

Final Report

Vegetation Assessment, Golden Sun Moth Population and Habitat Monitoring and Rabbit Abundance Monitoring for Year 1 (2022/23): 6060 Hamilton Highway, Cressy, Victoria

Prepared for

Greater Western Water

November 2023



Ecology and Heritage Partners Pty Ltd

DOCUMENT CONTROL

Assessment	Vegetation Assessments and Golden Sun Moth <i>Synemon plana</i> Population and Habitat Monitoring for Year 1 (2022/23)
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File name	16882_EHP_Monitoring_Year1_Warrambeen_Cressy_Final_27112023
Client	Greater Western Water
Bioregion	Victorian Volcanic Plain
CMA	Corangamite
Council	Colac Otway

VERSION CONTROL

Report versions	Comments	Comments made by:	Date submitted
Draft	Report sent to the client for review	MB	13/11/2023
Final	Updated based on client comments	MB	27/11/2023

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CONTENTS

1	INTRODUCTION.....	5
1.1	Background.....	5
1.2	Scope and Objectives.....	5
1.3	Study Area.....	6
1.4	Golden Sun Moth.....	7
2	METHODS	8
2.1	Landowner Annual Monitoring and Reporting.....	8
2.2	Vegetation Assessment.....	8
2.2.1	Detailed Vegetation Monitoring	8
2.2.2	Field Assessment.....	8
2.3	Golden Sun Moth Population Monitoring.....	9
2.3.1	Targeted Golden Sun Moth Surveys.....	9
2.4	Rabbit Abundance Monitoring.....	9
2.5	Assessment Qualifications and Limitations	10
2.5.1	Vegetation Assessment.....	10
2.5.2	Golden Sun Moth	10
3	RESULTS	11
3.1	Vegetation Assessment.....	11
3.1.1	Native Vegetation	11
3.1.2	Weeds.....	14
3.1.3	Biomass monitoring	15
3.2	Golden Sun Moth Monitoring.....	16
3.2.1	Previous Survey Results	16
3.2.2	Year 1 Survey results.....	16
3.2.3	Stocking Rate	17
3.3	Rabbit Abundance Monitoring.....	18
3.4	Management Targets.....	18
3.4.1	Weed Control.....	18
3.4.2	Biomass Control	19

3.4.3	Pest Animals.....	19
4	DISCUSSION	21
4.1	Vegetation Condition	21
4.1.1	Weed Cover	22
4.1.2	Biomass Control	23
4.1.3	Pest Plant and Animal Control	23
4.1.4	Photo Points.....	24
4.2	Golden Sun Moth.....	24
4.3	Management Actions Summary – 2022/23	25
	REFERENCES.....	32
	FIGURES	33
	APPENDIX 1 FLORA.....	37
	Appendix 1.1 Flora Results.....	37
	APPENDIX 2 – PHOTOPPOINTS CAPTURED BY ECOLOGY AND HERITAGE PARTNERS PTY LTD	39
	APPENDIX 3 – LANDOWNER REPORT	44

1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was engaged by Greater Western Water to undertake vegetation monitoring, Golden Sun Moth *Synemon plana* population and habitat quality monitoring and rabbit abundance monitoring for Year 1 for the offset site located at 6060 Hamilton Highway, Cressy, Victoria (herein referred to as the Cressy offset site). The requirement for Golden Sun Moth and Natural Temperate Grasslands of the Victorian Volcanic Plain (NTGVVP) offset monitoring was associated with the construction of the recycled water pipeline, Parwan to Melton, Victoria (EPBC 2018/8260). The offset requirements were conditions under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the removal of 5.1 hectares of Golden Sun Moth habitat and 4.96 hectares of the NTGVVP at the development site.

A total of 30 hectares of Golden Sun Moth habitat and 33 hectares of NTGVVP has been protected within the offset site, in accordance with the *Victorian Conservation Trust Act 1972* via a Trust for Nature covenant. The management, monitoring and auditing works required to be undertaken at the offset site are detailed in the Offset Management Plan (OMP) (Ecology and Heritage Partners 2022) prepared for the Cressy offset site. The OMP was approved by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act (EPBC 2018/8228).

Detailed vegetation monitoring, Golden Sun Moth population and habitat monitoring, and rabbit abundance monitoring has been undertaken in accordance with Section 8 of the endorsed OMP (Ecology and Heritage Partner 2022). The following report outlines the results of Year 1 monitoring results, which will provide future targets over subsequent years for the ongoing monitoring and management within the Cressy offset site.

1.2 Scope and Objectives

The Cressy offset site is being managed for the purposes of biodiversity conservation. Management of this site involves the physical protection of the offset site, control of pest animals and high threat environmental weeds, biomass reduction and general maintenance of the character and quality of the native vegetation, consistent with its historic context. The OMP and specified management actions form part of a broader strategy for long-term management of extant Golden Sun Moth populations and habitat, as well as the associated NTGVVP.

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

- Establish eight permanent photo-points across the offset site. Future photographs will be taken at the same location and during the same time each year by the landowner;
- Undertake detailed vegetation monitoring of NTGVVP to assess the overall quality and quantity of vegetation and composition of species (i.e Habitat Hectares assessment);
- Assess biomass levels within 14 x 1 m² sampling plots equidistant within the Cressy offset site;

- The extent, severity, trend and presence of current weed species and any new and emerging weed species;
- A general assessment of the results of the NTGVVP monitoring against the predicted EPBC offset gain calculator outcomes;
- 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;
- Undertake rabbit abundance monitoring, noting the location and abundance of any European Rabbit *Oryctolagus cuniculus* or European Hare *Lepus europaeus* within the offset site, mapping warrens or areas of harbour, and noting any secondary evidence of rabbit presence (i.e. grazing, scats or diggings); and, 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 Cressy offset site is located 6060 Hamilton Highway, Cressy, Victoria and is approximately 60 kilometres northwest of Geelong (Figure 1). The offset site comprises 33 hectares of suitable grassland habitat (areas of which constitute NTGVVP) and also supports a 30 hectare offset site for a resident population of Golden Sun Moth (GSM) (A total of 33 hectares are being managed as part of this offset site). Additional areas within 6060 Hamilton Highway, Cressy are currently secured and managed for the conservation of GSM and remnant NTGVVP (under previous EPBC Act approval conditions). The offset site is managed by the Warrambine Pastoral which supports extensive areas of remnant native grassland and Golden Sun Moth habitat.

According to the DEECA NatureKit Map (DEECA 2023a), 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 Colac Otway municipality.

1.4 Golden Sun Moth

EPBC Act Conservation Status: Vulnerable*

FFG Act Conservation Status: Listed

Golden Sun Moth (Plate 1) typically occurs in native grassland, grassy woodland, dominated by greater than 40% cover of wallaby-grass, in particular *Rytidosperma* spp. (DSE 2004), but may also inhabit areas dominated by Kangaroo Grass *Themeda triandra* (Endersby and Koehler 2006) and introduced grassland dominated by Chilean Needle-grass *Nassella neesiana* and other introduced species (A. Organ pers. obs.). Male flight is typically low, to about a metre above the ground, fast and can be prolonged, but they are generally not recorded flying more than 100 metres from suitable habitat (Clarke and O'Dwyer 2000).



Plate 1. Golden Sun Moth (Ecology and Heritage Partners Pty Ltd)

Prior to European settlement, the Golden Sun Moth was widespread and relatively continuous throughout its range, inhabiting grassy open woodlands and grassland, although it now mainly inhabits small, isolated sites (DSE 2004). The species is threatened by habitat loss, disturbance and fragmentation due to agricultural expansion and urbanisation. Many populations are isolated and fragmented, impeding the ability of the relatively immobile females to recolonise areas, thereby reducing the likelihood of genetic exchange (DSE 2004). Such populations are therefore vulnerable as there is little likelihood of recolonisation in the event of a local extinction.

***Note:** The EPBC Act Conservation Status for Golden Sun Moth was downgraded from Critically Endangered to Vulnerable, effective 7 December 2021.

2 METHODS

2.1 Landowner Annual Monitoring and Reporting

Year 1 monitoring has been undertaken by Ecology and Heritage Partners Pty Ltd on behalf of the landowner, and included an assessment of:

- The extent, severity, trend and presence of current weed species and any new and emerging weed species;
- The extent, severity, trend and presence of pest animal activity;
- Biomass levels, visually assessed across the site;
- Evidence of unpermitted human/stock access;
- Photographs taken at photo-points (see Figure 2); and,
- Any new threats.

The annual monitoring will be undertaken for each year of the ten years of the endorsed Offset Management Plan.

2.2 Vegetation Assessment

2.2.1 Detailed Vegetation Monitoring

Detailed vegetation monitoring was conducted by a qualified ecologist and documented the following components:

- Overall assessment of the quality and quantity of vegetation and composition of species (i.e. Habitat Hectare assessment);
- Biomass levels, assessed from 14 x 1 m² sampling plots, randomly spread throughout the offset site (see Figure 2); and,
- The extent, severity, trend and presence of current weed species and any new and emerging weed species.

2.2.2 Field Assessment

A field assessment was undertaken on 31 October 2023 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, and bare ground estimated. A habitat hectare assessment was undertaken following the methodology described in the Vegetation Quality Assessment Manual (DSE 2004).

2.3 Golden Sun Moth Population Monitoring

Golden Sun Moth survey procedures followed the approved monitoring guidelines prepared by DAWE (now DCCEE). The following measures were undertaken as part of population and habitat monitoring for Golden Sun Moth at the offset site:

- Surveys were conducted by suitably trained observers at 50 metre transects, across the entire offset site;
- Surveys were conducted over four separate days during the known flight season. Traditionally this would be November to early January, however the flight season did not commence until mid-December due to unseasonably cool and wet weather. As such, the surveys were conducted around mid-January; and,
- Surveys were undertaken at a time which is considered suitable for detecting the species (i.e. when adult males are flying), and when Golden Sun Moth was observed flying at nearby locations (The male of this species generally flies between 11am and 3pm on calm, warm [over 20°C], sunny days).

2.3.1 Targeted Golden Sun Moth Surveys

Targeted surveys for Golden Sun Moth were undertaken on 12, 13, 17 and 21 of January 2023 (see section 2.5.2 for justification for the short interval between some surveys). Areas of suitable habitat were walked by qualified ecologists at a time which is considered suitable for detecting the species (i.e. between 10:00am and 3:00pm during suitable weather conditions, when adult males are likely to be flying [DEWHA 2009]). The species was noted to be flying at other sites in the broader locality (i.e. Beaufort and Mount Mercer, Victoria) on the day of the surveys and via the Ecological Consultants Association of Victoria Golden Sun Moth flight diary.

2.4 Rabbit Abundance Monitoring

Baseline data for the abundance and distribution of warrens throughout the Cressy offset site was established in order to provide information for future assessments of the effectiveness of control actions. The following tasks were undertaken as part of the rabbit abundance survey:

- Assess the entire 33 hectare offset area and an area of 100 metres surrounding the offset area within the overall property;
- Map with handheld GPS existing warrens and area of harbour (i.e. rock piles or woody weeds including African Boxthorn and Sweet Briar);
- Note the location and abundance of any observations of European Rabbit *Oryctolagus cuniculus* or European Hare *Lepus europaeus* within the offset site or overall property;
- Note observation of any secondary evidence of rabbit presence (i.e. grazing, scats or diggings); and,
- Provide the data collected to the landowner to inform the implementation of initial rabbit control efforts.

2.5 Assessment Qualifications and Limitations

2.5.1 Vegetation Assessment

This report has been written based on the quality and extent of the ecological values and habitat considered to be present or absent at the time of the desktop and/or field assessments being undertaken.

Ecological values identified on site were recorded using a hand-held GPS or tablet with an accuracy of +/-3 metres. This level of accuracy is considered adequate to provide an accurate assessment of the ecological values present within the study area although this data should not be used for detailed surveying purposes.

The terrestrial flora and fauna data collected during the field assessment and information obtained from relevant desktop sources is considered to inform an accurate assessment of the ecological values present within the study area.

2.5.2 Golden Sun Moth

Targeted GSM 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 (#10009538) issued by DEECA under the *Wildlife Act 1975*.

The 2022/23 GSM season presented some unforeseen challenges, and Ecology and Heritage Partners closely monitored the emergence, distribution, and abundance of the species at reference sites across Victoria. Likely due to unseasonably wet and cool conditions through November and December, the species were not observed to be actively flying until mid-late December 2022, and numbers did not become consistent or reach typical abundances until the first to second week of January 2023. Typically, GSM emergence declines in the towards late January, whereby surveying for this species in February is unprecedented as historically the species' flight season is completed by this stage.

Furthermore, Ecology and Heritage Partners conducted a site assessment on 21 December 2022 and found the ground still too damp to begin the survey effort under suitable environmental conditions. In temperate regions, insect larvae often face a decision between development into their adult stage, or ongoing growth for emergence in the subsequent season (DEWHA 2009). We therefore expected a truncated emergence period for the species once conditions became suitable. However, in order to complete all four survey efforts while the species was known to be flying, surveys were undertaken slightly outside of the guideline's timing constraints, (i.e. surveys being conducted a week apart). As such, two surveys were conducted on consecutive days (12 and 13 January), to take advantage of a favourable weather window.

The species was also known to be flying at other sites in the broader locality (i.e. reference sites north and north east of the study areas) on the days of the survey. Given the species presence on site and the experience of surveyors, the results of this assessment are considered suitable for the purposes of assessing the works against the objectives of the project.

3 RESULTS

3.1 Vegetation Assessment

Native vegetation within the study area comprised of one EVC: *Heavier Soils Plains Grassland* (EVC 132_61) (Plate 2; Plate 3). The 33-hectare patch of *Heavier Soils Plains Grassland* was in moderate to high condition (i.e. 0.63/1) and contained high floristic diversity, including a diverse range of herbs and a high cover of native grasses, continuing to meet the condition threshold that defines the *Natural Temperate Grassland of the Victorian Volcanic Plain* ecological community.

In total, 50 flora species were observed within the study area, including 38 indigenous species and 12 non-indigenous species. A list of all flora species recorded during the field assessment is provided in Appendix 1.1.

3.1.1 Native Vegetation

The study area comprised approximately 60% cover of native grasses and herbs, of which native grasses comprised approximately 25% of the species, including Kangaroo Grass *Themeda triandra*, Rough Spear-grass *Austrostipa scabra*, Long-hair Plume-grass *Dichelachne crinita*, Common Tussock-grass *Poa labillardierei* (Plate 4) and Common Blown-grass *Lachnagrostis filiformis s.l.* (Plate 5). A diverse range of native herbs were also present comprising approximately 30% cover, including Sheep's Burr *Acaena echinata*, Kidney-weed *Dichondra repens*, Blue Devil *Eryngium ovinum*, Prickfoot *Eryngium vesiculosum* (Plate 6), Crane's Bill *Geranium spp.*, Buttons *Leptorhynchos spp.* (Plate 7), Branching Bluebell *Wahlenbergia multicaulis* (Plate 8), Cut-leaf Goodenia *Goodenia pinnatifida* (Plate 9), Yam Daisy *Microseris scapigera s.l.*, Shady Wood-sorrel *Oxalis exilis*, Narrow Plantain *Plantago gaudichaudii*, Common Woodruff *Asperula conferta*, Slender Speedwell *Veronica gracilis*, Plantain *Plantago spp.*, Poison Lobelia *Lobelia pratoides* and Smooth Halgania *Halgania andromedifolia*, among others. Native vegetation cover was highest in the central portions of the study area, with an approximate cover of 70-80%, whereas the borders of the study area, particularly along the eastern and southern portions, contained lower cover of approximately 30%.

The cover of native grasses and herbaceous plants has remained consistent since the OMP was enacted in November 2022 (Ecology and Heritage Partners 2022), which is evident by the audit that was conducted by Jacobs in August 2023 (Jacobs 2023) and this assessment, indicating similar vegetation condition scores (Table 1). The original baseline assessment was conducted by Biosis in 2019, which informed the vegetation condition scores in the OMP (Table 1).



Plate 2. Plains Grassland covering the offset site (Ecology and Heritage Partners Pty Ltd 31/01/2023).



Plate 3. Plains Grassland within the offset site (Ecology and Heritage Partners Pty Ltd 31/01/2023).



Plate 4. Common Tussock Grass present in Plains Grassland (Ecology and Heritage Partners Pty Ltd 31/01/2023).



Plate 5. Common Blown-grass within the study area (Ecology and Heritage Partners Pty Ltd 31/01/2023).



Plate 6. Juvenile Prickfoot identified within the study area (Ecology and Heritage Partners Pty Ltd 31/01/2023).



Plate 7. Buttons identified within the study area (Ecology and Heritage Partners Pty Ltd 31/01/2023).



Plate 8. Slender Speedwell identified within the study area (Ecology and Heritage Partners Pty Ltd 31/01/2023)



Plate 9. Cut-leaf Goodenia present within the study area (Ecology and Heritage Partners Pty Ltd 31/01/2023).

Table 1. Quantification of the current Site Condition Score based on the management of the offset site during the 2022/23 monitoring period.

Vegetation Zone		Baseline Assessment (Biosis 2019)*	Jacobs Assessment (2023) #	Year 1 Monitoring
Bioregion		VVP	VVP	VVP
EVC		PG	PG	PG
EVC Number		165	165	48
EVC Conservation Status		Vu	Vu	Vu
Patch Condition	Large Old Trees /10	N/A	N/A	N/A
	Canopy Cover /5	N/A	N/A	N/A
	Under storey /25	15	15	15
	Lack of Weeds /15	6	6	6
	Recruitment /10	10	10	10
	Organic Matter /5	5	5	5
	Logs /5	N/A	N/A	N/A
	Treeless EVC Multiplier	1.36	1.36	1.36
	Subtotal =	49.09	48.96	48.96
	Landscape Scores	Patch Size /10	8	8
Neighbourhood / 10		2	2	2
Distance to Core Area /5		4	4	4
Landscape Value /25		14	14	14
Habitat Points /100		63.09	60.24	62.96
Habitat Score		0.63	0.60	0.63

Notes: PG = *Heavier Soils Plains Grasslands*; VVP = *Victorian Volcanic Plain*; N/A = not applicable; * As specified in the Offset Management Plan (Ecology and Heritage Partners Pty Ltd 2022); # The standardiser score for the Biosis 2019 baseline assessment was calculated using the '75/55' formula, whereas the Jacobs assessment uses the 'x1.36 score, leading to a slight difference in reported

totals; a score of 49.09 was reported in the baseline assessment whereas the use of the 'x1.36' standardiser would produce a score of 48.96 as per the Jacobs Report. Both methods are considered valid within the Vegetation Quality Assessment Manual (DSE 2004), and the difference is not considered impactful (Jacobs 2023). The total habitat score in the Jacobs (2023) assessment was calculated incorrectly, and the actual habitat score, including landscape scores, is 62.96. Despite these inconsistencies, the values from the Biosis (2019) baseline assessment, Jacobs (2023) assessment and Year 1 monitoring are considered equivalent.

3.1.2 Weeds

The overall cover of exotic vegetation has remained consistent since the Offset Management Plan was completed in 2022, with observed specimens including Flatweed *Hypochaeris radicata*, Rat's-tail Fescue *Vulpia myuros*, Wild Oat *Avena fatua*, Large Quaking-grass *Briza maxima*, Hair Grass *Aira spp.*, Lesser Quaking-grass *Briza minor*, Soft Brome *Bromus hordeaceus* subsp. *hordeaceus*, Toowoomba Canary-grass *Phalaris aquatica*, Onion grass *Romulea spp.*, Yorkshire Fog *Holcus lanatus* and Clustered Dock *Rumex conglomeratus* (Table 2). During the field assessment, the central portions of the study area often contained low amounts of exotic plant cover (i.e. <20%), while the boundaries of the study area contained consistently higher exotic plant cover (i.e. <75%), particularly on the eastern and southern borders of the offset site. In particular, the encroachment of Toowoomba Canary-grass and Flatweed was occurring along the eastern boundary of the offset are, from the adjacent property. Along the southern portion of the offset area, Large Quaking-grass and Lesser Quaking-grass were observed in relatively high abundance, which may have been facilitated by motor-vehicles along Hamilton highway and the unmanaged roadside adjacent to the study area. The overall percentage cover of weeds observed within the study area was approximately 31%. Despite the presence of environmental weeds within the study area, declared noxious weeds, as defined under the *Catchment and Land Protection Act 1994* (CaLP Act), and Weeds of National Significance (WoNS) were not observed during the site assessment.

Ongoing active management will be necessary to ensure the percentage cover of weeds and biomass meets the objectives of the OMP, and options such as conducting a planned burn at the site to reduce biomass and weed cover, followed by targeted weed control, should be investigated.

Table 2. Weeds and percentage cover identified within the OMP Assessment (EHP 2022), Jacobs Assessment (Jacobs 2023), Year 1 Monitoring and Year 10 Target Cover.

Scientific Name	Common Name	High Threat	OMP % Cover (EHP 2022)	% Cover (Jacobs 2023)	Year 1 Monitoring % Cover	Year 10 Target % Cover
Annual Weeds						
<i>Cerastium glomeratum s.l.</i>	Common Mouse-ear Chickweed	-	N/A	<1%	<1%	<1%
<i>Hypochaeris radicata</i>	Flatweed	Y	45%	10%	8%	<1%
<i>Aira spp.</i>	Hair Grass	-	5%*	2%*	<1%	<1%
<i>Briza maxima</i>	Large Quaking-grass	-	5%*	5%*	5%	<1%
<i>Briza minor</i>	Lesser Quaking-grass	-	5%*	5%*	5%	<1%
<i>Romulea rosea</i>	Onion Grass	-	N/A	10%	8%	<1%
<i>Bromus spp.</i>	Soft Brome	-	5%*	2%*	<1%	<1%

<i>Avena fatua</i>	Wild Oat	-	5%*	2%*	<1%	<1%
Perennial Weeds						
<i>Cirsium Vulgare</i>	Spear Thistle	Y	<5%	<1%	0%	<1%
<i>Holcus lanatus</i>	Yorkshire Fog	-	N/A	N/A	<1%	<1%
<i>Nassella neesiana</i>	Chilean Needle-grass	Y	<5%	0%	0%	<1%
<i>Phalaris aquatica</i>	Toowoomba Canary-grass	Y	30%	2%	2%	<1%
<i>Rumex conglomeratus</i>	Clustered Dock	-	N/A	N/A	<1%	<1%
<i>Vulpia myuros</i>	Squirell-tail Fescue	-	25%	0%	1%	<1%
		Total % Cover	<135%	<23%	<31%	N/A

Notes; *Annual weeds which have been averaged due to grouping in the original baseline assessment and Jacobs Audit report; N/A = not applicable, not observed during the assessment; Y = High threat weed.

3.1.3 Biomass monitoring

As outlined in the Offset Management Plan for the Cressy offset site (Ecology and Heritage Partners 2022), the objective of biomass control is to promote and maintain floristic diversity, and inter-tussock space for germination of native flora associated with NTGVVP community. Biomass monitoring was undertaken across 14x1m² plots within the study area, which were deployed in a grid-like formation. The purpose of biomass monitoring was to determine the percentage native vegetation cover, percentage weed cover and percentage of bare ground/rock cover. The aim of biomass monitoring is to maintain approximately 20% cover of bare ground or inter-tussock space to allow for sufficient space for recruitment of native herbs and grasses. Based on the results of this assessment, native vegetation cover was approximately 55%, whilst weed cover and bare-ground cover were 29.5% and 11.9%, respectively (Table 3). In comparison with the objectives outlined in the OMP, the year 1 biomass monitoring indicates that the cover of bare ground/rock is lower than objective cover of 20%. Based on the results, the percentage cover of bare ground/rock was considerably higher around plots which had a high cover of weeds, whilst plots which contained a high cover of native vegetation had limited cover of bare-ground/rock.

Table 3. Biomass Monitoring conducted at 14 one-metre² established points across the study area.

Plot Number	Percentage (%) Native Cover	Percentage (%) Weed Cover	Percentage (%) Bare Ground/Rock Cover
Year 1			
1	60%	30%	10%
2	85%	5%	10%
3	60%	15%	25%
4	90%	5%	5%

5	80%	15%	5%
6	35%	50%	15%
7	95%	3%	2%
8	20%	65%	15%
9	25%	70%	5%
10	70%	25%	5%
11	25%	30%	15%
12	35%	30%	35%
13	90%	5%	5%
14	20%	65%	15%
Total Average	56.4%	29.5%	11.9%

3.2 Golden Sun Moth Monitoring

The following sections summarise the previous and current Golden Sun Moth monitoring results for the offset site located at 6060 Hamilton Highway, Cressy, Victoria.

3.2.1 Previous Survey Results

Records of GSM observed during previous targeted survey season can be found across the entire offset site. The results of the population monitoring are provided below (Table 4).

Incidental records have identified 55 GSM observed on the 21st of November 2018 (Biosis 2019). SMEC undertook surveys on the 29th and 30th of November 2018 and 6th and 12th of December 2018, with a total of 2969 individuals recorded during the survey event (SMEC 2019).

Table 4. Previous Golden Sun Moth Population Monitoring within the Cressy offset site

Survey Year	Golden Sun Moth Abundance	Management Recommendations
2018	55	The species was detected in high numbers demonstrating that the species still resides in high population numbers within the offset site.
2018	2969	

3.2.2 Year 1 Survey results

Prior to undertaking Golden Sun Moth surveys within the study area, reference sites were checked to determine if the species was actively flying on the day (Table 5).

Table 5. Reference sites for the 2022/23 flight season.

Date	Survey times	Reference site*	Temperature (°C)	Wind (km/hr)	Cloud cover (%)	No. of days since rain	No. GSM recorded
------	--------------	-----------------	------------------	--------------	-----------------	------------------------	------------------

							within reference area
12/01/2023	10:00-3:00pm	Mount Mercer	24.0	5.5 SSW	5	10	32
13/01/2023	10:00-3:00pm	Beaufort	25	33 SE	35	11	47
17/01/2023	10:00-3:00pm	Mount Mercer	25.7	3.7 ESE	20	14	21
21/01/2023	10:00-3:00pm	Mount Mercer	20.5	7.4 SE	60	2	4

*reference site refers to known locations of GSM populations where individuals were recorded flying on the day of the relevant survey to allow confidence that the survey conditions were suitable.

Targeted surveys identified a total of one (1) Golden Sun Moths at the Cressy offset site (Table 6; Figure 2).

Golden Sun Moth were not detected in similar numbers relative to previous surveys undertaken in surrounding areas (Table 4; Table 5), demonstrating that unfavourable environmental conditions have influenced the flight season and abundance of adult GSM emergence.

Table 6. Golden Sun Moth survey results during the 2022/23 flight season.

Date	Offset site	Survey times	Temperature (°C) (start and end of survey)		Wind (km/hr)	Cloud cover (%)	No. of days since rain	No. GSM recorded within study area
12/01/2023	Cressy	11:32AM	20.6	28.8	5.5 SSW	0	>7	1
13/01/2023	Cressy	11:25AM	22.4	24.0	13 SSE	70	>7	0
17/01/2023	Cressy	10:11AM	27.6	33.5	14.8 NNW	0	3	0
21/01/2023	Cressy	12:00PM	21.5	22.5	9.3 SE	20	1	0

3.2.3 Stocking Rate

Based on the monitoring results for Year 1 surveys, the stocking rate of GSM for the 2022/2023 survey season was 0.0303 GSM/Hectare (Table 7).

Table 7. Golden Sun Moth Stocking Rate at the Cressy Offset Site.

Year	No. of GSM [^]	Stocking Rate*
1	1	0.0303

Note: ^ Four Surveys undertaken; * GSM per hectare

3.3 Rabbit Abundance Monitoring

The purpose of undertaking rabbit abundance monitoring within the offset site was to determine the presence and abundance of European Rabbits *Oryctolagus cuniculus* and European Hare *Lepus europaeus*. The CaLP Act lists European Rabbits and Hares as established pest animals and requires landowners to take steps to prevent the spread of, and where possible, eradicate pest animals on their land. As such, rabbit abundance monitoring was undertaken across the entire 33-hectare offset area and 100-metres surrounding the offset site. During the field assessment, no European Rabbits or European Hares were observed within the offset site or immediately adjacent to it. Additionally, no secondary observations of rabbit presence, such as grazing, scats or diggings were identified within the offset area. However, one European Hare was identified approximately 500-metres to the north-west of the study area. This suggests that whilst no direct evidence of rabbits and hares were identified within the offset area, there is a high likelihood that European Rabbits and Hares utilise the surrounding area for foraging and habitat.

3.4 Management Targets

The following section discusses the performance measures outlined within the OMP (Ecology and Heritage Partners Pty Ltd 2022), and the recorded cover of biomass and pest plant cover during the 2022/23 monitoring of the offset site. The following information aims 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 the 2022/23 assessments.

3.4.1 Weed Control

The objective of weed control within the offset site is to improve the existing quality of NTGVVP and Golden Sun Moth habitat by reducing/minimising future invasion by exotic flora. This will be achieved through a combination of controlled pulse grazing (to limit opportunities for weed establishment and seed set in exotic flora) and weed spraying, through on-ground management activities.

3.4.1.1 Performance Indicators

- Detailed log of weed cover included in each report submitted as a part of the annual reporting requirement for the OMP;
- Cover of high threat herbaceous weeds does not exceed 20% cover of the offset site (VQA weed score of 6/15 achieved for NTGVVP area and 6/15 for remaining GSM area);
- Cover of new and emerging high threat herbaceous weeds is <1% within the offset site;
- Cover of herbaceous weeds is reduced to maintain VQA weed score of 6/15 for NTGVVP area and 6/15 for remaining GSM area; and,
- No woody weeds present within offset site at end of 10 Year OMP.

3.4.2 *Biomass Control*

The objective of biomass control within the offset site is to promote and maintain floristic diversity, and inter-tussock spaces for germination and recruitment of native flora associated with the NTGVVP community and associated Golden Sun Moth habitat. In addition, these actions will improve habitat quality for existing flora present within the offset site, and assist with minimising the growth of weeds.

3.4.2.1 **Performance Indicators**

- Document observations from routine site inspections of biomass and present in the annual report;
- Achieve at least a 1-point increase in the *lack of weeds* (As per the Habitat Hectare Assessment methodology [DSE 2004]) score by the Year 5 Detailed Vegetation Monitoring for the 33-hectare NTGVVP offset area.
- Maintain a lack of weeds score of 6/15 by the end of the 10-year management period (i.e. <50% cover of weeds and ≤50% of weed species present are ‘high threat’ weeds based on the EVC benchmark) within the NTGVVP offset area and maintain the score at the offset commencement score of 6/15 by the end of the 10 year management period for GSM offset areas outside of the NTGVVP offset area;
- Maintain an understorey score of at least 15/25 (i.e. in accordance with the habitat hectare method) by the end of the 10 year management period (i.e. ≥50-90% of life forms present and of those present <50% are substantially modified);
- Stock grazing is excluded between October 1 to January 31, except where necessary for appropriate biomass reduction and the maintenance of inter-tussock space. Grazing should not occur between October 1 to January 31 in more than two consecutive years in the same areas;
- A fire frequency of no greater than once every 5 years will be implemented for any one area across the offset site;
- Maintain organic litter at approximately 10% cover to meet the EVC benchmark for Plains Grassland. This will be recorded during detailed vegetation monitoring to be undertaken in years 1,3, 5, 8 and 10 of this OMP; and
- All grazing and burning events effectively documented.

3.4.3 *Pest Animals*

The objective of pest animal management is to control pest animals (e.g. rabbits, foxes) within the offset site, as required, to minimise negative impacts to the Plains Grassland communities, which provides habitat for GSM and NTGVVP. The *Catchment and Land Protection Act 1994* lists rabbits and foxes as established pest animals and requires that all landowners take reasonable steps to prevent the spread of, and as far as possible eradicate, established pest animals on their land.

3.4.3.1 **Performance Indicators**

- Evidence of routine pest animal inspections presented in the annual report each year. Apply pest animal control methods in response to observations of the routine inspections;

- Reduction in the abundance of pest animals observed during routine pest animal inspections when compared to baseline rabbit abundance survey, and no detectable impacts to the native grassland community;
- All monitoring and management activities are effectively documented; and
- No active rabbit warrens present within the site at Year 10 of the OMP.

4 DISCUSSION

4.1 Vegetation Condition

Vegetation condition within the offset site has remained consistent over the past four years, since the original baseline assessment was conducted in 2019 (Biosis 2019). In Year 1 of management (2022/2023), the overall vegetation condition was 0.63/1 (Table 1), achieving the same condition score as the baseline assessment. Across the *understorey*, *lack of weeds*, *recruitment* and *organic matter* scores, there has been no deviation in the scores since the OMP was enacted in 2022. The highest cover of native vegetation was identified in the central, northern and north-western portions of the study area. Whereas, the southern and eastern portions of the offset area contained lower cover of native vegetation, largely due to weed encroachment.

The *understorey* component achieved a score of 15/25. The study area contained a high diversity of native herbs, well above the benchmark number of species, with six (6) large herbs (benchmark # of spp. 2), 22 medium herbs (benchmark # of spp. 12) and 14 small or prostrate herbs (benchmark # of spp. 4) being identified. There was also a high diversity of native grasses within the study area, with approximately 11 medium-tufted graminoids (benchmark # of spp. 13) identified within the study area; however, no large tufted graminoids or medium to tiny non-tufted graminoids were identified during the field assessment. Additionally, bryophytes/lichens were also scattered throughout the ground layer (approximately 10-15% cover), meeting the benchmark requirements, and soil crust was also present as indicated by the biomass monitoring (Table 3).

The *lack of weeds* component was consistent with previous years, achieving a score of 6/15, which is consistent with the baseline assessment conducted in 2019 (Biosis 2019) and the audit conducted by Jacobs in 2023 (Jacobs 2023). The percentage cover of weed was approximately 31% and the cover of high threat weeds was <50%. This is further discussed in Section 4.1.1.

The *recruitment* component achieved a score of 10/10, as the percentage recruitment area was approximately 20-25%, with high native herb diversity. The recruitment component considers both the cumulative cover of bare ground, bryophytes/lichens and soil crust. Whilst the biomass monitoring indicated a percentage cover of bare ground/rock of approximately 11.9%, when considering the percentage cover of bryophytes/lichens which was approximated at 10-15%, the cumulative cover of recruitment area is above 20%.

Lastly, the *organic litter* component achieved a score of 5/5, which is consistent with previous monitoring. The benchmark cover for organic litter is 10% and the organic litter was approximated at 8%, dominated by native organic litter.

Based on the requirements outlined in the OMP, the vegetation condition for Plains Grassland patches is consistent with the original baseline monitoring (Biosis 2019) and the Jacobs audit (Jacobs 2023). The study area contains a high diversity of both native grasses and herbs as indicated by the habitat hectare assessment (Table 1). As such, vegetation condition within the 33-hectare patch of Plains Grassland and NTGVVP is meeting the objectives of the OMP as there has been no reduction in vegetation quality. Increases in the habitat hectare score can be achieved by reducing overall weed cover within the study area, aiming to increase the *lack of weeds* score. Weed cover and management measures are outlined below (Section 4.1.1)

4.1.1 Weed Cover

Year 1 monitoring indicated the overall cover of weeds was approximated at 31%, which is generally consistent with the biomass monitoring that was conducted (Table 2; Table 3). As outlined in the OMP, the objectives of weed management is to achieve and maintain a VQA weed score of at least 6/15 (i.e. 25-50% cover and less than 50% high threat weeds). Within the 33-hectare NTGVVP offset area, the OMP indicated the cover of herbaceous weeds was approximately 45%, comprised mostly of Flatweed (Ecology and Heritage Partners 2022). Based on the results of Year 1 monitoring, the overall cover of herbaceous weeds within the study area has reduced by approximately 37% (i.e. 45% to 8%; Table 2). Despite the significant decrease in total cover of herbaceous weeds since the OMP was enacted, the total percentage cover of weeds has not reduced enough for it to receive a higher *lack of weeds* score. The OMP noted the presence of several high threat weeds, including Spear Thistle, Flatweed, Chilean Needle-grass, Squirrel-tail Fescue and Toowoomba Canary-grass. During the field assessment, the total cover of weeds has reduced considerable, including:

- Toowoomba Canary-grass was primarily located on the southern and eastern borders of the study area, adjacent to the neighbouring land and the roadside. A reduction in the total cover of Toowoomba Canary-grass to 2%, reduced from 30%.
- Chilean Needle-grass was not identified during the field assessment, with a cover of <1%, reduced from <5%; However, the species may be present within the soil seedbank and on-going weed management should aim to eradicate new incursions of the species;
- Spear Thistle was not identified during the field assessment, with a cover of <1%, reduced from <5%. The species may still be present within the study area and on-going weed management should aim to eradicate new incursions of the species;
- Squirrel-tail Fescue was scattered throughout the study area, with an estimated cover of 2%, reduced from 8%; and,
- Flatweed was present scattered throughout the study area, however the cover was highest in the eastern and southern portions of the study area, with an estimated cover of 8% across the study area, reduced from 45%.

Since the OMP was implemented in 2022 (Ecology and Heritage Partners 2022), there has been a considerable reduction in the total cover of environmental and noxious weeds. Due to the high cover of environmental weeds in the eastern and southern portions of the offset area, ongoing weed management measures should aim to target these areas. Ongoing intensive and integrated weed management is required to ensure these high threat weeds do not continue to increase in cover within the offset site. This should include a combination of herbicide application and pulse grazing as per the OMP. The idea of an autumn burn should also be investigated, which may assist in reducing the overall cover of weeds within the study area and support recruitment for native grasses and herbs. Weed management measures should aim to reduce the overall cover of weeds to <25% over the coming years, which would increase the *lack of weeds* score, improving the vegetation condition.

Specific weed management actions undertaken (i.e. physical removal, spraying, pulse grazing) will be provided by the landowner as part of their annual report.

4.1.2 *Biomass Control*

Biomass management is essential to enhance the ecological values throughout the offset site, including the maintenance and improvement of GSM habitat and NTGVVP. Biomass management is also required to maintain inter-tussock spaces and prevent excessive competition to grassland forbs. Biomass control will aim to maintain approximately 20% of bare ground or inter-tussock space to allow sufficient space for recruitment of herbs and grasses. Based on the results of Year 1 of Monitoring, the cumulative percentage of bare-ground/rock was approximately 11.9%, which is lower than the goal cover of 20% outlined in the OMP. This may be due to the unseasonably wet conditions over the past two years (2021/2022), which maintained consecutive La Niña years. Based on the biomass monitoring, the percentage cover of bare-ground was highest in areas which contained relatively higher percentage cover of weeds, whereas bare-ground was lower in areas which were dominated by native species (Table 3).

In order to improve biomass levels to the amount specified within the OMP, the landowner should explore a variety of options, including:

- Pulse Grazing – which should occur lightly throughout winter to prevent increases in weeds and biomass to uncontrollable levels. However, grazing should not occur between October 1 and January 31. Aim for total vegetation cover of no greater than 80% after grazing. Additionally, pulse grazing should not occur too frequently during periods of high rain, which might result in pugging, disturbing the soil;
- Ecological Burn – this is not a compulsory component of the OMP, however, it is considered that an appropriate ecological burning regime will appropriately control biomass and enhance and promote the maintenance of species diversity within the offset site; and,
- Weed spraying – this method should occur in conjunction with pulse grazing and ecological burns, and effort should be made to minimise weed incursions along the southern and eastern border of the offset area. This would reduce the cover of weeds, enabling recruitment of native grasses and herbs in these areas.

It is anticipated that, if weather conditions permit, an integrated approach with pulse grazing followed by weed spraying at the appropriate time would be beneficial to the site, and assist in meeting the biomass control target of 80% by the completion of the OMP. The potential impact of an ecological burn on Striped Legless Lizard *Delma impar*, which is known to occupy the site, must be considered during this investigation, and as such, planned burning should not occur during late winter/spring.

4.1.3 *Pest Plant and Animal Control*

Based on the field assessment, no rabbits were identified within the offset area at the time of the assessment and no indirect evidence, including rabbit warrens, scats, tracks and diggings, were identified. One European Hare was identified approximately 500-metres north-west of the offset area, suggesting that rabbits and hares occupy the surrounding area. Should any warrens be identified within the offset area at a later date, these should be treated by low impact measures such as fumigation or collapsing. Despite the pest animals not being identified during the field assessment, the landowner should conduct routine inspections to determine the presence of the species within the offset area. If rabbits or hares are identified within the offset area, measures such as poison baiting should be conducted, and the carcasses should be disposed of appropriately to prevent

poisoning of native predators. Any areas of refuge (i.e. African Box-thorn, but this species was not recorded during the Year 1 assessment), which may provide harbour for pest animals should be appropriately managed.

4.1.4 *Photo Points*

Eight (8) photo point locations were established using star pickets, marked with fluorescent green flagging tape (Appendix 2). Each of the photos were taken by fixing a camera on top of the star picket, facing south, with only a slight portion of the horizon present. These were deployed within the offset site on 31 October 2023 and the landowners will provide them in conjunction with future monitoring requirements as outlined within the endorsed OMP.

For the purposes of this assessment, photos from each of the photo points have also been provided in Appendix 1, which were taken at the time of the vegetation assessment.

4.2 **Golden Sun Moth**

Targeted surveys identified a total of one (1) Golden Sun Moth flying within the Cressy offset site over four days (12, 13, 17 and 21 of January 2023). Golden Sun Moth were not detected in similar numbers relative to previous surveys undertaken in surrounding areas, demonstrating that atypical weather conditions during the 2022/23 survey season may have compelled GSM to stay in the larval stage rather than emerge and develop into an adult, and await warmer drier conditions in the subsequent season (DEWHA 2009).

Continued biomass and weed control within the offset site will enhance existing GSM habitat by reducing and/or minimising future invasion by exotic flora. This will assist in supporting the open structured Plains Grassland community suitable for the ecological requirements of Golden Sun Moth. Should the 2023/24 survey period provide more favourable warm and dry survey conditions, we expect a more accurate representation of GSM abundance in the Year 2 monitoring season, particularly as these conditions relate to ground and soil dryness.

Nevertheless, given the extent of suitable habitat for Golden Sun Moth within and adjacent to the offset site, as well as the high numbers of individuals previously recorded, it is anticipated that provided environmental conditions are optimal in future years, the stocking rate will increase.

4.3 Management Actions Summary – 2022/23

A summary of the required management actions and completion dates for 2022/23 as outlined in the OMP are provided below in Table 6.

Table 6. Management Action Table for the offset site for the Year 2 (2022/23) monitoring period.

Year from Commencement	Area	Management Action Description	Resource	Timing of action	Key performance target/s for end of 10-year management plan	Year 1 Action Completed? (Yes/No)	Date	Additional Comments
Fencing								
Year 1 - 10	30 ha of GSM habitat; 33 ha of NTGVVP	Establish fence around the boundary of the offset site in accordance with advice from a qualified ecologist and land surveyor Refer Section 5.5.3.	Landowner	Ongoing	Exclude stock from the offset site during exclusion period to protect Golden Sun Moth habitat and NTGVVP	Yes	Details provided by James Taylor (Landholder)	See Appendix 3 for details
	30 ha of GSM habitat; 33 ha of NTGVVP	Maintain fencing in good condition to appropriately exclude unintended grazing by livestock over the 10 year management period. Refer Section 5.5.3		ongoing	Maintain fencing to DELWP fencing standards in BushBroker Information Sheet 12 - Standards for Management – Fencing (excluding the southern boundary along the stone wall where a simple stock-proof fence will be used)	Yes	Details provided by James Taylor (Landholder)	See Appendix 3 for details

Year from Commencement	Area	Management Action Description	Resource	Timing of action	Key performance target/s for end of 10-year management plan	Year 1 Action Completed? (Yes/No)	Date	Additional Comments
Woody Weed Control								
Year 1 - 10	30 ha of GSM habitat; 33 ha of NTGVVP	Control new and emerging woody weeds Refer Section 5.5.4	Landowner	Ongoing	Maintain woody weeds (<1% cover)	Yes	Details provided by James Taylor (Landholder)	See Appendix 3 for details
Herbaceous Weed Control								
Year 1 - 10	30 ha of GSM habitat; 33 ha of NTGVVP	Control herbaceous weeds. Refer to Table 7 for list of herbaceous weeds, their control method and timing of actions Refer Section 5.5.4	Landowner	Refer to Table 8 of the OMP.	Maintain high threat weeds to levels outlined with section 5.5.4. Minimise off-target damage (avoid all native plants)	Yes	Details provided by James Taylor (Landholder)	See Appendix 3 for details
	30 ha of GSM habitat; 33 ha of NTGVVP	Control all new & emerging herbaceous weeds Refer Section 5.5.4		Ongoing.	<2% cover of all new and emerging herbaceous weeds at the end of Year 10	Yes	Details provided by James Taylor (Landholder)	See Appendix 3 for details
Pest Animals								
Year 1 - 10	30 ha of GSM habitat; 33 ha of NTGVVP	Control rabbits and foxes. Refer to Error! Reference source not found. 5 for a	Landowner / Pest Animal Contractor	Refer to Table 9 of the OMP.	No surface disturbance within the offset site; No active rabbit warrens to be present;	Yes	Details provided by James Taylor (Landholder)	See Appendix 3 for details

Year from Commencement	Area	Management Action Description	Resource	Timing of action	Key performance target/s for end of 10-year management plan	Year 1 Action Completed? (Yes/No)	Date	Additional Comments
		list of control methods and timing of actions Refer Section 5.5.5			No active fox dens to be present; No rubbish/artificial harbour present; Minimal artificial piles of logs and rocks			
	30 ha of GSM habitat; 33 ha of NTGVVP	Monitor and control rabbits and foxes Refer Section 5.5.5		Ongoing	Reduction in the abundance of pest animals, and no detectable impacts to the native grassland	Yes	Details provided by James Taylor (Landholder)	See Appendix 3 for details
	30 ha of GSM habitat; 33 ha of NTGVVP	Monitor and control all new and emerging pest animals Refer Section 5.5.5		Ongoing	Control numbers of any new & emerging pest animals	Yes	Details provided by James Taylor (Landholder)	See Appendix 3 for details
Biomass Management								

Year from Commencement	Area	Management Action Description	Resource	Timing of action	Key performance target/s for end of 10-year management plan	Year 1 Action Completed? (Yes/No)	Date	Additional Comments
Year 1 -10	30 ha of GSM habitat; 33 ha of NTGVVP	Pulse grazing in dry years and light grazing in wet years. Refer Section 5.5.6	Landowner	The maximum length of continuous grazing is four weeks with at least two weeks rest between cycles. Stock generally excluded during October - January Stock removed immediately following any high rainfall events.	Stock must be removed should total vegetation cover fall to or below 70% Sufficient bare ground (approximately 20%) maintained in order to maintain space for recruitment of herbs and grasses. Maintain or improve species richness and improve species diversity. No loss of native plant diversity as a result of grazing regimes. Reduction in weed cover. All grazing events to be documented.	Yes	Details provided by James Taylor (Landholder)	Additional pulse grazing should occur throughout Years 2 and 3 and an ecological burn should be considered

Year from Commencement	Area	Management Action Description	Resource	Timing of action	Key performance target/s for end of 10-year management plan	Year 1 Action Completed? (Yes/No)	Date	Additional Comments
Year 1 -10	30 ha of GSM habitat; 33 ha of NTGVVP	Monitor organic litter and grass density and enact ecological burn or other biomass reduction plan if appropriate Refer Section 5.5.6 of the OMP	Landowner	Outside of the GSM active season and SLL breeding season. Do not burn an area more than once every 5 years.	Sufficient bare ground (approximately 20%) maintained in order to maintain space for recruitment of herbs and grasses. Maintain or improve species richness and improve species diversity. Flush out weed seed stored in seed bank. No loss of native plant diversity as a result of burning regimes. Reduction in weed cover. All burning events to be documented.	Yes	Details provided by James Taylor (Landholder)	Consider implementing ecological burn over ongoing years if biomass levels do not improve
Detailed Golden Sun Moth Population and Vegetation Monitoring								
Years 1, 3, 5, 8 and 10	30 ha of GSM habitat; 33 ha of NTGVVP	Monitoring Refer Section 8.2, 8.3 and 8.5 of the OMP Landowner responsible for arranging third party monitoring, while the Approval Holder	Suitably qualified ecologist (Ecology and Heritage Partners)	Spring/Summer	Assessment of the effectiveness of the management actions. Monitoring reports will include a review of past management works against the performance targets and objectives contained within this OMP, and recommended changes	Yes	See Sections 3 and 4 above.	N/A

Year from Commencement	Area	Management Action Description	Resource	Timing of action	Key performance target/s for end of 10-year management plan	Year 1 Action Completed? (Yes/No)	Date	Additional Comments
		is responsible for funding monitoring and reporting			to management actions where required. Landowner to submit Annual Reports including surveys to TFN and the Approval Holder. The Approval Holder is responsible for submitting all reporting to DAWE.			

4.4 Recommendations

Recommended measures to improve the condition and extent of native vegetation and associated Golden Sun Moth habitat within the offset site, include:

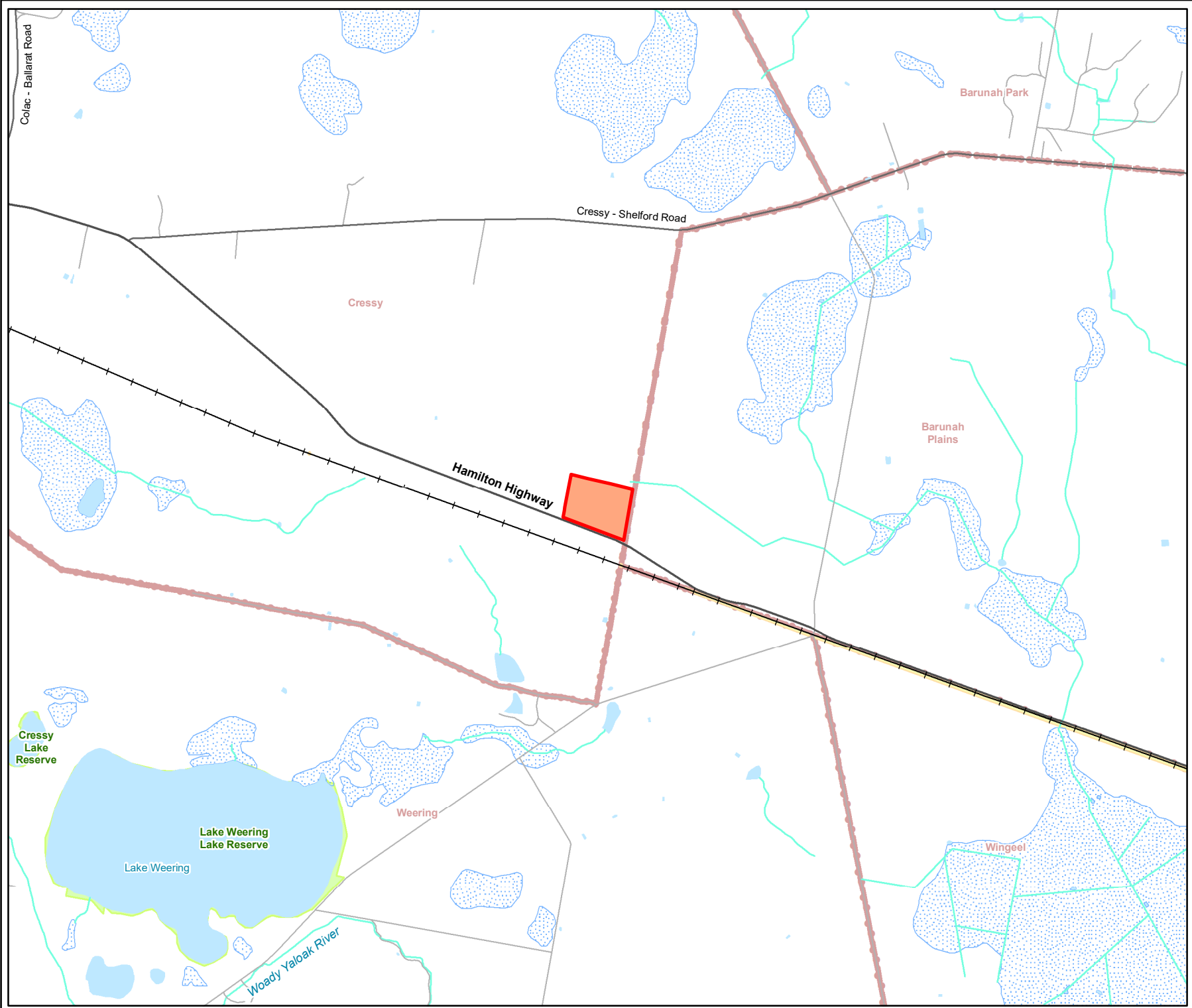
- Continue to implement pulse grazing during late summer, early autumn and winter (if dry) to reduce (and then maintain) the overall biomass cover to 80% across entire offset site;
- Pursue the possibility of conducting an autumn burn to help reduce the grassy weed cover on site and reduce the amount of weed seed present (that set and dropped due to conditions being unsuitable to spray prior to seed set). Care should be taken to ensure the native grasses have dropped their seed, as this may take place later than usual due to the wetter conditions this year. Burns should not occur more than once every 5 years;
- Strategic grazing in early Spring will assist to reduce the spread of annual weeds on site, as this is when annual weeds are most prominent; and,
- Additional active weed control by the landowner or a suitable contractor will be required to maintain and/or reduce the cover of high threat weed species below the threshold of <1%. Spot spraying of Flatweed, Rat's-tailed Fescue, Large Quaking-grass, Lesser Quaking-grass, Toowoomba Canary-grass, Yorkshire Fog and Onion grass should occur along the eastern and southern boundaries of the study area, and controlling newly emerging high threat weeds must be actively continued to meet the required target weed cover across the offset site.

Whilst it is understood that the OMP allows for the landholder to use an Adaptive Management Approach to allow the flexibility to respond appropriately and effectively to the uncertainties involved in ecological processes, it should be noted that *any proposed changes to the management (i.e. alterations to strategic grazing regime) contrary to that specified within the OMP must be approved by DCCEE, prior to implementation*. For instance, the OMP indicates that pulse grazing should not occur between 1st October and 31st January. Should pulse grazing be proposed to occur during this period, this action must be approved by DCCEE prior to implementation.

REFERENCES

- Biosis 2019. 6060 Hamilton Highway, Cressy: Native Grassland Offset Site – Vegetation Condition Assessment. Prepared for Warrambine Pastoral by Biosis Pty Ltd, Melbourne, in 2019.
- Clarke and O’Dwyer 2000. Genetic variability and population structure of the endangered Golden Sun Moth, *Synemon plana*. *Biological Conservation* 92, 371-381.
- DEECA 2023a. NatureKit Map [www Document]. URL: <https://maps2.biodiversity.vic.gov.au/Html5viewer/index.html?viewer=NatureKit>. Victorian Department of Energy, Environment and Climate Action, Melbourne, Victoria.
- DEECA 2023b. *Flora and Fauna Guarantee Act 1988* Threatened List – June 2023 [www Document]. URL: https://www.environment.vic.gov.au/data/assets/pdf_file/0021/655410/FFG-Threatened-List-June-2023.pdf. Victorian Department of Energy, Environment and Climate Action, Melbourne, Victoria.
- DELWP 2019a. *Flora and Fauna Guarantee Act 1988* Protected Flora List – November 2019 [www Document]. URL: https://www.environment.vic.gov.au/data/assets/pdf_file/0011/50420/20191114-FFG-protected-flora-list.pdf. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.
- DEWHA 2009. Significant impact guidelines for the critically endangered golden sun moth (*Synemon plana*). Background paper to EPBC Act policy statement 3.12. Canberra, Australia: Department of the Environment, Water, Heritage and the Arts.
- DSE 2004. Vegetation Quality Assessment Manual. Department of Sustainability and the Environment, Melbourne, Victoria.
- Ecology and Heritage Partners 2022. Offset Management Plan: 606 Hamilton Highway, Cressy, Victoria (EPBC 2018/8260) – Version 3. Prepared for CH2M Beca on behalf of Greater Western Water, May 2022.
- Endersby and Koehler 2006. Golden Sun Moth *Synemon plana*: discovery of new populations around Melbourne. *The Victorian Naturalist* 123, 362-365.
- Jacobs 2023. Ground-truthing of EPBC Act offset site information: 2018/8260 Cresst. Prepared by Jacobs on behalf of the Commonwealth Department of Climate Change, Energy, the Environment and Water, August 2023.
- SMEC 2019. 6060 Hamilton Highway, Cressy, Victoria – Golden Sun Moth Population Monitoring. Report prepared by SMEC for R D Griffiths Trading.

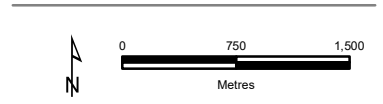
FIGURES



- Legend**
- Cressy Offset Site
 - Railway
 - Major Road
 - Collector Road
 - Minor Road
 - Minor Watercourse
 - Permanent Waterbody
 - Land Subject to Inundation
 - Parks and Reserves
 - Crown Land
 - Localities



Figure 1
Location of Cressy Offset Site
Offset Site Monitoring



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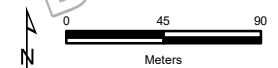
Legend

- Cressy Offset Site
- NTGVVP offset site (33 ha)
- Biomass monitoring plot
- Photo Point



Figure 2
Survey Results - Cressy
Offset Site
Offset Site Monitoring

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Legend

- Cressy Offset Site
- Golden Sun Moth (Survey date: 12/01/2023)

Weeds

- + Artichoke Thistle
- Briza minor
- Phalaris
- Yorkshire Fog

- Weed patch

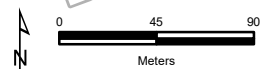
Golden Sun Moth Habitat Quality

- High Quality
- Moderate Quality
- Low Quality



Figure 3
Golden Sun Moth Habitat Quality - Cressy Offset Site
Offset Site Monitoring

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APPENDIX 1 FLORA

Appendix 1.1 Flora Results

Legend:

L Listed as Threatened under the FFG Act (DEECA 2023b)

I Listed as Protected under the FFG Act (DELWP 2019)

^ Naturally growing (i.e. non-planted) indigenous species to the study area

Table A1.1. Flora within the study area.

Scientific Name	Common Name	Notes
INDIGENOUS SPECIES		
<i>Acaena echinata</i>	Sheep's Burr	^
<i>Amphibromus</i> spp.	Swamp Wallaby-grass	^
<i>Asperula conferta</i>	Common Woodruff	^
<i>Austrostipa scabra</i>	Rough Spear-grass	^
<i>Austrostipa</i> spp.	Spear Grass	^
<i>Calocephalus citreus</i>	Lemon Beauty-heads	^
<i>Calotis anthemoides</i>	Cut-leaf Burr-daisy	I
<i>Chrysocephalum apiculatum</i> s.l.	Common Everlasting	^
<i>Convolvulus angustissimus</i> subsp. <i>omnigracilis</i>	Slender Bindweed	^
<i>Crassula decumbens</i> var. <i>decumbens</i>	Spreading Crassula	^
<i>Dichelachne crinita</i>	Long-hair Plume-grass	^
<i>Dichondra repens</i>	Kidney-weed	^
<i>Drosera aberrans</i>	Scented Sundew	^
<i>Eryngium ovinum</i>	Blue Devil	^
<i>Eryngium vesiculosum</i>	Prickfoot	^
<i>Euchiton</i> spp.	Cudweed	^
<i>Geranium</i> spp.	Crane's Bill	^
<i>Goodenia pinnatifida</i>	Cut-leaf Goodenia	^
<i>Halgania andromedifolia</i>	Smooth Halgania	^
<i>Haloragis heterophylla</i>	Varied Raspwort	^
<i>Juncus</i> spp.	Rush	^
<i>Juncus subsecundus</i>	Finger Rush	^
<i>Lachnagrostis filiformis</i> s.l.	Common Blown-grass	^

Scientific Name	Common Name	Notes
<i>Leptorhynchos</i> spp.	Buttons	^
<i>Lobelia pratioides</i>	Poison Lobelia	^
<i>Microseris scapigera</i> s.l.	Yam Daisy	L
<i>Oxalis exilis</i>	Shady Wood-sorrel	^
<i>Plantago gaudichaudii</i>	Narrow Plantain	^
<i>Plantago</i> spp.	Plantain	^
<i>Poa labillardierei</i>	Common Tussock-grass	^
<i>Rhytidosperma</i> spp.	Wallaby Grass	^
<i>Rhytidosperma coespitosum</i>	Common Wallaby Grass	^
<i>Rumex</i> spp.	Dock	^
<i>Solenogyne dominii</i>	Smooth Solenogyne	^
<i>Themeda triandra</i>	Kangaroo Grass	^
<i>Triptilodiscus pygmaeus</i>	Common Sunray	^
<i>Veronica gracilis</i>	Slender Speedwell	^
<i>Wahlenbergia multicaulis</i>	Branching Bluebell	^
NON-INDIGENOUS OR INTRODUCED SPECIES		
<i>Aira</i> spp.	Hair Grass	-
<i>Avena fatua</i>	Wild Oat	-
<i>Briza maxima</i>	Large Quaking-grass	-
<i>Briza minor</i>	Lesser Quaking-grass	-
<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome	-
<i>Cerastium glomeratum</i> s.l.	Common Mouse-ear Chickweed	-
<i>Holcus lanatus</i>	Yorkshire Fog	-
<i>Hypochaeris radicata</i>	Flatweed	-
<i>Romulea rosea</i>	Onion Grass	-
<i>Phalaris aquatica</i>	Toowoomba Canary-grass	-
<i>Rumex conglomeratus</i>	Clustered Dock	-
<i>Vulpia myuros</i>	Rat's-tail Fescue	-

APPENDIX 2 – PHOTOPOINTS CAPTURED BY ECOLOGY AND HERITAGE PARTNERS PTY LTD

Photo Point 1



Photo Point 2



Photo Point 3



Photo Point 4



Photo Point 5



Photo Point 6



Photo Point 7



Photo Point 8



APPENDIX 3 – LANDOWNER REPORT



Landowner of offset site	James Taylor
Location and address of offset site	Chathams Farm 6060 Hamilton Highway, Cressy
Offset Proponent	Western Water EPBC 2009/4856
Responsible Authority	DEWHA
Report number / Year Start Month	Year 2 / November 2022 to November 2023 November 2022
Type of Offset Size of Offset	Vegetation and Golden Sun Moth 33 HA
Signature	
Date	9/11/23

Information to be included:

- A copy of the Management Action Table from the OMP with information on which actions have been completed for the year/s of this reporting period;
- A description of the specific monitoring results from surveys undertaken for vegetation/flora species;
- A description of the specific monitoring results from surveys undertaken for significant fauna species, such as the Golden Sun Moth
- Fencing work;
- Success of weed and pest animal control work;
- Successful management tools (i.e. techniques used to control weed species, protection of new plants, monitoring technique, etc.);
- Any problems or issues experienced (i.e. new infestation of weed species, storm damage to fencing, etc.)
- Include any corrective actions and contingency measures where monitoring indicates that there has been a degradation in the native vegetation and Golden Sun Moth population and habitat; and,
- Provide any photographs showing evidence of works.

Table of Contents

General Offset Overview	3
Monitoring Results (Ecologist Report)	3
Rabbit Abundance Report	3
Vegetation Monitoring	3
GSM Monitoring	4
Successful Management Tools	6
Biomass Control / Grazing	6
Grazing Schedule	6
Pest Control	6
Weed Control	7
Corrective Actions and Contingency Measures	8
Fencing Work	8
Management Plan	9
Overview	9
Grazing	10
Observations	10
Reporting	10
Photos	11
Appendix 1 - Management Action Tables	11
Appendix 3 - Quarterly Reports	12
Summer 2022	12
Autumn 2023	14
Winter 2023	16
Spring 2023	19
Appendix 4 – Evidence of works completed	21
New fencing along rock wall	22
Appendix - Photo Points & Maps	24

General Offset Overview

We are generally very happy with the state of the Western Water (WW) Offset. An independent ecologist, while viewing the offset, commented that in his view, it was one of the best looking grassland mosaics in Western Victoria. This was in late January after grazing was completed, but the site has an excellent mixture of native plants.

Apart from this there are no other major issues. We are satisfied with the control of flatweed, and the general state of offset.

Monitoring Results (Ecologist Report)

Rabbit Abundance Report

EHP conducted baseline monitoring in November 2023 and found no rabbits and no sign of rabbits. A hare was noted 500m from the offset site. This matches our own experience as landowners. The soil is too hard for rabbits and there is no population on the offset. If we see any sign of rabbits in future we will note them. If possible we would like to request that we do not have to undertake Rabbit monitoring unless we find a sign of them.

Vegetation Monitoring

EHP undertook vegetation monitoring in Late October 2023. See following page for excerpt.

Excerpt - Biomass / Vegetation cover monitoring 2023

Table 3. Biomass Monitoring conducted at 14 one-metre² established points across the study area.

Plot Number	Percentage (%) Native Cover	Percentage (%) Weed Cover	Percentage (%) Bare Ground/Rock Cover
Year 1			
1	60%	30%	10%
2	85%	5%	10%
3	60%	15%	25%
4	90%	5%	5%

Vegetation Assessment, Golden Sun Moth Population and Habitat Monitoring and Rabbit Abundance Monitoring for Year 1 (2022/23): 6060 Hamilton Highway, Cressy, Victoria, Victoria 15

5	80%	15%	5%
6	35%	50%	15%
7	95%	3%	2%
8	20%	65%	15%
9	25%	70%	5%
10	70%	25%	5%
11	25%	30%	15%
12	35%	30%	35%
13	90%	5%	5%
14	20%	65%	15%
Total Average	56.4%	29.5%	11.9%

Landowner comments:

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This matches our own monitoring and photos through the year. We note that the weed cover would increase through winter and decrease in late Summer. We note that last year an independent botanist called the WW offset one of the best examples of native vegetation he had seen last year.

Weed analysis Excerpt (EHP) (3.1.2 Weeds)

The overall cover of exotic vegetation has remained consistent since the Offset Management Plan was completed in 2022, with observed specimens including Flatweed Hypochaeris radicata, Rat's-tail Fescue Vulpia myuros, Wild Oat Avena fatua, Large Quaking-grass Briza maxima, Hair Grass Aira spp., Lesser Quaking-grass Briza minor, Soft Brome Bromus hordeaceus subsp. hordeaceus, Toowoomba Canary-grass Phalaris aquatica, Onion grass Romulea spp., Yorkshire Fog Holcus lanatus and Clustered Dock Rumex conglomeratus (Table 2). During the field assessment, the central portions of the study area often contained low amounts of exotic plant cover (i.e. <20%), while the boundaries of the study area contained consistently higher exotic plant cover (i.e. <75%), particularly on the eastern and southern borders of the offset site. In particular, the encroachment of Toowoomba Canary-grass and Flatweed was occurring along the eastern boundary of the offset area, from the adjacent property. Along the southern portion of the offset area, Large Quaking-grass and Lesser Quaking-grass were observed in relatively high abundance, which may have been facilitated by motor-vehicles along Hamilton highway and the unmanaged roadside adjacent to the study area. The overall percentage cover of weeds observed within the study area was approximately 31%. Despite the presence of environmental weeds within the study area, declared noxious weeds, as defined under the Catchment and Land Protection Act 1994 (CaLP Act), and Weeds of National Significance (WoNS) were not observed during the site assessment. Ongoing active management will be necessary to ensure the percentage cover of weeds and biomass meets the objectives of the OMP, and options such as conducting a planned burn at the site to reduce biomass and weed cover, followed by targeted weed control, should be investigated.

GSM Monitoring

(Summary of the EHP Report conducted from the 12 to the 21 of January 2023 for Western Water)

The monitoring took place during January 2023 and followed approved guidelines, as much as possible. Surveys were conducted by experienced ecologists, and weather conditions were considered suitable for detecting GSM. The survey period was adjusted due to unusual weather conditions in the 2022/23 season.

Results showed that GSM numbers at the Cressy offset site were extremely low - in fact only 1 x Moth was sited over the survey days. likely due to unfavourable environmental conditions during the survey season, i.e. it being extremely wet and cool and the lack of warm days during this summer. EHP note they needed to do surveys on consecutive days as the advice at the time was the season was concluding. We (the Landowner) requested that EHP confirm this was satisfactory from a monitoring perspective and were advised that due to the lack of good days that matched the guidelines that it was necessary. This was our conclusion as well. that .

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In conclusion, the Year 1 monitoring results indicate a decline in GSM numbers at the Cressy Offset Site due to an extremely wet year with record rainfall. However, the EHP report suggests that, under more favourable conditions, Moths will be found and that the vegetation remains in a suitable state. This is our view also.

This table below shows the sites and dates EHP undertook monitoring and where moths were observed, as a comparison to the Western Water Site. This was included to show that the monitoring dates EHP chose were suitable.

Table 2. Reference sites for the 2022/23 flight season.

Date	Survey times	Reference site*	Temperature (°C)	Wind (km/hr)	Cloud cover (%)	No. of days since rain	No. GSM recorded within reference area
12/01/2023	10:00-3:00pm	Mount Mercer	24.0	5.5 SSW	5	10	32
13/01/2023	10:00-3:00pm	Beaufort	25	33 SE	35	11	47
17/01/2023	10:00-3:00pm	Mount Mercer	25.7	3.7 ESE	20	14	21
21/01/2023	10:00-3:00pm	Mount Mercer	20.5	7.4 SE	60	2	4

*reference site refers to known locations of GSM populations where individuals were recorded flying on the day of the relevant survey to allow confidence that the survey conditions were suitable.

EHP GSM Monitoring Results

Table 3. Golden Sun Moth survey results during the 2022/23 flight season.

Date	Offset site	Survey times	Temperature (°C) (start and end of survey)		Wind (km/hr)	Cloud cover (%)	No. of days since rain	No. GSM recorded within study area
12/01/2023	Cressy	11:32AM	20.6	28.8	5.5 SSW	0	>7	1
13/01/2023	Cressy	11:25AM	22.4	24.0	13 SSE	70	>7	0
17/01/2023	Cressy	10:11AM	27.6	33.5	14.8 NNW	0	3	0
21/01/2023	Cressy	12:00PM	21.5	22.5	9.3 SE	20	1	0

EHP Report Conclusion

“Should the 2023/24 survey period provide more favourable warm and dry survey conditions, we expect a more accurate representation of GSM abundance in the Year 2 monitoring season, particularly as these conditions relate to ground and soil dryness. Nevertheless, given the extent of suitable habitat for Golden Sun Moth within and adjacent to the offset site, as well as the high numbers of individuals previously recorded.

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Landowner Comments on GSM Survey

While the results were disappointing we do not feel there is any need for concern. The fact is this area was surveyed 4 years ago with a huge number of GSM. Apart from weed control we have not undertaken any other major changes so there's no reason to think that numbers have been impacted.

We look forward to seeing GSM survey outcomes over summer of 2023/24. .

Successful Management Tools

Biomass Control / Grazing

Native grasses, including wallaby grass, spear grass, and kangaroo grass, have thrived this year. We have also noted an increase in the number of lemon beauty heads and blue devil. There are several interesting patches of Spear Grass which are spreading.

We are very happy with the results achieved from grazing in relation to the control of flatweed. Timed grazing to remove the flowers in Winter and Spring running into a dry year has been very effective. Also we have grazed the site hard to ensure plenty of bare ground is available for the moth breeding season.

Very happy with the targeted winter spray on the stone wall southern boundary. The inspection in the Spring revealed an excellent reduction.

Grazing Schedule

Offset area	Sheep in	No.	Sheep Out
Chathams East	4 Jan 2022	820 Ewes	1 Feb 2022
	2-14 June 2022	680 Ewes	8 July- 6 Sept 2022
	21 Sept 2022	680 Ewes	17 Oct 2022
	6 Dec 2022	680 Ewes	10 Dec 2022
	20 Jan 2023	680 Ewes	9 Feb 2022
	20 March 2023	680 Ewes	27 April 2023
	31 Aug 2023	753 Wether lambs	18 Sept 2023

Pest Control

One fox was successfully shot while contractors were spotlighting the area in 2023. Similar to past years, there were few animals and no signs of rabbits at the site.

Date	Activity	Observation	Action Required/Completed
13 May 2023	shot	1 fox	was shot - neighboring

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			paddock
2 June 2023	Landowner monitoring	 <p>Rabbit Scratchings along the rock wall , with faeces sighted.</p>	Monitor
3 September 2023	spotlighting	none	n/a

While EHP’s survey found no rabbits we did find evidence above of one rabbit. This is an extremely low concern issue as mentioned previously.

Weed Control

Our Weed control works in the last 12 months have consisted of 3 x passes using a team of 3 people in Summer and 6 people in Spring. We have targeted key weeds we have identified in our quarterly reports

- Fog grass
- Phalaris
- Spear Thistle
- Small patches of cats ear

Other weeds we have identified on the site

- Onion weed
- Rye grass in small patches
- Brome

The list above is our weed log as required by the OMP. EHP have completed the first vegetation monitoring and have compiled a weed log prepared by a professional surveyor, this will represent our weed control log for this year.

As of mid-year 2022, our weed control efforts in the Western Water offset area have yielded significant improvements and positive outcomes.

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We have successfully managed a Chilean needle grass outbreak in a neighbouring paddock, achieving good results with a reduction from around 100 plants to 2 plants

Phil Hunter, the weed control contractor, conducted spot spraying for Phalaris and searched for Chilean or Texas needle grass on November 20th.

Weather events, such as La Niña and a flooding event in November 2022, led to a temporarily waterlogged offset, which we promptly addressed in our management strategy. We have also noted weed issues on the stone wall area and the Eastern boundary. We believe the season has led to an increase in Themeda, blue devil and lemon beauty heads. The wet start to the year also brought on a good population of herbs. The removal of sheep at the beginning of 2023 to allow wallaby grass and kangaroo grass to seed, while effectively controlling flatweed in 2022.

Weed control dates

Dates	People	Target Weeds
20 Nov 2023	Phil Hunter Contractor	Chilean and Texas Needle, Phalaris
24 / 25 Aug 2023	Phil Spark and 3 x Staff	Phalaris / Spear Thistle / Brown Top
14 / 15 / 16 Dec 2022	Phil Spark and 5 x Staff	Phalaris / Spear Thistle / Brown Top / Variegated / Rye Grass

Corrective Actions and Contingency Measures

There are no major issues or contingency measures at this point. The offset is in extremely good condition given the wet start. We will continue weed control and monitoring but nothing major to work on at the moment that is not in the OMP.

With the finding of Chilean Needle grass on the neighbouring site we will ramp up monitoring efforts and ensure a suitably qualified person walks the site. Identifying this type of weed is beyond our capacity as a landowner - it can look exactly like Spear Grass.

Fencing Work

The recent installation of fencing was completed in Winter 2023 with minimal soil disturbance. All fencing remains stock proof, effectively maintained stock. The trough is in the exclusion zone.



Management Plan

Overview

Weed Control in the Next 12 Months

The management plan will be as per the OMP. As there are no specific issues identified we will continue with the same calendar of activities as the last 12 months.

Over the next 12 months, weed control efforts in the western water offset area will consist of a comprehensive 3x pass approach. Tailored control measures will be implemented based on any issues identified in our monitoring

Regular reporting will be undertaken, documenting weed control activities, including weed counts where useful and control methods employed, contributing to the annual landowner report

We will continue our specifically targeted campaign against Needle grass as well using external contractors. The risks of this type of plant appearing on the site are huge. Our internal staff don't have the skills to identify these plants.

GSM

Continued Biomass and Weed Control: Within the offset site, the OMP requires ongoing biomass and weed control. The goal of this management action is to improve existing Golden Sun Moth (GSM) habitat.

Optimism for Future Surveys: Despite low GSM sightings in the 2022/23 survey season due to unfavourable weather, we are optimistic that numbers will be found again this year in a dryer season.

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Grazing

A crash grazing plan will be continued in accordance with the OMP, with the goal of achieving a much higher bare ground rate and, following the wet year, much better biomass reduction.

We will still graze the area if the winter is wetter, but at a much lower rate. We've discovered that not grazing an area at all is worse than pugging at a low level.

Observations

Please refer to quarterly reports below for notable observations and photos of different plant species.

We found a huge difference in the ability to manage the offset in a dryer year. A very wet year certainly favours exotic species.

Sheep were removed in early 2023 following a graze to control flatweed. Complete monitoring and reporting processes were implemented, which contributed to adaptive management for a healthy ecosystem.

Reporting

To effectively address the previously mentioned timing issue, we will work closely with the proponent to make necessary changes to our reporting deadlines. This change is necessary to ensure that we provide the most up-to-date and relevant information possible, aligning our reporting timelines with the organic cycles of our offset site's ecological systems and the practicalities of data collection. As previously stated, the current deadlines coincide with the VEG & GSM season as well as other critical activities.

Quarterly monitoring reports - over and above required in the OMP have been completed. We have a lot more photos than have been included in this report on file.

GSM monitoring was completed in Summer 2022/23 and the report will be submitted with the monitoring report.

We have included EHP's vegetation and rabbit monitoring report from Spring 2023 with this report. EHP have also undertaken photos at the 8 x photo points for this year and installed the photo points on the offset site.

Photos

Appendix 1 - Management Action Tables



8.5 Monitoring and Reporting Timeline

Table 14. Timeline of Monitoring and Reporting requirements throughout the 10 year Offset Management Period

OMP Year	Task	Responsibility	Relevant OMP Section
1	Annual Monitoring of Habitat and Effectiveness of Management Actions	Landowner	8.1
1	Detailed NTGVVP Monitoring 17.5 ha site	Undertaken by a qualified ecologist and funded by the Approval Holder	8.2
1	GSM Population Monitoring	Undertaken by a qualified ecologist and funded by the Approval Holder	8.3
1	Baseline Rabbit Abundance Survey	Undertaken by a qualified ecologist and funded by the Approval Holder	8.4.1
1	Ongoing Rabbit Monitoring	Undertaken by Landowner during site inspections and incorporated into annual reports	8.4.2
1	Annual Report- (Complete template provided)	Prepared and submitted by the Landowner annually to TfN and the Approval Holder	8.5.1
1	Detailed Assessment Reporting	Undertaken by a qualified ecologist and funded by the Approval Holder	8.5.2
2	Annual Monitoring of Habitat and Effectiveness of Management Actions	Landowner	8.1
2	Ongoing Rabbit Monitoring	Undertaken by Landowner during site inspections and incorporated into annual reports	8.4.2
2	Annual Report - See Template	Prepared and submitted by the Landowner annually to TfN and the Approval Holder	8.5.1
3	Annual Monitoring of Habitat and Effectiveness of Management Actions	Landowner	8.1
3	Detailed Vegetation Monitoring	Undertaken by a qualified ecologist and funded by the Approval Holder	8.2
3	GSM Population Monitoring	Undertaken by a qualified ecologist and funded by the Approval Holder	8.3
3	Ongoing Rabbit Monitoring	Undertaken by Landowner during site inspections and incorporated into annual reports	8.4.2

Appendix 3 - Quarterly Reports

Summer 2022

Summer 2022 Western Water Offset

Report #2022-Y1-Q4-Western Water

Review of Offsets

Offset Site: Western Water Offset Year: 2

Date of review: 9/01/2023

Name (Landowner Authorised Delegate): Jamie, Phil and Nicole

Fencing: Good/ Damaged?

- Good condition, stock proof

Weed coverage observations:

- Very good mixture of varieties. Excellent weed control
- Sheep have controlled flatweed extremely well



Dead flatweed from summer dry

Biomass observations:

- Lots of herbs and blue devil. Remove sheep in next 7 days to allow wallaby grass and kangaroo grass to seed
- Excellent grazing 60 % biomass

Pest sighted? No if yes state what _____

Sheep now on offset? Yes

Overall state of offset:

Has held up well after an incredibly wet year. Good biomass reduction, plenty of Blue devil. Looks exactly as it should in summer. Fencing not yet completed. Fencers booked for next 2 months.

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Summer 2022 Western Water Offset

Report #2022-Y1-Q4-Western Water



Any other notes/comments/difficulties experienced?

Side note - sheep moved off 28th Feb



Date last review was conducted: 07/06/2022

Signature: *Nicole Wilke*

Date: 26/04/23

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Autumn 2023

Autumn 2023 Western Water Offset

Report #2023-YR 2-Q1-Western Water

Autumn 2023 Western Water Offset GSM & VEG EPBC 2009/4856

James Taylor

Report #2023-YEAR 2-Q2-Western Water

Location: Chattams Farm 6060 Hamilton Highway, Cressy

Type of Offset: GSM & VEG

Date of Inspection: 09/02/23

Previous Inspection: 09/01/23

Name: (Landowner / Team Member): Jamie and Phil

Review

Observations	Information
Fencing	Stock Proof
Weed Coverage	Moderate
Biomass	70% Biomass
Pest Sightings	None
Overall State of Offset	Satisfactory
Grazing	Yes

Fencing

All fencing is stock proof

Weed Coverage

Effective grazing has reduced flatweed extremely well, Excellent grazing 60% biomass.

Biomass Observations

Excellent inter-tussock spaces and lots of bare ground, large mixture of different varieties of natives on display, abundance of blue devil. Wallaby and Kangaroo Grass has finished seeding

State of Offset

State of the offset remains satisfactory, success in effective grazing to reduce flatweed, with healthy biomass levels moving into winter, with healthy native grasses setting seed and excellent inter-tussock spaces available for native seed to grow. A dry summer yields positive results for flatweed, showing it slowly dying off due to less rainfall.

Successes & Challenges

- Success with grazing activities including dead flat weed from dry summer.
- Thymede numbers continue to increase

Management Actions

Weed Control: Target Phalaris south of stone wall in eastern lane

Grazing: Only Short Graze required for late autumn to allow wallaby and kangaroo grass to set seed

Pest control:

Further monitoring required for pest control

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Autumn 2023 Western Water Offset

Report #2023-YR 2-Q1-Western Water

Successes & Challenges

- Success with grazing activities including dead flat weed from dry summer.
- Thernada numbers continue to increase

Management Actions:

Weed Control: Target Phalaris south of stone wall in eastern lane.

Grazing: Only Short Graze required for late autumn to allow wallaby and kangaroo grass to set seed.

Pest control

Further monitoring required for pest control

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Winter 2023

Winter 2023 Western Water Offset

Report #2023-Y2-Q2-Western Water

Winter 2023 Review of Western Water Offset GSM & VEG 2018/8260

James Taylor

Report #2023-Year 2-Q2-Western Water

Location: 6060 Hamilton Highway, Cressy, "Chatham's Block".

Type of Offset: GSM & NTGVVP 33 ha. Date of Inspection: 19 July 2023 Previous Inspection: 9 February 2023

Name: (Landowner / Team Member): Jamie and Phil

Review

Observations	Information
Fencing	Stock Proof
Weed Coverage	Moderate
Overall Biomass	70%
Pest Sightings	1 Fox; Rabbit Scratchings and Faeces Sighted
Overall State of Offset	Fair - As is expected in Winter
Grazing	Yes

Fencing

- Stock Proof, refer photos [\[8\]](#) [\[11\]](#) [\[12\]](#)
- Recent fencing installation of the boundary was successful. A good job done with very little soil disturbance.

Weed Coverage

Weed coverage observations include

- Onion weed mixed in with herbs [\[5\]](#)
- Excellent results spot spraying phalaris, particularly the South East corner.
- Juvenile Flatweed Patches [\[2\]](#) [\[7\]](#)
- Patch of flatweed observed. [\[9\]](#)
- Very low numbers of thistle observed

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Winter 2023 Western Water Offset

Report #2023-Y2-Q2-Western Water

Pest Control

To control the number of invasive animals on the property, shooting was conducted in accordance with the OMP. In May and June, One fox shot was recorded as part of pest control efforts. Due to concerns surrounding safe shooting, baiting may happen as a result of alternative pest control near rocky areas. Given the lack of feed and the harshness of the soil, it is unlikely that rabbit populations will grow.

Date	Activity	Observation	Action Required/Completed
13 May 2023	shot	1 fox	was shot
2 June 2023	Landowner monitoring Rabbit Scratchings along the rock wall, with faeces sighted.		Monitor

Biomass Observations

Healthy biomass observed within the offset including:

- Mixture of grasses including, Wallaby, poa Kangaroo [\[10\]](#)
- Underlay of herbs [\[6\]](#)
- Blue devil [\[15\]](#)
- Estimated 40% bare ground in some areas [\[1\]](#) [\[3\]](#) [\[4\]](#)

State of Offset

The newly installed fencing is in excellent condition and requires no immediate maintenance. The weed coverage in the area is rated as moderate, with a presence of onion weed and emerging patches of juvenile flatweed mixing in with underlying herbs. Additionally, several low areas impacted by flatweed have been reported, affecting overall weed coverage.

Despite these weed challenges, the grassland demonstrates excellent biomass at 60% in some areas to 70% for the majority of the offset, about 30% to 40% bare ground in winter is ideal, allowing room for seedlings to grow in Spring. The grassland comprises a healthy blend of wallaby grass, poa, kangaroo, and Blue Devil plant.

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Winter 2023 Western Water Offset

Report #2023-Y2-Q2-Western Water

Notes

- Pest sightings include evidence of rabbit scratchings and faeces, indicating the presence of rabbits
- New infrastructure built includes the trough for grazing purposes situated in the exclusion zone.

Successes & Challenges

Successes

- Controlling Phalaris
- Healthy biomass with herb abundance and healthy natives

Challenges

- Flatweed, onion weed mixed in with healthy biomass (herbs) Please refer to the pictures [\[2\]\[5\]\[6\]\[7\]\[9\]](#) at the end of this document,
- Rabbit scratchings particularly along the rock wall [\[22\]](#)

Shooting on the site, especially down near the Highway is problematic due to Safety concerns. Rabbit monitoring will be undertaken, and parts of the offset will still be shot regularly. If in the event Rabbit numbers increase (which is extremely unlikely given the low amount of feed and soil hardness), we will seek other solutions such as baiting.

Management Actions

Feed Control: When conditions and resources allow Spring spot sprays and a short graze to management actions to combat challenges that remain such as with flatweed, and onion weed. [\[13\]](#) [\[14\]](#) [\[16\]](#)[\[17\]](#)[\[18\]](#)[\[20\]](#)[\[21\]](#)

Pest control: Observations of rabbit scratchings and faeces along the rock wall were noted in the winter report, pest control to be conducted on sight over spring 2023.

Annual Monitoring Activities Coming Up

- A baseline rabbit abundance survey will be conducted, providing valuable information on rabbit populations as well as potential pest control management actions for specific areas with activity sightings early November along with the annual Vegetation assessment and C&SM monitoring 2023.

Warrambeen Offset Management

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Spring 2023

Spring 2023 Western Water Offset

Report #2023-YR 2-Q3-Western Water

Spring 2023 Western Water Offset GSM & VEG EPBC 2009/4856

James Taylor

Report #2023-YEAR 2-Q4-Western Water

Location: Chattams Farm 6060 Hamilton Highway, Cressy "Chatham's Block"

Type of Offset: GSM & NTGVVP Date of Inspection: 29 September 2023 Previous Inspection: 19 July 2023

Name: (Landowner / Team Member): Jamie and Phil

Review

Observations	Information
Fencing	Stock Proof
Weed Coverage	Moderate
Biomass	70%
Pest Sightings	None
Overall State of Offset	Satisfactory
Grazing	Yes

Fencing

Stock proof Fencing, Gates upgraded.

Weed Coverage

Weed coverage observations include

- Reduction in phalaris, especially near stone wall where it was sprayed earlier in the year
- Breezer coming through, will require grazing within next 3 weeks to prevent seed set

Biomass Observations

- Excellent mosaic of native grasses, great patches of Themeda
- Abundance of herbs

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1

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Spring 2023 Western Water Offset

Report #2023-YR 2-Q3-Western Water

State of Offset

Status of the offset is excellent, some future management actions are required to manage rye grass and typical species such as Phalaris and breezer. Grazing has done a good job at Biomass control.

Notes

Gravelling the road at the main entrance (not on the offset) has been very effective for allowing access to the site. We will continue the gravel installation to allow all weather access over the next 12 months This is placing gravel on an existing track.

Successes & Challenges

- Grazing effectiveness.
- No major challenges noted for this year

Management Actions

Weed Control:

- Undertake 2 x weed control pass for Thistles, Phalaris, Fog and Brown top before seed set in early summer

Grazing:

- Planned graze within the next 14 days
- Slashing to be conducted in October for management of rye grass if possible - some issue with [contractor](#) and access to particular rocky areas, need to outsource other options for rye grass management.
- Maintain grazing success

/

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2

Appendix 4 – Evidence of works completed





New fencing along rock wall



Winter Spot Spray along rock wall



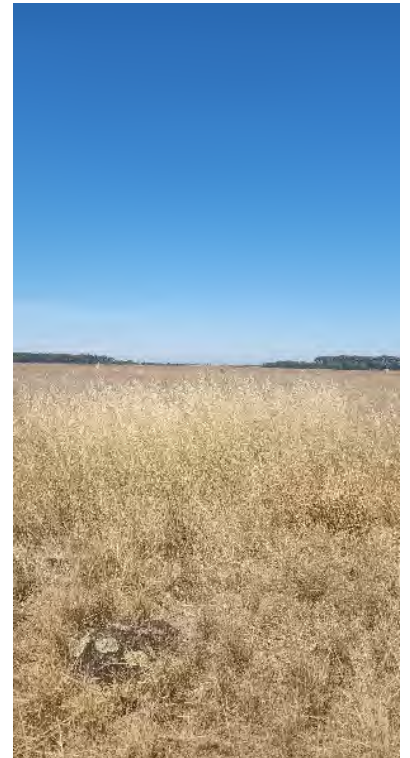
Winter Spot spray of dotted Phalaris



Dried out flatweed due to dry summer 2022



Unknown daisy, juvenile Blue Devil



Autumn observation of grasses



Winter Biomass 40% bareground



Grazed Autumn Offset



Abundance of Herbs



Autumn observation



Mix underlying herbs



Blue Devil

Appendix - Photo Points & Maps



Photo Point 1



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Photo Point 2



Photo Point 3



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Photo Point 4



Photo Point 5



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Photo Point 6



Photo Point 7



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Photo Point 8

