

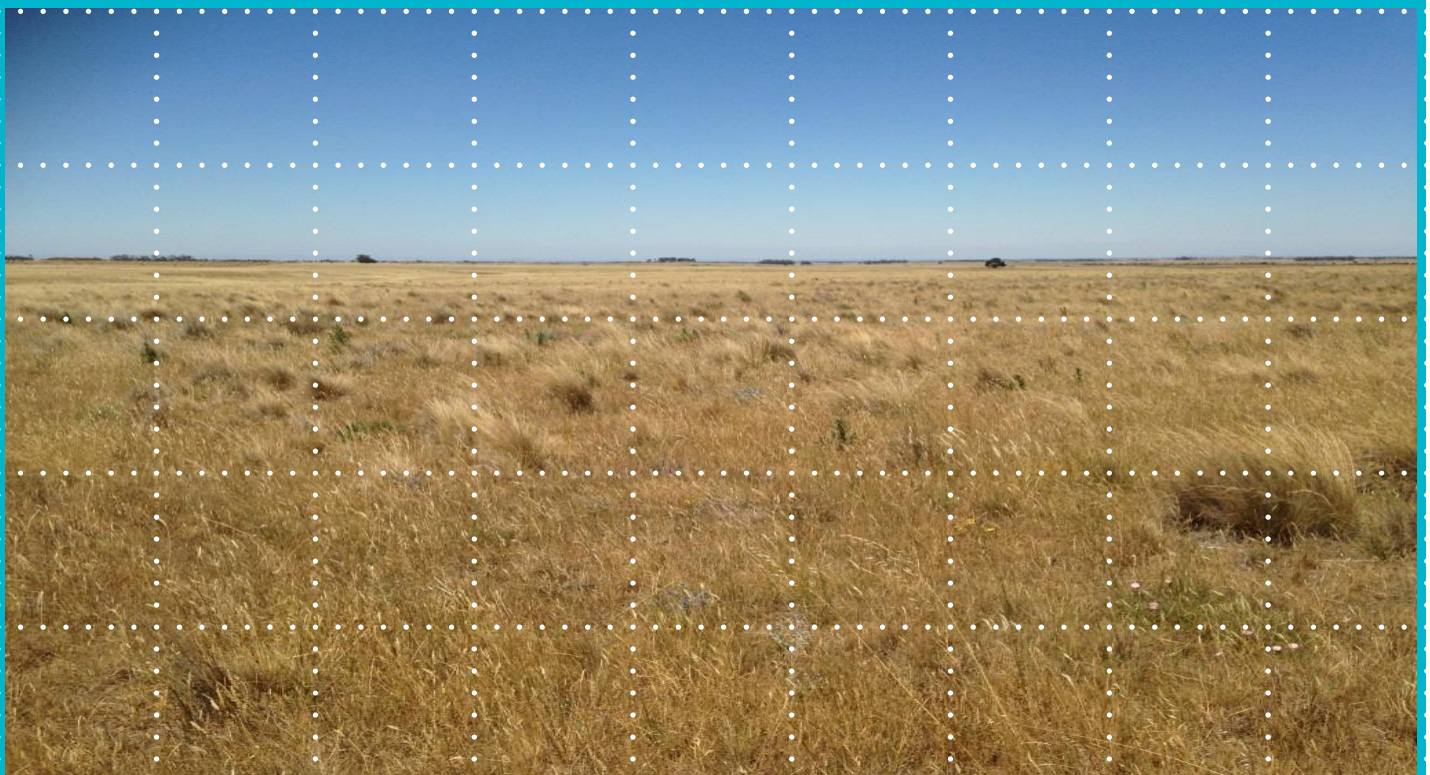
FINAL Report

Vegetation Assessments and Golden Sun Moth *Synemon plana* Population and Habitat Monitoring (2017/18), Rosenthal Offset Site, Warrambeen, Victoria

Prepared for

Warrambeen Landcare Farm

April 2018



Ecology and Heritage Partners Pty Ltd

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- Ian and James Taylor (the landowners) and Lee Evans who provided access to the offset site and on-site management information within the offset site.

DOCUMENT CONTROL

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1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was engaged by Warrambeen Landcare Farm to undertake vegetation monitoring and Golden Sun Moth *Synemon plana* population and habitat quality for Year 2 (2017/2018) for the Rosenthal Offset Site, Warrambeen, Victoria. The requirement for Golden Sun Moth offsets was associated with the construction of the Rosenthal Estate, 100 Vineyard Road, Sunbury, Victoria (Ecology and Heritage Partners Pty Ltd 2015).

The offset requirements were set under the EPBC Act for the removal of 42.27 hectares of Golden Sun Moth habitat from the Rosenthal Estate. A total of 86.0 hectares of Golden Sun Moth habitat is to be protected within the Warrambeen Group 2, Areas B1, B2 & E offset site as part of the offset requirements for the Rosenthal Estate.

An Offset Management Plan (OMP) for the Rosenthal offset Site has been identified and endorsed by all stakeholders (Ecology and Heritage Partners Pty Ltd 2015), including the City of Hume and the Department of Environment, Land, Water and Planning (DELWP), as a valid pathway to fulfil offset obligations. As per the OMP, only Area B1 is required to be protected and managed to satisfy the State offset requirements for removal of remnant vegetation within the Rosenthal Estate.

Vegetation and Golden Sun Moth population and habitat monitoring will be undertaken in accordance with Section 5.5 of the endorsed Offset Management Plan (OMP) (Ecology and Heritage Partner Pty Ltd 2015). The following report outlines the results of Year 2 monitoring results which will provide future targets over subsequent years for the ongoing monitoring and management within the Rosenthal offset site.

1.2 Scope and Objectives

The offset site will be managed for the purposes of conservation. Management of these sites will involve physical protection of the proposed offset site, the control of pest animals and a number of high threat environmental weeds, biomass reduction and general maintenance of the character and quality of the native vegetation, consistent with its historic context. The offset management plan and specified management actions will form part of a broader strategy for long-term management of Golden Sun Moth and its habitat as well as associated threatened species and ecological communities.

The objectives of the vegetation assessment and Golden Sun Moth monitoring were to:

- Determine the abundance and distribution of Golden Sun Moth throughout the offset site;
- Determine any potential impacts to Golden Sun Moth and their associated habitat in response to current management practices;
- Overall condition and composition of vegetation as well as consideration of measurable vegetation quality outcomes i.e. habitat hectare assessment;
- Biomass levels;

- The extent, severity, trend and presence of current weed species and any new and emerging weed species;
- Implementation of permanent photo points. Photographs must be taken at the same location and during the same time of each year by the landowner; and
- Provide advice on recommendations that may be undertaken to avoid and/or mitigate potential adverse impacts on significant ecological values.

1.3 Study Area

The Rosenthal offset site is located within the Woolly and Creek Paddocks within the Warrambeen Demonstration Landcare Farm, approximately 60 kilometres northwest of Geelong (Figure 1). The Rosenthal offset site includes areas known as Group 3 Areas B & E which cover a total of 86.0 hectares (Figure 2). The Warrambeen Demonstration Landcare Farm is privately owned and supports extensive areas of remnant native grassland.

The Warrambeen property has in recent history been used for wool production and substantial parts of the property have never been improved with fertilisers or cleared of embedded and scattered rock. Large tracts of remnant vegetation therefore persist throughout the property.

According to the Department of Environment, Water, Land and Planning (DEWLP) Biodiversity Interactive Map (DEWLP 2017), the study area occurs within the Victorian Volcanic Plain Bioregion. It is located within the jurisdiction of the Corangamite Catchment Management Authority (CMA) and the Golden Plains municipality (DEWLP 2017).

2 METHODS

2.1 Vegetation Assessment

2.1.1 Site Assessment

A field assessment was undertaken on 7 February 2018 to obtain information on flora values within the study area. The study area was walked, with all observed vascular flora species recorded, any significant records mapped, the overall condition of vegetation noted and the percentage cover of native plants, weeds, leaf litter, bare ground estimated. Where remnant vegetation was identified a habitat hectare assessment was undertaken following methodology described in the Vegetation Quality Assessment Manual (DSE 2004).

2.2 Targeted Golden Sun Moth Surveys

Targeted surveys for Golden Sun Moth were undertaken on 22 and 30 November 2017 in accordance with approved monitoring guidelines for Golden Sun Moth prepared by the Department of the Environment and Energy (DoEE) (DEWHA 2009). Surveys concentrated in areas identified as supporting indigenous grassland, namely those supporting Wallaby-grass *Rytidosperma* spp., which is a known food source for Golden Sun Moth (DEWHA 2009).

Areas of suitable habitat were walked or driven by a qualified zoologist over one day during the known flight season (i.e. late-October to early January). Surveys were undertaken at a time which is considered suitable for detecting the species (i.e. when adult males are likely to be flying). The male of this species generally flies between 11am and 3pm on calm, warm (over 20°C), sunny days.

2.3 Assessment Qualifications and Limitations

Vegetation Assessment

Ecological values identified on site are recorded using a hand-held GPS or tablet with an accuracy of +/-5 metres. This level of accuracy is considered adequate to provide an accurate assessment of the ecological values present within the study area; however this data should not be used for detailed surveying purposes.

The field assessment was undertaken during a sub-optimal season for the identification of flora species (late-summer); annual or cryptic flora species such as those that persist via underground tubers may have been absent at the time of assessment. Targeted flora surveys were not undertaken, as this was beyond the preliminary scope of the project. Nevertheless, the flora data collected during the field assessment and information obtained from relevant desktop sources is considered adequate to provide an accurate assessment of the ecological values present within the study area.

Golden Sun Moth

Targeted Golden Sun Moth surveys were undertaken by experienced personnel during the known flight period of the species and during appropriate conditions by following suitable survey guidelines. Fauna surveys were conducted under the Ecology and Heritage Partners Pty Ltd Research Permit (#10008283) issued by DELWP under the *Wildlife Act 1975*.

Given the species was confirmed on site as a result of previous targeted surveys, no additional 'reference' sites were visited to confirm the species flight activity prior to undertaking surveys.

However, given the species presence on site and the experience of surveyors, the results of this assessment are considered adequate for the purposes of confirming the species presence/absence on site and providing recommendations for managing the offset site over subsequent years.

The high number of Golden Sun Moth recorded during the surveys is considered to be associated with the species first emergence for the 2017/18 core flight season. Accordingly, subsequent surveys of the site were not considered warranted given the high population numbers for the species across the entire offset site.

3 RESULTS

3.1 Golden Sun Moth Monitoring

The following sections summarises the previous and current Golden Sun Moth monitoring results for the Rosenthal offset site.

3.1.1 Previous Population Monitoring

Table 1. Golden Sun Moth Population Monitoring within the Rosenthal offset site during previous monitoring periods.

Survey Year	Golden Sun Moth Abundances	Management Recommendations
2015/16 (Baseline Data – Year 1)	62 moths over three days (30 November, 4 and 17 December 2015)	The offset site was considered to provide favourable habitat for Golden Sun Moth at the time of the targeted surveys (Ecology and Heritage Partners Pty Ltd 2016).
2017/18 (Year 2)	238	The results of Golden Sun Moth surveys indicate that a high overall population density of the species remains within the Rosenthal offset site. Additional biomass control and weed management is recommended to increase the overall habitat quality of remnant vegetation and Golden Sun Moth in subsequent years of the OMP implementation.
2017/18 (Year 3)	320	The results of Golden Sun Moth surveys indicate that a high overall population density of the species remains within the Rosenthal offset site. Additional biomass control and weed management is recommended to increase the overall habitat quality of remnant vegetation and Golden Sun Moth in subsequent years of the OMP implementation.

3.1.2 Golden Sun Monitoring Results 2017/18

Targeted surveys identified a total of 320 Golden Sun Moth flying within the Rosenthal offset site between 22–30 November 2017 and during favourable conditions (Table 2; Figure 3). Golden Sun Moth was detected across the entire offset site and given the majority of the site contains suitable host plants, the species was recorded using most areas of the offset site during the assessment (Figure 3).

Table 2. Golden Sun Moth survey results during the 2015/16 flight season.

Date	Survey times	Reference Site	Temperature (°C) (9am and 3pm)		Wind (km/hr)	Cloud cover (%)	No. of days since rain	No. GSM
22/11/2017	13:00 – 16:30	Flying during survey	24.8	31.0	22	15	>4	96
30/11/2017	13:00 – 16:30	Flying during survey	25.6	26.1	26	15	>2	224

While the species is likely to have had several additional emergences throughout the core 2017/18 flight period (as previously observed within the Warrambeen Landcare Farm), the high number of moths detected during the assessments during November indicates that the species was in high enough abundances to confirm the offset site is providing suitable habitat for the species. The high abundances also indicate the

Golden Sun Moth population is currently being sustained to sufficient levels within the offset site under the current land management regimes.

3.2 Habitat Assessment

The study area comprised Plains Grassland in good condition (Plate 1). Four habitat zones (areas of differing quality) were recorded (Figure 2; Table 3).

Annual low threat grassy weed cover has increased since the baseline assessment and previous monitoring events (Table 5; Plates 2-4). This subsequently resulted in an increase in overall biomass (Table 4) and reduction in overall vegetation condition score (Table 3). Vegetation condition within the offset site has degraded, primarily as a result of an increase in annual weed cover and/or an emerging infestation of Spear Thistle *Cirsium vulgare*.

The predominant weed species within the study area was Wild Oat *Avena fatua*, which will require active management to ensure the percentage cover of biomass meets the objectives of the OMP (Plates 1 – 6) (Section 4; Figure 2). However, despite implementing the biomass regime as outlined within the CMP, the biomass has increased. As such, the management actions within the CMP require a review (Section 5). Other dominant weeds include Quacking-grass *Briza maxima*, Squirrel-tail Fescue *Vulpia myuros*, Soft Brome *Bromus hordeaceus* subsp. *hordeaceus* and Cat's Ear *Hypochoeris radicata*.

High threat weeds recorded comprised, Toowoomba Canary-grass *Phalaris aquatica* and the noxious Serrated Tussock *Nassella trichotoma* and Spear Thistle.



Plate 1. Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 30 November 2017).



Plate 2. Plains Grassland within the study area, with high cover of Wild Oats (Ecology and Heritage Partners Pty Ltd 30 November 2017).



Plate 3. Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 30 November 2017).



Plate 4. Plains Grassland within the study area with high cover of Wild Oats (Ecology and Heritage Partners Pty Ltd 30 November 2017).

4 MANAGEMENT TARGETS AND RECOMMENDATIONS

The following section discusses the performance measures outlined within the OMP (Ecology and Heritage Partners Pty Ltd 2015), and the recorded cover of biomass, bare ground and pest plant cover during the 2017/18 monitoring of the Rosenthal offset site. The following information aim to compare the overall targets of the vegetation quality noted within the OMP and baseline assessment with the current levels measured on site during the spring and summer of 2017/18 assessments.

4.1.1 Vegetation condition

Management actions in recent years has led to successful elimination of the high threat weed Saffron Thistle. However, the high threat weed Spear Thistle *Cirsium vulgare* has since established within the site (Table 5). Spot spraying and/or hand chipping of high threat weeds (Spear Thistle) must be undertaken to control high threat weeds.

Despite implementing the biomass regime as outlined within the CMP, the biomass and cover of annual weeds has increased (Tables 4 and 5). As such, the management actions within the CMP require a review, and adaptive management may be required (Section 5).

Table 3. Quantification of the current Site Condition Score and estimated improvement from the management of the Rosenthal offset site during the 2017/18 monitoring period.

EOI Code / land manager name		Rosenthal Estate										
Site code (number) / Habitat Zone ID (letter)		Group3 Area B1										
Land tenure		Freehold										
Property Size		>=10 Ha										
Patch Size		>=20Ha										
Zone type		Offset (Stat Planning)										
Proposal type		Remnant patch										
Security arrangement		Registered on-title agreement or crown land equivalent										
Bioregion		Victorian Volcanic Plain										
EVC name		Plains Grassland										
BCS		Endangered										
EVC standardiser		1.36										
	Max	Baseline condition	Condition during monitoring								Predicted condition following 10 years of management*	
			PG1		PG2		PG3		PG4			
			Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2		
Scores	Large Trees	10	-	-	-	-	-	-	-	-	-	-
	Tree Canopy Cover	5	-	-	-	-	-	-	-	-	-	-
	Understorey	25	15	15	15	15	15	15	15	15	15	15
	Lack of Weeds	15	9	9	6	2	2	6	6	9	6	9
	Recruitment	10	10	10	6	0	0	6	6	10	6	10
	Organic Litter	5	3	5	3	2	2	4	2	5	3	4
	Logs	5	-	-	-	-	-	-	-	-	-	-
Total Site Condition Score		37	39	30	19	19	31	29	39	30	38	

Notes: Ha = Hectare, HHa = Habitat hectare; - = not applicable; * Based on improvement gain/ha, as specified in the Offset Management Plan (Ecology and Heritage Partners Pty Ltd 2015).

4.1.2 Biomass Control

Table 4. Biomass targets and current levels within the Rosenthal offset site during the 2017/18 monitoring period.

% Biomass Control Target*	Zone (see Figure 2)	Cover biomass			Management Recommendations
		Baseline	Year 1	Year 2	
70%	PG1	70%	80%	80%	Biomass levels are increasing beyond target. Biomass Control using crash grazing should continue to be implemented during late January to maintain the overall biomass cover at 70% across entire offset site.
	PG2		75%	90%	
	PG3		70%	95%	
	PG4		70%	80%	

Note: (*) = Control Targets set out in BY Ecology and Heritage Partners (Ecology and Heritage Partners Pty Ltd 2016).

4.1.3 Weed Cover

Table 5. Weed Cover and current levels within the Rosenthal offset site during the 2017/18 monitoring period.

% Weed Cover Target*	Offset Site Location (see Figure 2)	Weed cover			Management Recommendations
		Baseline	Year 1	Year 2	
Low threat weeds: Control, and if possible reduce cover	PG1	25%	40%	40%	Weed cover was measured to be higher than the required target and is predominantly related to the presence of introduced annual pasture grasses such as Wild Oat. Strategic grazing and weed management should be actively undertaken to ensure the required targets outlined in the OMP are met annually.
	PG2		60%	60%	
	PG3		30%	30%	
	PG4		20%	50%	
Medium threat weeds: <5%	PG1	10%	10%	10%	Medium threat weed cover was measured to on target. Strategic grazing and weed management should be actively undertaken to maintain the required targets outlined in the OMP are met annually.
	PG2		10%	10%	
	PG3		10%	10%	
	PG4		10%	10%	
High threat weeds: <1%	PG1	5%	1-10%	<1%	Saffron Thistle infestation have successfully been controlled. However, high threat weed cover was measured to be higher than the required target in some areas, primarily due to new infestations of Spear Thistle. Spot spraying and/or hand chipping of Spear Thistle and, and newly emerging high threat weeds must be actively undertaken to meet the required targets outlined in the OMP.
	PG2		1-15%	1-5% (See Figure 2)	
	PG3		<1%	<1%	
	PG4		<1%	1-%	

Note: (*) = Control Targets set out in the Golden Sun Moth OMP (Ecology and Heritage Partners Pty Ltd 2015).

4.1.4 Pest Plant and Animal Control

The details of any pest animal control will be provided by the landowner. Specific weed management actions (i.e. physical removal, spraying, slashing) will be undertaken by the landowner.

4.2 Management Actions Summary – 2017/2018

A summary of the required management actions and completion dates for 2017/18 of the OMP are provided below in Table 6.

Table 6. Management Action Table for the Rosenthal offset site for the 2017/18 monitoring period.

Actions	Management action	Resource	Timing of action	Key performance target	Completed (Yes/No)	Date
2.1	Conduct weed control	Landowner	At least three times per year, late winter, early spring and late spring	Reduce high threat weeds to <1% and medium threat weeds to <5%. Control, and if possible, reduce cover of low threat weeds.	Partially met. Saffron Thistle successfully eliminated. Spear Thistle requires active management to meet <1% thresholds as per the OMP. Cover of annual grasses is increasing. Review of management actions outlined in Section 5 to ensure low threat weed targets within CMP are met.	See Section 4 above. Control methods to be provided by Ian Taylor (landholder)
2.2	Monitor populations of pest animals and conduct control works if required	Landowner / Pest Animal Contractor	After peak breeding season - late summer/early autumn	No increase in pest animal activity from approval of this plan; and, Minimal soil disturbance and no native vegetation loss from pest animal management activities.	Yes	Provided by Ian Taylor (landholder)
2.3	Conduct monitoring for vegetation and Golden Sun Moth and progress reporting	Suitably qualified ecological specialist	October to early January	Golden Sun Moth has persisted in grassland areas and to ensure that management actions and habitats are suitable for a viable Golden Sun Moth population in the future.	Yes	See Section 3.1 above.
2.4	Maintain fences	Landowner/ Fencing Contractor	As required	No gaps/holes in fences	Yes	Provided by Ian Taylor (landholder)

Actions	Management action	Resource	Timing of action	Key performance target	Completed (Yes/No)	Date
2.5	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	Landowner/ Bushland Management Contractor/C FA	During late Summer, Autumn and Winter (if dry)	Maintain at least 70% vegetation cover and adhere to seasonal spelling.	Partially met – biomass management undertaken through grazing. However, despite implementing the grazing regime as per CMP, biomass is increasing. Review of management actions outlined in Section 5 to ensure biomass targets within CMP are met.	Provided by Ian Taylor (landholder)
2.6	Monitor and assess works, and prepare progress report	Suitably qualified ecological specialist	Two years after commencement of OMP	The details of monitoring are covered by this report.	Yes	April 2018

5 CONSERVATION MANAGEMENT PLAN REVIEW AND RECOMMENDATIONS

5.1 Conservation Management Plan Review

Based on the results of targeted Golden Sun Moth monitoring during the 2017/18 flight period, the species is clearly persisting in good population numbers under the current management within the Rosenthal offset site, with increases in the recorded number of individuals each year over the past two years. While annual low threat weeds, such as Wild Oat, are increasing, it is considered likely the cover of this species can be countered by altering the grazing regime.

Provided the recommendations outlined in Section 5.2 below are implemented, the Rosenthal offset site will continue to provide suitable habitat and is likely to support a high population of Golden Sun Moth under the current management regimes outlined within the approved CMP (Ecology Partners Pty Ltd 2015). Apart from managing pasture grasses (Section 5.2) and Spear Thistle, no additional management alterations to the Golden Sun Moth CMP are recommended assuming all management actions are implemented into the future.

5.1.1 Review of grazing regimes

The cover of annual weeds within the offset site has remained higher than the target for several years (Table 5). Control of annual weeds is likely to be most effectively controlled through strategic grazing. Exotic annual grasses typically flower and set seed earlier in the season than native grasses and herbs. As such, if the site is grazed prior to, and during, the flowering and seed set of exotic annual grasses, and removed prior to the peak flowering period of native grasses, species dominance can be shifted over time, favouring the native species.

Mavromihalis et al (2013) have reviewed the effect of various grazing regimes in western Victorian basalt grasslands on the control of annual grasses and diversity of native plants. Continuing grazing through the spring reduced cover of exotic annual grasses, and led to a change in vegetation dominance favouring native plants, however, the increased duration of grazing through spring also led to a reduction of native species richness, with a decline in grazing sensitive herbs. As such, while prolonged grazing through spring may shift species dominance toward native species, Mavromihalis et al (2013) recommends caution when implementing this grazing regime. They suggest a mosaic of management regimes across the landscape is likely to be a useful approach in order to manage the conflicting benefits of weed control/native species diversity. Further, given the large year-to-year variation of species composition/abundance in grasslands, flexible management regimes are necessary to accommodate temporal fluctuations. The results and recommendations from this research has been reviewed and incorporated into the management recommendations for the Rosenthal offset site, as outlined below.

5.2 Recommendations

The grazing regime within the CMP recommends removing stock from about the time the Wallaby Grasses *Rytidosperma* spp. start to elongate their seed heads, which is approximately in late September. Given that

the abundance of annual weeds within the offset site are higher than the target, and have been increasing based on the current management regime, it is recommended that the sites grazing period is extended for approximately one month (October). The extension of grazing by this period is not considered likely to reduce the abundance of native species, and aims to shift the species dominance over time toward the natives, which continue to flower through late spring and summer.

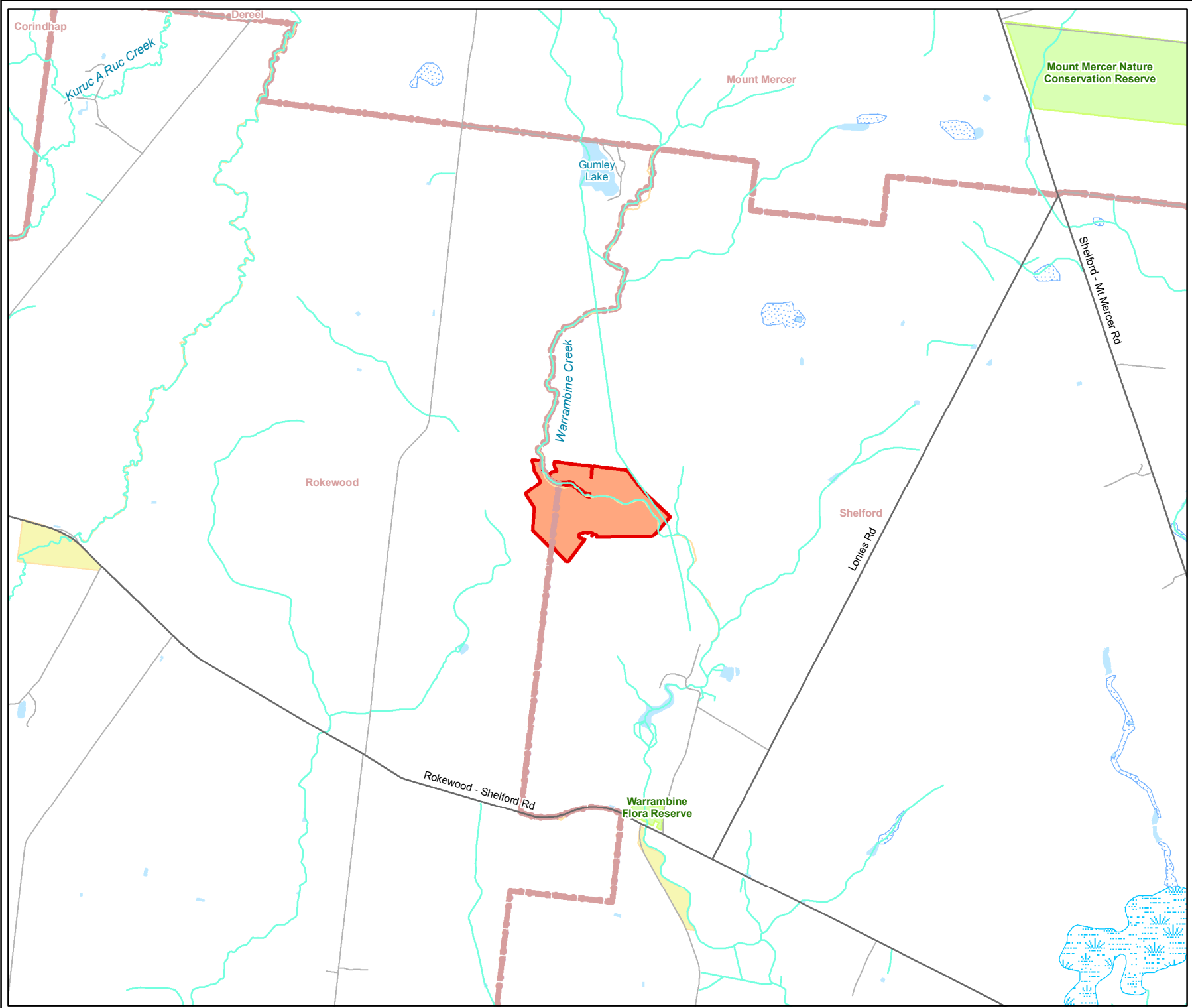
Where annual weed cover is particularly high in a given year (due to seasonal fluctuation), further grazing through November may be appropriate. However, given the increased risk to native herb diversity of such an extension, a qualified ecologist must review the risks and benefits of the proposed prolonged grazing period on-site prior to any implementation of an extended grazing period in any given year.

The above alteration to the grazing strategy outlined within the CMP must be approved by the Commonwealth Department of Environment and Energy prior to implementation.

REFERENCES

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- Ecology Partners Pty Ltd 2016. Baseline Vegetation, and Golden Sun Moth *Synemon plana* Population and Habitat Quality Summary (2015/2016), Warrambeen Group 3, Areas B1, B2 & E, (Woolly and Creek Paddocks), Shelford, Victoria. Unpublished report prepared for Warrambeen Demonstration Landcare Farm.

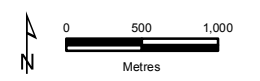
FIGURES



- Legend**
- Study Area
 - Collector Road
 - Minor Road
 - Minor Watercourse
 - Permanent Waterbody
 - Land Subject to Inundation
 - Wetland/Swamp
 - Parks and Reserves
 - Crown Land
 - Localities

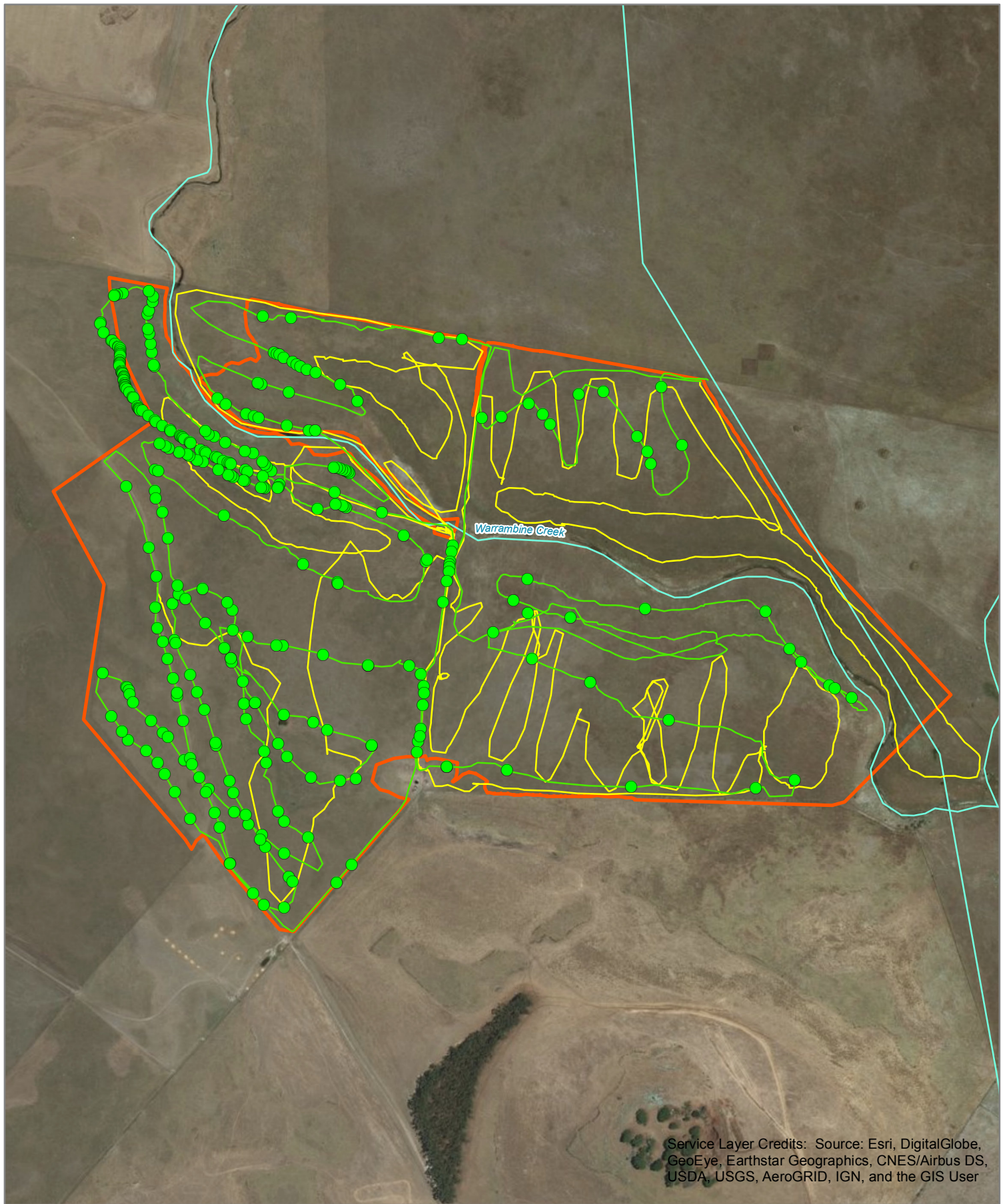


Figure 1
Location of the study area
Golden Sun Moth population and habitat monitoring, Warrambine



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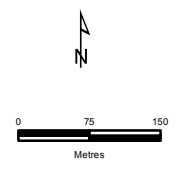
7435 Fig01_StudyArea 7/12/2017 melslv



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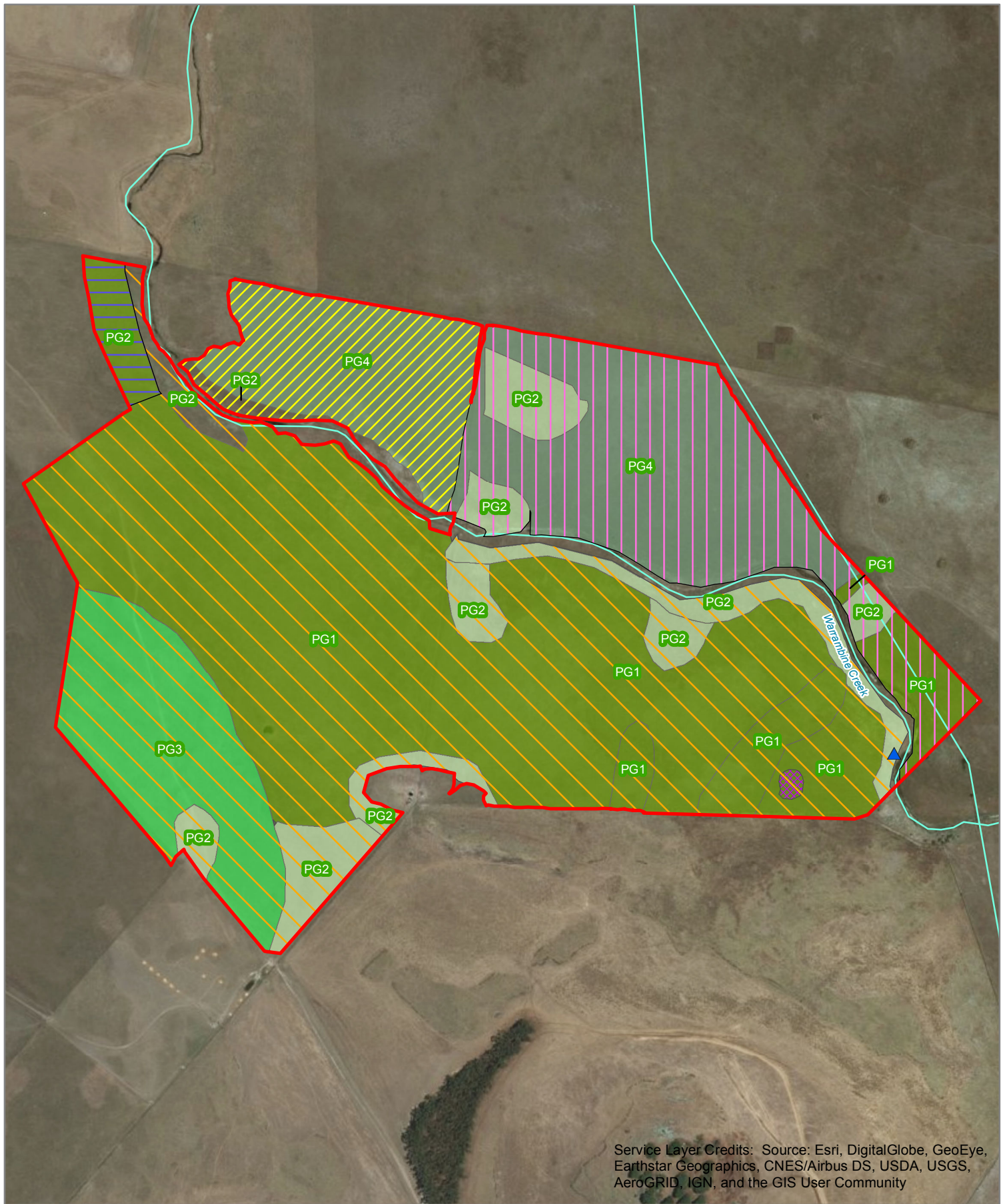
Figure 2
Golden Sun Moth
population and habitat
monitoring - survey
tracks
Warrambine

- Legend**
- Rosenthal Estate Offset Area
 - Golden Sun Moth**
 - 2nd survey 30/11/2017
 - Survey tracks**
 - 1st survey 22/11/2017
 - 2nd survey 30/11/2017



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Figure 2
Vegetation Assessment
 Warrambien Group 3 Areas B1, B2 and E

Legend

Rosenthal Estate Offset Area

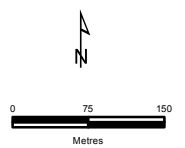
Serrated Tussock

Plains Grassland Zones

PG1
 PG2
 PG3
 PG4

Weed Coverage:

<1% Spear Thistle
 1% Spear Thistle
 1% Saffron Thistle
 2-3% Spear Thistle
 3-5% Spear Thistle



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