66	59	66	57	65	43	59	45	55	60	668
Other native species	-	2	1	1	0	0	1	11	1	0	3	2	1	2	73	0	0	0	0	0	2	00
Total native hits		61	30	48	37	36	42	62	66	50	67	68	60	68	130	65	43	59	45	55	62	68
<b>TOTAL HITS</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>169</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>98</b>	<b>205</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>165</b>

Note: Every habitat feature was recorded at every meter along the transects in 2022 (See Section 2.1.2 for more details in the methodology). Orange cells highlight concerning results that need to be addressed.

**Table 3.5 Density of native larval food plants on habitat transects within vegetation transects**

Native larval food plants	Desirable % range (EMP)	Transect 1 (% cover)							Transect 2 (% cover)							Transect 3 (% cover)						
		Jan 13	Dec 15	Jan 17	Feb 18	Jan 20	Dec 20	Jan 22	Jan 13	Dec 15	Jan 17	Feb 18	Jan 20	Dec 20	Jan 22	Jan 13	Dec 15	Jan 17	Feb 18	Jan 20	Dec 20	Jan 22
Austrostipa sp. Rytidosperma sp.	55-65	32	14	17	12	26	42	7	61	32	41	44	34	34	105	66	32	56	45	47	58	100
Rytidosperma sp.		6	-	-	-	2	19	0	59	-	-	-	22	3	75	23	-	-	-	11	14	48
Austrostipa sp.		26	-	-	-	24	23	7	2	-	-	-	12	31	30	43	-	-	-	36	44	52

**Table 3.6 Photo monitoring photos of each transect**

Transect	Start	End
1		
2		
3		

## 4.0 Discussion

### 4.1 Golden Sun Moth Population and Habitat Conditions

Very low numbers of GSM were observed, during surveys completed in January 2022. This is likely to be the result of two main factors: poor seasonal conditions for GSM regionally throughout the GSM flying season with corresponding low numbers observed, including at all reference sites, which typically support moderate to high numbers; and the completion of the surveys late in the GSM flying season. Typically, the GSM flying season ends in late December or early January, however possibly due to the wet and cool conditions in November and December, the flying season was prolonged. Due to the late surveys, and unsuitable conditions in much of January, only two surveys were completed. The detection of flying moths at a low rate across the site in January, along with the low levels of flying moth activity regionally, are indicative that moths are persisting within Reservoir Hill.

The desirable range for native food plant cover in the EMP was selected based on measured cover at high quality sites within the ACT at 55-65%. In 2022, there has been an increase in exotic species in particular broad leaf species in Transect 1 and 3.

The habitat condition has had a large increase in exotic species and particularly exotic broadleaf in Transect 3. The overall height and thatch across the transects has increased by an average height of 12.3 cm in 2020 to 18.6 cm in 2022 and an average thatch depth of 1.4 cm to 3.2 cm. The current habitat condition is outside of the optimal range for GSM habitat by more than 3 cm in height and 2 cm in thatch depth. The EMP prescribes grass height to be kept at less than 15 cm, and thatch depth at less than 1 cm, especially in the lead up to the GSM flight season (Rowell 2013). This can be maintained and improved with the biomass management recommendations outlined below in **Section 4.3**.

One of the other major issues relating to the habitat conditions is the high proportion of exotic grass species and exotic broadleaf species across all three transects. As noted below in the management section, weed control and follow-up weed control after a burn or slashing, will both improve biomass management levels to increase the likely breeding success for GSM and increase the native species diversity on the site.

### 4.2 Weed Management

Weed control was undertaken across the site in autumn, spring, and summer 2021. Species controlled included Chilean needlegrass, serrated tussock, saffron thistle, fleabane, great mullein, blackberry, and sweet briar (P. Lees, pers. comm. 2022; CoreEnviro Solutions 2021).

In spite of the control efforts, due to the wetter conditions during 2021, significant growth in exotic weed species was observed, including in areas where remnant populations of GSM were detected. The eastern portion of the site has seen extensive growth of exotic species, including annual grasses (Wild Oats), perennial grasses (Phalaris) and broadleaf weeds, with these forming a dense sward that dominating slower growing native species.

The majority of the area supporting dense exotic species is located outside the GSM management area of Reservoir Hill (**Figure 4.1**), but within both the monitored area and overlapping with areas of confirmed GSM activity. The most common exotic species within the high-biomass areas of the site have a strong response to early spring rains. As a result, there is the potential to treat these areas with herbicide to selectively exclude exotic species prior to the emergence and growth of most native grass species, and well before GSM are likely to emerge.

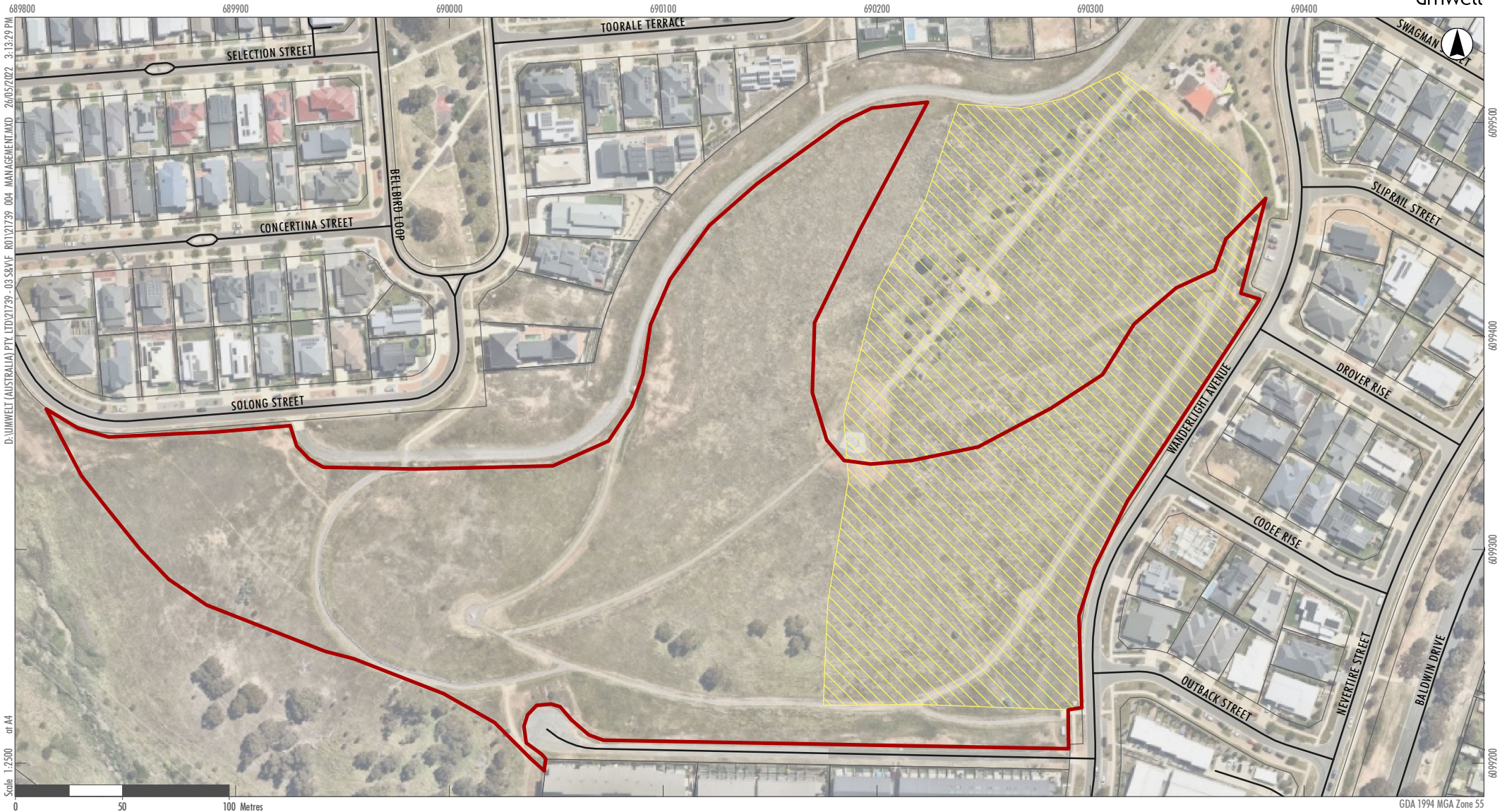
### **4.3 Biomass Management**

The visual nature of the mating cues for GSM means that this tall growth is detrimental to breeding success, as it reduces the likelihood that flying males will see a female at ground level. The survey noted areas on the eastern and southern side of the site where a combination of a south-eastern slope and wetter than average conditions have resulted in the establishment of a dense sward of mostly exotic grasses. The site was slashed in November and December 2021 (P. Lees, pers. Comm. 2022), indicating that the current biomass management regime may not be sufficient to maintain suitable habitat for the golden sun moth in years with above average rainfall.

At the time the site was surveyed the biomass had cured and was shading out low-growing native species. It also represents a potential fire risk; particularly should an ignition occur at the base of the hill and burn uphill towards the walking trails and lookouts.

Mechanical methods (mowing/slashing) and controlled burning are the recommend biomass management treatments. Both treatments will facilitate follow-up weed control by creating a uniform, low grass height that exotic weeds will emerge from. Where possible, biomass control should be implemented in early spring, prior to the GSM flying season, however, should also be maintained throughout the GSM season to maintain suitable structure throughout the flight season as required.

A combination of slashing, ecological burns and targeted herbicide application is recommended in the management guidelines below in **Appendix A**.



- Legend
- Project Area
  - Intensive Weed and Biomass Management
  - Property Boundaries
  - Roads

FIGURE 4.1  
Reservoir Hill Land Management Zones

## 5.0 Recommendations

After the 2021 monitoring of the GSM across Reservoir Hill various recommendations to improve the quality of the monitoring on the site and efficiency of the monitoring report are outlined below:

Site management recommendations:

- Spot spraying of exotic broadleaf species across the site using a selective herbicide (for example a solution with the main ingredient including metsulfuron-methyl).
- Spot spraying for annual grasses (Wild Oats) and perennial grasses (Phalaris) patches.
- Mechanical biomass removal to slash and remove of the cut hay as per the prescriptions within the EMP.

Report recommendations:

- Potential for updating monitoring to be consistent with the ACT Government Ecological Monitoring Module for GSM habitat and for Herbage Mass.
- Potential for GSM monitoring transects and Vegetation transects to be integrated into the ACT Offsets teams spatial monitoring database and data be collected using the ACT Government apps (ensures data is centralised within the ACT systems and collected consistently with recognised standards for offsets monitoring). Access can be granted by contacting the Spatial Planner within the ACT Parks and Conservation Service Environmental Offsets team.
- Future monitoring to include thatch percentage cover also be recorded in the 1x1m quadrats, to allow thatch density to be calculated (thatch depth x thatch cover).
- Development of some biomass and weed management targets that TCCS can use to assess annual performance of management control measures.

## 6.0 References

Bureau of Meteorology (2022), *Climate Data Online, Annual rainfall, Maximum Temperature, Minimum Temperature, Commonwealth of Australia*. Bureau of Meteorology. Available at: <http://www.bom.gov.au/climate/data/> Accessed: 3<sup>rd</sup> March 2022

CoreEnviro Solutions Pty Ltd (2021) *Reservoir Hill Golden Sun Moth Site Spray Treatment Report: Treatment of St John's Wort and African Lovegrass*. CoreEnviro Solutions, Canberra.

Department of Agriculture, Water, and the Environment (DAWE) (2009) *Significant impact guidelines for the critically endangered golden sun moth (Synemon plana), Nationally threatened species and ecological communities, EPBC Act policy statement 3.12. Commonwealth of Australia*. Available at: <https://www.awe.gov.au/sites/default/files/documents/golden-sun-moth.pdf> Accessed: 3 March 2020

Department of the Environment, Water, Heritage, and the Arts (2009) *Significant Impact Guidelines for the critically endangered golden sun moth*. Canberra.

Environment, Planning and Sustainable Development Directorate (2019) *Detailed method for measuring average grass height and thatch depth*. ACT Government, Canberra.

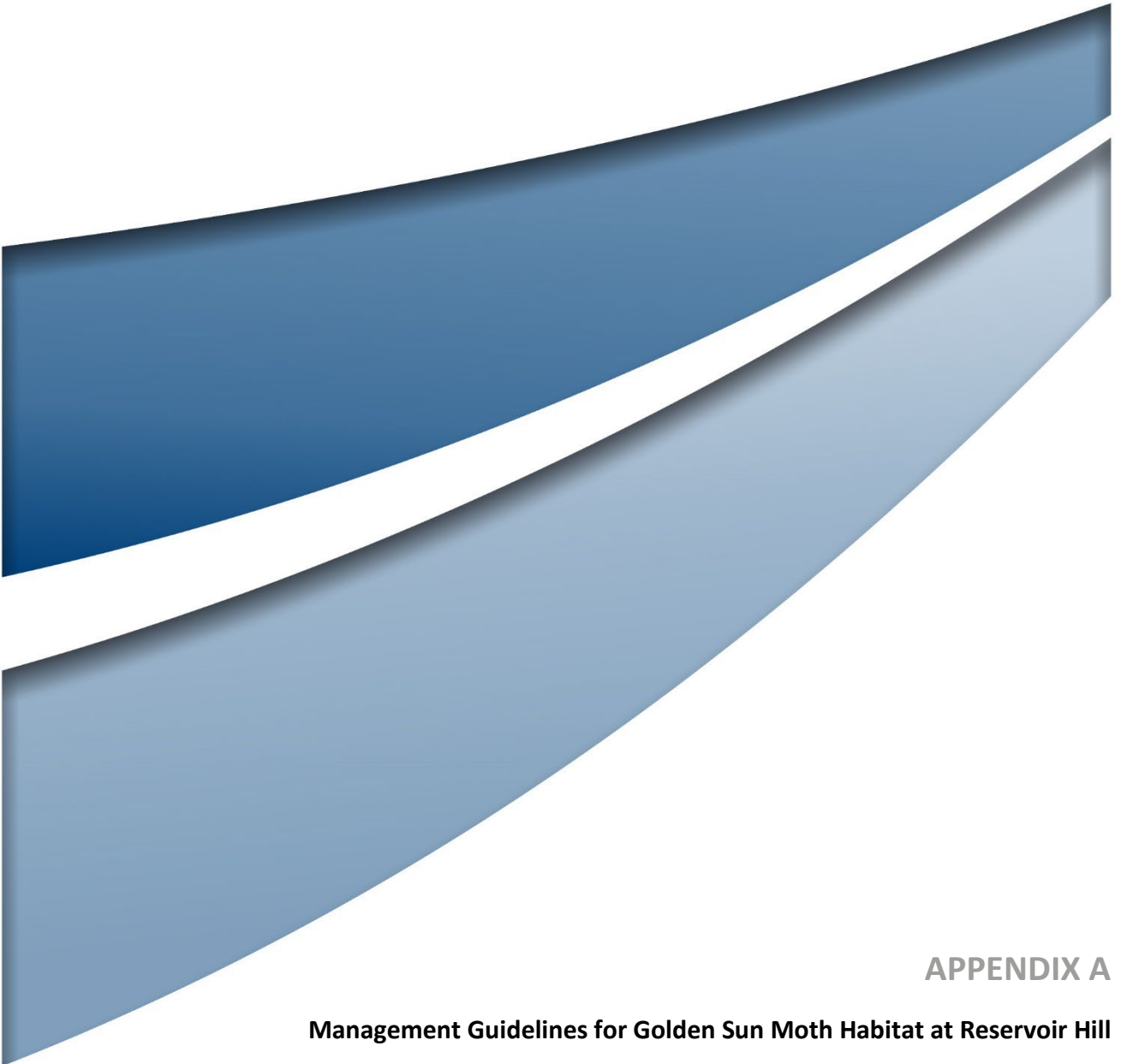
Umwelt (2020) *Monitoring of golden sun moth (Synemon plana) and its habitat at Reservoir Hill*. Prepared for ACT Land Development Agency, Canberra.

Rowell, A. (2013) *Environmental management Plan for GSM habitat on Reservoir Hill, Lawson South*. Report prepared for INDESCO and ACT Land Development Agency, Canberra.

Rowell, A. and Evans, M. (2014) *Draft ACT GSM Monitoring Plan*. ACT Government, Canberra

Rowell, A. (2020) *Monitoring of GSM Synemon plana and its habitat at Reservoir Hill (Lawson South Open Space) Report*. Prepared for ACT Government. Canberra

Williams, N.S.G., Marshall, A., and Morgan, J.W. (2015) *Land of Sweeping Plains – Managing and Restoring the Native Grasslands of South-Eastern Australia*. CSIRO Publishing, Victoria



**APPENDIX A**

**Management Guidelines for Golden Sun Moth Habitat at Reservoir Hill**

# Management Guidelines for Golden Sun Moth Habitat at Reservoir Hill

The overall objective of annual management actions will be to improve the quantity and quality of native habitats across the site, with an emphasis on enhancing potential habitat for GSM and Natural Temperate Grassland. The most pressing management issue on the site is to suppress the vigorous growth of exotic grasses that established across parts of the site during 2022, reducing grass height down to the range prescribed in the EMP.

As part of this the management actions will aim to:

- Remove excess biomass on the eastern and southern portions of the site caused by exotic grasses prior to the 2022/2023 GSM breeding season.
- Controlling weeds through removal/suppression of mature plants and prevention of flowering/seed set.
- Maintaining overall weed suppression across other areas of the site through targeted control.
- Assessing opportunities to implement ecological burns to enhance native habitat.

**Table A1.1 Annual Work Schedule for Reservoir Hill, South Lawson**

Task Description	Timing	Areas to be covered
Removal of excess biomass. <ul style="list-style-type: none"> <li>• Slashing/baling of grasses and thistles</li> <li>• Slash to be removed from site</li> </ul>	Winter 2022. Important to maintain biomass at levels suitable for the GSM prior to the commencement of the GSM flight season.	Eastern slope of Reservoir Hill Treatment area to cover all areas of tall exotic grasses where the sward exceeds 0.5 m
Monitoring emergence of exotic grasses <ul style="list-style-type: none"> <li>• Periodic checks for emergence and establishment</li> <li>• Provide estimated timing for herbicide application</li> </ul>	Mid-winter 2022	Eastern slope of Reservoir Hill Treatment area to cover all areas of tall exotic grasses where the sward exceeds 0.5 m
Treatment of emergent exotic weeds <ul style="list-style-type: none"> <li>• Herbicide boom to treat tall growing weeds once above 0.3 cm</li> <li>• Managed grazing as an alternative treatment.</li> </ul>	Late winter – early spring 2022 Trigger point is emergence of exotic grasses and active growth suitable for treatment	Eastern slope of Reservoir Hill Treatment area to cover all areas of tall exotic grasses where the sward exceeds 0.5 m

Task Description	Timing	Areas to be covered
Spot-treatment of weeds <ul style="list-style-type: none"> <li>• Focus on Saffron thistle clusters, as seed set will be localised to the adult plants</li> <li>• Treatment via spot spraying or slashing of weed clusters.</li> </ul>	Spring 2022	All areas of the site, particularly clusters of Saffron Thistle on the western side of Reservoir Hill.
Introduce ecological burning regimes <ul style="list-style-type: none"> <li>• Consultation on trial treatments, including opportunities to enhance native grassland condition as part of burning program.</li> </ul>	Autumn – winter 2022	All areas of the site

Burning treatments are not included in this plan, however consultation should be undertaken with ACT vegetation ecologists with Conservation Research (EPSDD) and the PCS Fire Management Unit to investigate whether prescriptions can be applied to the site, particularly in the lower productivity areas on the western facing slopes, where there is a higher proportion of native grassland species present.

