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**REVISION SCHEDULE**

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EXECUTIVE SUMMARY

MWH was engaged by the Adams Group to undertake a targeted Golden Sun Moth (GSM) survey of an 895ha rural property located at 2025 Merriang Road, Beveridge. The property has a history of heavy grazing and cropping and is currently zoned Green Wedge (GWZ). It is proposed that the land will be rezoned to allow for future residential development (ERM, 2008a).

The Subject site was assessed during the generally accepted optimal survey period for the GSM which is between late November to early January and generally during favourable conditions for male flight. Four site inspections for the species were undertaken. Two reference sites, both of which contained GSM populations were used to determine the timing of the survey at Beveridge.

No GSM were observed within the Beveridge study area during the four site inspections, despite the presence of suitable habitat (patches of Wallaby-grass) and despite the presence of GSM at the reference site on the days of the study area survey. This could be attributed to:

- The study area is outside the known distribution of the species as indicated by the Museum of Victoria (Endersby & Koehler, 2008) and there are no known recordings of the GSM within close proximity to the study area.

- The closest known location is approximately 12 km south of the subject site (near Summerhill Road). Rural activities and recent urbanisation may act as barriers to the species reaching the study area.

- Patches of Wallaby-grass containing potential suitable habitat within the study area are isolated with no linkages to aid in species dispersal.

- It is considered unlikely, but the species may be in larval form and did not emerge as adults during the 2008/2009 flight period, despite the presence of relatively large numbers of GSM at other sites during the assessment period.

In summary, it is considered unlikely that the site contains the critical or core habitat of GSM, however there is a low probability that the species is present in larval form and may not emerge as adults until subsequent flight periods.

It is recommended that opportunistic searches and incidental observations be made for the GSM during late spring 2009 to early summer 2010. Such opportunistic searches for the GSM can be undertaken at the same time as other planned targeted species searches during that period.
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## BEVERIDGE

### GOLDEN SUN MOTH TARGETED SURVEY

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## APPENDICES

A. **MAP**
1. INTRODUCTION

MWH were engaged to carry out a targeted survey for GSM’s for a rural property located at 2025 Merriang Road, Beveridge. The property is proposed for rezoning for potential future residential development. This report highlights the results of the targeted species survey and recommendations for further work to meet legislative requirements.

1.1 BACKGROUND

The study area is located approximately 42 kilometres from the Melbourne CBD east of the township of Beveridge. The property is bound by Hadfield Road to the north, Beveridge Road to the south, Epping-Kilmore Road to the east and a railway line to the west and is approximately 895 ha in size (ERM, 2008a). The property has a history of agricultural use and cattle presently graze the majority of the property. The property is currently zoned Green Wedge (GWZ) and it is proposed that the land will be rezoned to allow for future residential development (ERM, 2008a).

A broad ecological assessment of the property including site inspections were carried out during October – December 2007 (ERM, 2008a) and a project brief for the Beveridge Road Precinct Structure Plan was prepared for the Beveridge Pastoral Group (ERM, 2008b). ERM (2008) did not record any listed threatened flora and fauna. Previous surveys (Atlas of Victorian Wildlife and Flora Information System data) recorded listed species within the property and surrounding area and ERM concluded that the property potentially contains suitable habitat for listed flora and fauna species (ERM, 2008a). The report recommended among other things that targeted species surveys for a number of listed flora and fauna be carried out. Although the GSM (*Synemon plana*) has not been previously recorded within the study area, ERM stated that suitable habitat is potentially present within the study area, as such they considered that there was a moderate likelihood of a population being present (ERM, 2008a). As a result of these findings MWH have been engaged by the Adams Group to complete a GSM survey for the property.

1.2 OBJECTIVES

The objectives of the assessment are to:

- Review all previous reports to determine the most likely habitat to support the GSM and to ensure that the locations would satisfy the requirements of the Department of Sustainability and Environment (DSE).

- Undertake a GSM survey in late November to January. This will require at least four site visits on suitable days at weekly intervals during the main flight period. The location of any GSMs observed will be recorded.

- Complete a brief report detailing the results of the assessment, including:
  - The location of GSM searches and the rationale behind the site selection;
  - The results of the searches and discussions of any populations which are observed; and
  - Recommendations detailing mitigation/minimisation measures that may reduce the potential ecological impacts on the species or habitat for the species.
2. METHODOLOGY

The GSM assessment was completed via two primary methods; literature reviews and field survey.

2.1 LITERATURE AND DATA SET REVIEW

Research reports completed on the species were reviewed as were previous reports completed for the study area. They include:


2.2 FIELD SURVEY ACTIVITIES

The Subject site was assessed during the generally accepted optimal survey period for the GSM which is between late November to early January and generally during suitable conditions for male flight (Gilmore et al 2008). Four site inspections for the species were undertaken during the survey period by two ecologists during 2008/2009: Wednesday 26th November, Thursday 4th December, Wednesday 7th January and Wednesday 14th January and totalled approximately 13.5 hours of site work. Two reference sites were used to determine the timing of the survey at Beveridge. These were Coopers Street Grasslands, Epping and a rural property located at Mount Ridley Road, Mount Ridley, both of which contain known GSM populations. Inspections of the reference sites were undertaken in mid October and mid November. Four inspections of the Beveridge study area were undertaken to account for any seasonal variation in the emergence time of the species when compared to the reference sites.

Due to the large size of the property (895 hectares), the study area was assessed by both car and by foot to determine the presence/absence of the species. The ecological features reports (ERM,2008a) was also used as a guide to determine potentially suitable habitat. Areas generally accepted as suitable to support GSM populations (areas of Wallaby Grass (Austrodanthonia sp.)) or at least containing a small proportion of Wallaby-grass were surveyed by foot.

Zones of Wallaby-grass which were more substantial and likely to contain the most suitable habitat for the species were mapped for future reference, as areas where GSM habitat is present.
2.2.1 LIMITATIONS OF THE FIELD SURVEY

The survey was undertaken during the generally accepted optimal survey period for the species (late November to mid January). Up until recent years little has been known about the species, its distribution and habitat requirements and information on the species is still emerging and surveys to increase knowledge being undertaken. Our knowledge of the species, review of previous GSM research reports, reviews of the previous reports undertaken for the study area, as well as four site inspections to account for seasonal variation were undertaken to ensure that our chances of observing the species were maximised. However, the size of the property (895 hectares) made it difficult to ensure that all areas were comprehensively surveyed. As a result, the majority of the inspections undertaken on foot targeted areas containing Wallaby-grass (approximately >25% projected foliage cover) and at least 20m² in area. Such sites were considered to have greater chances of encountering GSM. Restrictions in accessing the study area made it occasionally difficult to survey the site during weather conditions which were most favourable for the species and to survey the entire site in one day. As a result sections of the study area were assessed on different days, with areas considered most likely to contain GSMs revisited during subsequent visits.

3. RESULTS

Section 3 highlights firstly knowledge of the species, its current known distribution and habitat requirements and the results of the site inspections.

3.1 GOLDEN SUN MOTH ECOLOGY

The GSM is listed as Critically Endangered under the EPBC Act (1999). The species is known to inhabit open temperate grasslands and open grassy woodlands dominated by species of Wallaby-grass, which forms a major food component for the species at the larval stage (DEWHA 2009a). It has previously been suggested that to adequately support a population of the species, greater than 40% coverage of Wallaby-grass is required (O’Dwyer and Attwill, 1999). However, more recent research has established that the species has a much broader habitat tolerance than first believed.

Recent research undertaken by Gilmore, Koehler, O’Dwyer and Moore (2008) recorded the GSM on sites which were heavily infested with Chilean Needle Grass and other exotic grass and females were observed during their research laying eggs on Chilean Needle Grass. It has been suggested that GSM may not be restricted to using Wallaby-grass as a larval food source and that in the absence of this primary food source GSM larval will feed on sub optimal habitat containing exotic grasses, such as Chilean Needle Grass.

Research undertaken by Ecology Australia (2008) also supports this hypothesis and recorded the species in areas characterised by as little as 5% cover of Wallaby-grass, and in areas of high weed cover. A recent report by Ecology Australia (2008) summarised the core habitat of GSMs as having the following combined attributes:

- Natural rock surfaces;
- Biomass reduction;
- Moderate to high cover of indigenous grass (primarily Wallaby-grass);
- Bare ground;
- Undulating micro topography and/or north facing gentle slopes.
The generally accepted flight period for Melbourne populations extends from late November through to January (Endersby & Koehler, 2006), however males may become active from mid October (Ecology Australia, 2008). The most favourable conditions for male flight is on bright sunny days which have a temperature greater than 20°C, no rain, wind reduced to no more then a light breeze and preferably during the hours of 10am to 2pm (Gilmore, Koehler, O’Dwyer and Moore, 2008).

Females are poor fliers and it is believed that females lay their eggs between tussocks. It is assumed that larva feed on the plant tissue at first and then the underground parts of the grass for up to two to three years before pupating and emerging as moths (Gilmore, Koehler, O’Dwyer and Moore, 2008). Adult moths lack mouth parts and live for only a few days (Gilmore, Koehler, O’Dwyer and Moore, 2008).

In recent years, research on the GSM has determined that the distribution of species is wider than first thought. In 2003 populations were recorded at the Craigieburn and Coopers Street Grasslands (Endersby & Koehler, 2006) which is roughly 15.5 km and 20 km from the Beveridge study area respectively. The known distribution of the GSM also extends to just north of Summerhill Road, Craigieburn which is roughly 12 kilometres from the Beveridge study area.

3.2 SITE INVESTIGATION RESULTS

The study area has a long history of cattle grazing and cropping (ERM, 2008a) and as a result the vegetation is considered to be highly modified from its original state. Cattle grazing is still occurring throughout much of the site. Overall, much of the study area is dominated by introduced grasses such as Chilean Needle Grass, Wild Oats (Avena fatua) and Perennial Rye Grass (Lolium perenne). Areas of native grass occur throughout the study area and numerous rocky knolls were also noted containing native grasses and herbs. Native grass was also observed towards Merri Creek which passes through the property and along slopes and ridges of hills. Native grass was dominated by species of Wallaby-grass, Weeping Grass (Microlaena stipoides) and Spear-grass (Austrostipa sp.). Common Wheat-grass (Elymus scabrus), Kangaroo Grass (Themeda triandra) and Tussock Grass (Poa sp) were also observed. One paddock appears to have been rested from grazing for a period of time, and as a result, a larger proportion of native grass is reoccurring within the paddock particularly along the hilly slopes.

GSMs were observed during an inspection of the reference site located along Mount Ridley Road, Mount Ridley on the 25th November. However, no GSMs were observed within the Beveridge study area, during similar weather conditions on the 26th November. Despite the presence of patches of Wallaby-grass within the study area which could contain suitable habitat for the species, further site inspections of the study area also failed to detect any GSMs. This may be attributed to the fact that the Beveridge study area is outside the known distributional range of the species for the Melbourne area as indicated by the Museum of Victoria (Endersby & Koehler, 2008) which extends to just north of Summerhill Road, Craigieburn, approximately 12 kilometres south of the Beveridge study area. Residential housing and rural properties are situated between the study area and the known distribution of the species and may have created a barrier and damaged any potential habitat links.

Despite the presence of potentially suitable patches of Wallaby-grass, these patches are relatively isolated and surrounded by exotic grasses. Cattle grazing and cropping is likely to have impacted on the sites suitability to sustain GSM habitat, however research by Gilmore et al. (2008) determined that many of the sites containing the species had been subjected to Biomass reduction including grazing activities. Research undertaken by Endersby & Koehler (2006) has observed males in flight over paddocks as far as 400 metres from the nearest location of suitable Wallaby-grass breeding habitat, however, in general many of the patches of Wallaby-grass within the property were over 400 metres apart, with very little Wallaby-grass located between these larger patches, which could have aided in dispersal. A map detailing larger areas of Wallaby-grass which were considered to contain the most suitable habitat for the species occurs in Appendix A.
It is also possible that eggs and larvae are located within suitable patches of Wallaby-grass (since they can remain underground as larvae for up to three years (Endersby & Koehler, 2008)) and may not emerge as adults until the 2009/2010 flight season. However, given that the moth was located elsewhere this is considered unlikely.

4. CONCLUSIONS

Despite the presence of exposed rocky areas dominated by Wallaby-grass, the presence of potential habitat for the GSM and the presence of the species at the reference site, the four site inspections failed to record any individuals.

This could be attributed to:

- The study area is outside the known distribution of the species as indicated by the Museum of Victoria (Endersby & Koehler, 2008) and there are no known recordings of the GSM within close proximity to the study area.

- The closest known location is approximately 12 km south of the subject site (near Summerhill Road). Rural activities and recent urbanisation may act as barriers to the species reaching the study area.

- Patches of Wallaby-grass containing potential suitable habitat within the study area are isolated with no linkages to aid in species dispersal.

- Species may be located within the study area but may still be in larval form and did not emerge as adults during the 2008/2009 flight period, despite the presence of relatively large numbers of GSM at other sites during the assessment period.

In summary, it is considered unlikely that the site contains the critical or core habitat of GSM, however there is a low probability that the species is present in larval form and may not emerge as adults until the 2009/2010 flight period.

5. RECOMMENDATIONS

It is recommended that opportunistic searches and any incidental observations of the GSM during late spring 2009 to early summer 2010 be recorded. Such opportunistic searches for the GSM can be undertaken at the same time as other planned targeted species searches during spring of 2009.
6. REFERENCES


APPENDIX A

MAP