

Aurora Reserves:
Golden Sun Moth monitoring 2016-17
season

FINAL REPORT

Prepared for Lendlease Communities

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Contents

1. Introduction	3
2. Methods	5
2.1 Determining flight season commencement.....	5
2.2 Transect counts.....	5
2.3 Permits.....	6
2.4 Mapping.....	6
3. Results	8
4. Discussion and conclusions.....	14

Tables

Table 1 Weather conditions during Golden Sun Moth Surveys throughout Aurora reserves during the 2016-17 flight season.....	7
Table 2 Golden Sun Moth monitoring counts for the 2016- 17 flight season	8
Table 3 Historical Golden Sun Moth monitoring data for Aurora Reserves.....	10

Figures

Figure 1 Location of the study area, Victoria.....	4
Figure 2 Aurora reserves Golden Sun Moth results during 2016-17 flight season	9
Figure 3 Annual abundance monitoring of Golden Sun Moth populations at Aurora reserves	13

1. Introduction

Biosis Pty Ltd was commissioned by Lendlease Communities to undertake annual monitoring of Golden Sun Moth *Synemon plana* within the Aurora residential development area at Epping North, Victoria (Figure 1).

Fourteen conservation reserves were established within the Aurora residential development in 2007 (Figure 2). The reserves contain areas of fauna habitat and patches of native vegetation that are being managed for protection of biodiversity values, including threatened flora and fauna species, and as offset sites to meet the project's net gain targets.

All reserves were initially surveyed to determine the distribution of Golden Sun Moth within the Aurora estate and to inform management of the reserves. Monitoring commenced in the 2007–08 flight season and is to continue for 10 years (until 2018) as a condition of approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for Aurora (EPBC 2007/3524). In 2015, thirteen of the reserves within the Aurora residential development were sold to Lendlease Communities; hence the requirement to continue monitoring of these reserves was transferred from Places Victoria to Lend Lease Communities.

Based on the results of previous monitoring commissioned by Places Victoria, reserves 1, 2, 3, 4, 5, 8, 10 and 11 have been excluded from monitoring as they do not contain suitable habitat, or Golden Sun Moth has not been recorded within the reserve over consecutive years. The five remaining reserves (6, 7, 9, 12 and 13) contain key populations of Golden Sun Moth within the Aurora development area.

This report presents the monitoring results for the 2016–17 flight season. This is the ninth year of annual monitoring and builds on annual monitoring undertaken since the 2007–08 season.

2. Methods

2.1 Determining flight season commencement

The commencement of the flight season varies according to location and weather conditions, therefore commencement of the flight season needs to be confirmed within reference populations before surveys can commence. Reconnaissance surveys were conducted at reserve 12 (the largest known population at Aurora) and in the south of Aurora, adjacent to O'Herns Road, as part of widespread reference site checks to determine flight season commencement. Golden Sun Moths were first observed flying at Aurora on 7 December 2016.

2.2 Transect counts

During the 2016- 17 flight season walking transect counts were used to detect Golden Sun Moth presence and population distribution within the reserves. This method has been employed since the 2014-15 flight season. Point count methods, employed for the initial 6 years of survey, were abandoned after statistical analysis determined this method to be less reliable than walking transect counts.

Monitoring surveys were undertaken on 19 December 2016 and 23 December 2016 when conditions were suitable for male flight (above 20°C, minimal cloud cover and wind). Survey commenced at 11:00am and concluded around 2pm. The surveys were spaced at least one week apart to capture variation in emergence patterns. See

Table 1 for weather conditions at the beginning and end of each completed survey.

Survey consisted of suitably qualified zoologists walking a series of transects approximately 50 m apart through reserves 6, 7, 9, 12, and 13. Tracks were recorded using a Garmin GPS and a waypoint was taken for each location where Golden Sun Moths were observed.

Each reserve was surveyed twice during the flight season. This level of survey effort was considered sufficient to achieve the objective of confirming continued presence of Golden Sun Moth within the reserves and obtaining an estimated population size.

2.3 Permits

Biosis undertook the Golden Sun Moth surveys under a Research Permit/Management Authorisation and Permit to Take Protected Flora & Protected Fish issued by the Department of Sustainability and Environment under the *Wildlife Act 1975*, *Flora and Fauna Guarantee Act 1988* and *National Parks Act 1975* (Permit number 10007569, expiry date 30 April 2018).

2.4 Mapping

Mapping was conducted using hand-held (uncorrected) GPS units (GPSMap 64) and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally ± 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Table 1 Weather conditions during Golden Sun Moth Surveys throughout Aurora reserves during the 2016-17 flight season

Date	19/12/2016	23/12/2016
Start time	11:15	12:30
End	15:00	15:00
Golden Sun Moth recorded	Y	Y
Site temperature (°C) (start/end)	24/28.7	27/33.4
Cloud cover (%)	20/30	5/5
Wind direction	NE/N	N/N
Average wind speed (km/hr)	17/43	11/9
Ground conditions	dry/dry	dry/dry
Humidity (%)	35/16	47/26
Reference site where moths were recorded on day of survey	Epping / O'Herns Rd Reference Site	Epping / O'Herns Rd Reference Site

3. Results

Golden Sun Moth were observed at reserves 6, 9, 12 and 13 this season. Similar to previous seasons, Golden Sun Moth were not observed at reserve 7. The overall number of Golden Sun Moth recorded at reserve 6, 9 and 13 were similar to previously recorded numbers. The total number of Golden Sun Moth recorded for reserve 12 was the largest it's been since 2013-14 flight season (Table 2).

Numbers of moths observed during the 2016-17 surveys are shown in Table 2 and spatial distribution is displayed in Figure 1. A comparison of the number of moths observed over the years of annual monitoring is provided in Table 3. Historical Golden Sun Moth monitoring data for Aurora Reserves and Figure 3. The number of Golden Sun Moth observed within Aurora decreased this season compared with the results from the previous seasons but was comparable to numbers seen during the 2012-13 season.

Table 2 Golden Sun Moth monitoring counts for the 2016- 17 flight season

Reserve Number	GSM Count 19 December 2016	GSM Count 23 December 2016
6	-	7
7	-	-
9	6	-
12	60	333
13	-	8
Total	66	348

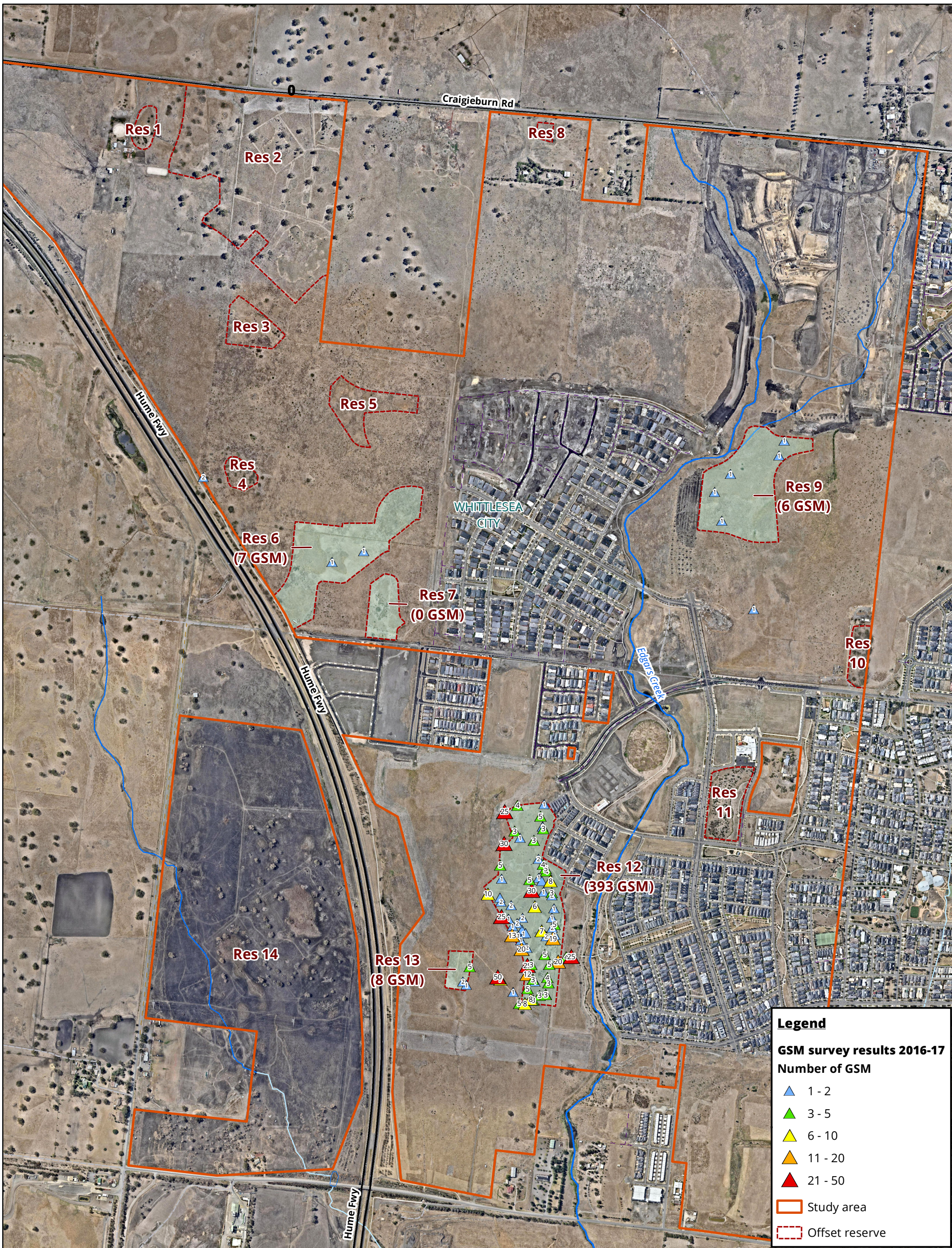


Figure 2: Aurora Golden Sun Moth survey results for the 2016–2017 flight season

Acknowledgements: Imagery: NearMap

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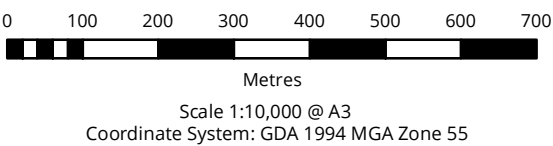


Table 3 Historical Golden Sun Moth monitoring data for Aurora Reserves

Reserve	Monitoring point	Number of GSM 2009-10	Number of GSM 2010-11	Number of GSM 2011-12	Number of GSM 2012-13	Number of GSM 2013-14	Number of GSM 2014-15	Number of GSM 2015-16	Number of GSM 2016-17
1	1.1	-	0	0	Survey discontinued after two years of absence				
	Incidental observations	-	0	0					
	Total	-	0	0					
2	2.1	-	0	0	Survey discontinued after two years of absence				
	2.2	-	0	0					
	2.3	-	0	0					
	2.4	-	0	0					
	Incidental observations	-	0	0					
	Total	-	0	0					
3	3.1	-	0	0	Survey discontinued after two years of absence				
	3.2	-	0	0					
	Incidental observations	-	0	0					
	Total	-	0	0					
4	4.1	0	-	0	0	0	Survey discontinued after two years of absence		
	Incidental observations	1	1	0	0	0			
	Total	1	1	0	0	0			
5	5.1	-	0	0	Survey discontinued after two years of absence				
	5.2	-	0	0					
	Incidental observations	-	-	0					
	Total	-	0	0					

Reserve	Monitoring point	Number of GSM 2009-10	Number of GSM 2010-11	Number of GSM 2011-12	Number of GSM 2012-13	Number of GSM 2013-14	Number of GSM 2014-15	Number of GSM 2015-16	Number of GSM 2016-17
6	6.1	0	2	0	0	0	Point count method no longer used		
	6.2	0	0	0	0	0			
	6.3	0	0	0	0	0			
	Incidental observations	0	19	2	0	9	1	1	7
	Total	0	21	2	0	9	1	1	7
7	7.1	0	0	0	1	0	Point count method no longer used		
	7.2	0	0	0	0	0			
	Incidental observations	0	3	0	5	0	1	0	0
	Total	0	3	0	6	0	1	0	0
8	8.1	-	-	0	-	-	Survey discontinued after two years of absence		
	Incidental observations	-	-	0	-	-			
	Total	-	-	0	-	-			
9	9.1	0	2	0	0	1	Point count method no longer used		
	9.2	0	3	0	1	0			
	9.3	0	4	0	0	1			
	Incidental observations	2	2	3	10	10	26	3	6
	Total	2	11	3	11	12	26	3	6
10	10.1	0	0	Survey discontinued after two years of absence					
	Incidental observations	0	0						
	Total	0	0						
11	11.1	0	0	Survey discontinued after two years of absence					
	Incidental observations	0	0						
	Total	0	0						

Reserve	Monitoring point	Number of GSM 2009-10	Number of GSM 2010-11	Number of GSM 2011-12	Number of GSM 2012-13	Number of GSM 2013-14	Number of GSM 2014-15	Number of GSM 2015-16	Number of GSM 2016-17
12	12.1	8	41	0	0	4	Point count method no longer used		
	12.2	50	60	0	0	3			
	12.3	5	38	0	1	2			
	Incidental observations	161	394	101	85	427	116	8	393
	Total	224	533	101	86	436	116	8	393
13	13.1	8	20	1	0	57	Point count method no longer used		
	Incidental observations	57	42	18	23	84	0	0	8
	Total	65	62	22	49	141	0	0	8
GRAND TOTAL		292	631	128	152	598	144	12	414

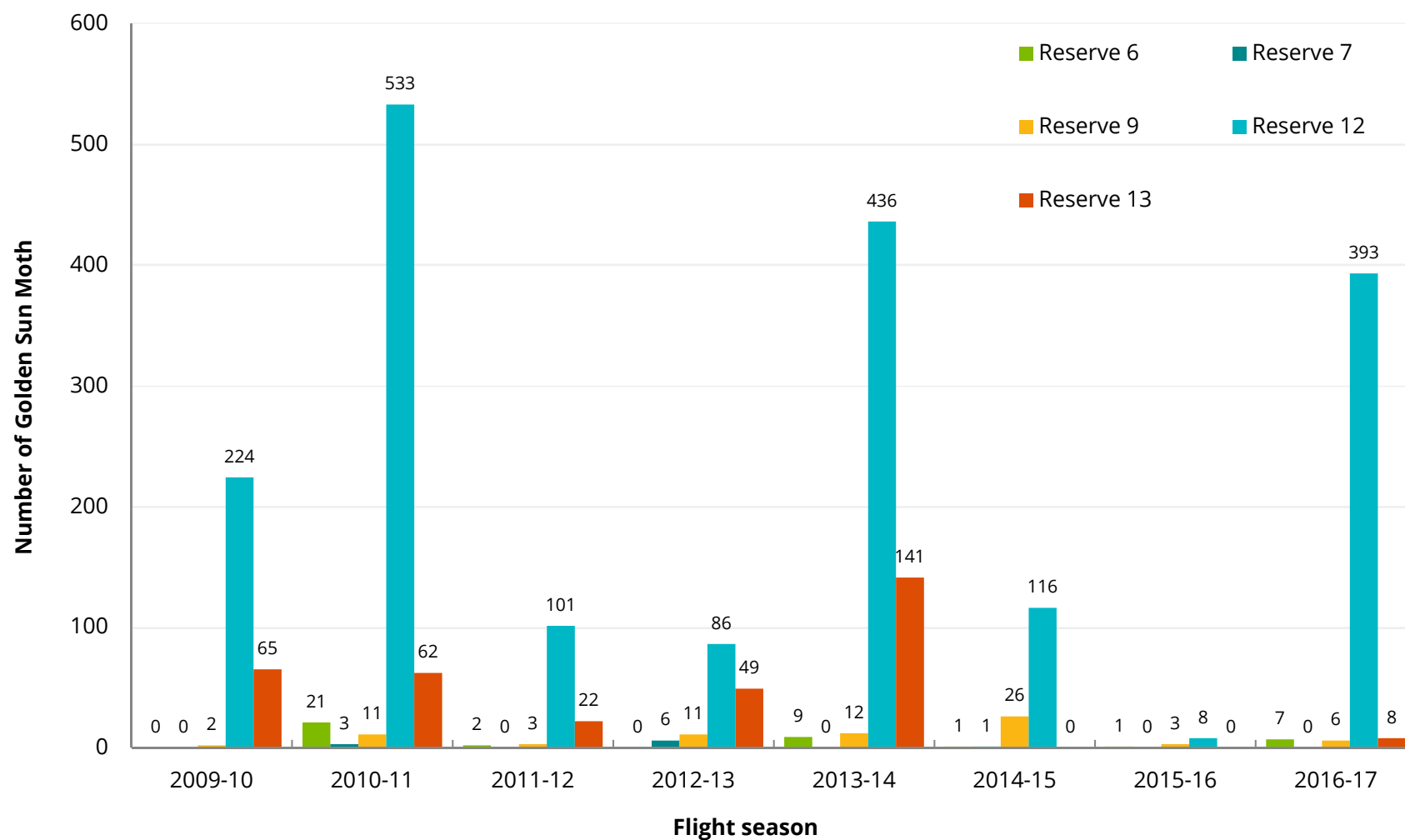


Figure 3 Annual abundance monitoring of Golden Sun Moth populations at Aurora reserves

4. Discussion and conclusions

Of the five study sites, Reserves 6, 7 and 9 have consistently yielded very low to no Golden Sun Moth over the last seven years in comparison to other reserves where Golden Sun Moth are present. Compared to more reserves with more established populations, such as Reserve 12, Reserves 6, 7 and 9 are not as large and are unable to support an increased area of favourable habitat (e.g. dominated by Spear Grass *Austrostipa* spp., Wallaby Grass *Rytidosperma* spp. and Needle Grass *Nassella* spp.) which is optimal for an abundant population of Golden Sun Moths.

There was a notable increase in the number of Golden Sun Moth throughout Reserve 12 compared to the 2015-2016 season. Reserve 12 has experienced fluctuations throughout the ongoing monitoring program, which can be attributed to natural population fluctuations. A consistent positive or negative trend in population numbers over three successive monitoring seasons is necessary to reflect a true indication of changes in population (Clarke 1999).

The degree to which the populations are dependent upon the surrounding land is unknown. As the area becomes further developed, populations within some of the smaller reserves may decline as habitat and connectivity becomes more limited. Appropriate management strategies, such as biomass reduction, should be undertaken, especially in these small reserves, to ensure optimal habitat conditions for populations that are small and isolated from one another.

There was a notable increase in the number of Golden Sun Moth recorded in the current flight season compared to the 2015–16 season. These results, along with the results over the past seven years of monitoring highlight the widely acknowledged view that Golden Sun Moth numbers at any given site vary enormously both within and between seasons. Furthermore, this demonstrates the importance of long term monitoring and inability to draw conclusions based on minimal data.

Conclusions and recommendations

The stronghold for Golden Sun Moth within the Aurora reserves remains Reserve 12 and 13. Despite small to non-existent populations within Reserves 6, 7 and 9, monitoring should continue throughout these reserves. Ongoing management of the reserves should continue to incorporate biomass reduction measures as a means of maintaining and/or increasing the availability of suitable habitat structure for Golden Sun Moth. Monitoring for the 2017-2018 flight season should continue with transect monitoring as this method provides adequate coverage of the study area.

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