

Annual monitoring of Matted Flax-lily: Aurora, Epping (Year 8: 2016/2017)

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Background

Biosis Pty Ltd was commissioned by Development Victoria to undertake the year 8 (2016/2017) annual monitoring of the Matted Flax-lily *Dianella amoena* population within Reserves 11 and 14 at the Aurora residential development, Epping, Victoria (Figure 1).

1.1 Approval under the EPBC Act

The Aurora Residential Subdivision (development area ADP2, refer to Figure 2) received approval from the Department of the Environment, Water, Heritage and the Arts (DEWHA) (now Department of the Environment and Energy (DoEE)) on 16 March 2008, subject to several conditions. Conditions relating to Matted Flax-lily include 1, 2c and 2e, outlined below:

- 1. The person taking the action must undertake all works in accordance with the Aurora Conservation Management Plan January 2008 (Biosis Research 2008).
- To protect the threatened species listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), in particular the Matted Flax-lily *Dianella amoena* and Golden Sun Moth *Synemon plana*, the person taking the action must monitor and manage the reserves identified in Figures 1a and 1b in accordance with the Aurora Conservation Management Plan – January 2008. In particular the following actions must be taken:
 - c. Monitoring of the Matted Flax-lily is to be undertaken between 1 October and 1 March every 12 months commencing 2008 and continuing for a period of 10 years after establishment of reserves.
 - e. If monitoring indicates declining health, the cause of the decline must be investigated. Corrective actions must be developed and implemented. In this event the Department must be provided, within two months of the monitoring results being known, with a report stating the corrective action(s) implemented.

1.2 Annual monitoring

Biosis has been monitoring the Matted Flax-lily population at Aurora Reserves 11 and 14 annually since 2008 (pre-reserve establishment), with annual monitoring in compliance with the Aurora CMP beginning during the 2009/2010 season. Annual reports submitted to the relevant Departments are listed in Table 1.



Table 1Annual monitoring reports

Year	Report
Year 0: 2008/2009	Letters to DEWHA, 5 May and 26 June 2009
Year 1: 2009/2010	Report to DEWHA, 19 July 2010
Year 2: 2010/2011	Report to DSEWPaC, 4 May 2011
Year 3: 2011/2012	Report to DSEWPaC, 8 June 2012
Year 4: 2012/2013	Report to DSEWPaC, 4 April 2013
Year 5: 2013/2014	Report to DoE, 11 April 2014
Year 6: 2014/2015	Report to DoE, 1 March 2015
Year 7: 2015/2016	Report to DoE, 25 August 2016
Year 8: 2016/2017	Current report – to be submitted to DoEE upon finalisation





1.3 Timing of surveys

A total of 30 Matted Flax-lily were included in the EPBC Act referral submission and these plants were recorded over a number of years prior to March 2008. Since then, Biosis have completed eight years of annual Matted Flax-lily population monitoring.

Year	Surveys
Pre 2008	Original records – plants included in the EPBC approval in March 2008, from surveys between 2001–2008 (i.e. the 30 original records).
Year 0: 2008/2009	Monitoring in December 2008 and June 2009, prior to the implementation of the CMP.
Year 1: 2009/2010	<u>CMP implemented</u> . Monitoring in November 2009 and January 2010 (when plants were staked) and May/June 2010.
Year 2: 2010/2011	Monitoring in December 2010 and January 2011 (when new plants were located with a DGPS and staked).
Year 3: 2011/2012	Monitoring in January/February 2012.
Year 4: 2012/2013	Monitoring in December 2012 and January 2013.
Year 5: 2013/2014	Monitoring in December 2013.
Year 6: 2014/2015	Monitoring in December 2014 and January/February 2015.
Year 7: 2015/2016	Monitoring in December 2015.
Year 8: 2016/2017	Monitoring in December 2016 and January 2017.

Table 2	Annual Matted Flax-lily monitoring surveys at Aurora Reserves 11 and 14
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In years 0 and 1 surveys were undertaken in late summer (as per the EPBC Act approval conditions), when the plants were due to flower and therefore generally easier to locate. However, due to poor conditions (drought and grazing) during 2008–2010 most Matted Flax-lily had not flowered and were generally difficult to locate during this late summer period. As a result, for both years 0 and 1, Biosis undertook follow-up surveys in autumn/winter, following substantial rains and subsequent growth of the plants. Consequently, during the autumn/winter surveys, the plants were easier to locate.

Surveys from years 2 to 8 have been undertaken in late spring/summer only. Plants were observed to be flowering and fruiting in each of these years and were mostly easily located. In addition, all of the plants have now been individually marked in the field with star pickets and labels, making them easier to locate.

1.4 Additional plants

An additional six Matted Flax-lily plants were recorded outside of fenced reserves, between Reserves 9 and 10 prior to 2014. These were salvaged in January 2014 and are currently being housed in the GAGIN nursery. There are no plans to translocate Matted Flax-lily into any Development Victoria reserves into the future.



1.5 Matted Flax-lily outside the EPBC Act approval area

Matted Flax-lily that occur within Aurora Conservation Reserve 14, which is on the western side of the Hume Freeway and outside the EPBC Act approval area ADP2, are also being monitored as part of the annual monitoring program.

Currently, there are 14 Matted Flax-lily being monitored within reserve 14, including one new plant noted during the 2013/2014 monitoring survey.



2. Methods

2.1 Marking of Matted Flax-lily

At commencement of the 10 year monitoring program, the locations of Matted Flax-lily were initially recorded using a hand-held GPS unit (+/- 7 m accuracy). This aided in relocation of plants, but still led to difficulties where plants were small and difficult to see and/or the surrounding biomass was high.

Biosis have since recorded plants with a DGPS, which has a greater accuracy (+/- 4 m) than a standard GPS enabling improved mapping accuracy of Matted Flax-lily locations.

All Matted Flax-lily being monitored have also been marked with a star picket positioned adjacent to each plant with a numbered tag attached to each star picket. This has made relocation of plants much easier and also ensures contractors undertaking vegetation management works within conservation reserves are aware of the location of all Matted Flax-lily plants.

2.2 Monitoring data

During year 8 (2016/2017) of monitoring, plants were located using current mapping (Figure 2 - above) and with the aid of star pickets next to each plant.

The following information was recorded for each plant:

- Plant health (good, moderate, poor)
- Number of inflorescences (<5, 5-10, 10+)
- Approximate number of leaf tufts (<5, 5-10, 10+)
- Approximate spread of the plant (width at the widest point in centimetres)
- Management/other notes (e.g. relating to presence of fruit, if weeding is required, evidence of herbivory).

2.3 Year 8 monitoring dates

Monitoring in year 8 was undertaken on 23 December 2016 and 12 January 2017.



3. Results

The total number of Matted Flax-lily recorded in Reserves 11 and 14 is provided in Table 3. Figure 2 indicates the location of monitored Matted Flax-lily in year 8. Plant health data is provided in Table 4.

3.1 Annual numbers of Matted Flax-lily

Since year 0 (2008/2009) surveys, the number of Matted Flax-lily that have been discovered and added to the annual monitoring program has increased. Table 3 provides the located and monitored numbers of Matted Flax-lily by survey year. In year 0, data was collected on five Matted Flax-lily within reserves 11 and 14, whereas in year 5 data was collected on 18 Matted Flax-lily plants. It is possible some of the additional plants are due to recruitment within the population, but the increase is also likely to be a result of the high level of survey effort over time enabling these plants to be found. Despite small annual fluctuations in individual numbers of Matted Flax-lily, and low levels of mortality, the Aurora population is considered to be stable and thus it appears that current management of the population is appropriate.

Four Matted Flax-lily (072, 163, 187 and 188) were searched for but not found during year 8 monitoring. Matted Flax-lily 099, which could not be located in year 7, was rediscovered in year 8 and was in moderate health, with 5-10 leaf tufts. Searches around star pickets and rocks where the other four plants were located did not reveal any dead leaf tufts. Whether lack of detection of these plants is due to death is difficult to conclude after a single year of monitoring. Failure to detect a plant may be due to natural fluctuations of foliar growth, seasonal differences and locational error. These 'missing' plants will be searched for again in year 9 and 10, along with all other recorded Matted Flax-lily.



Reserve number	Baseline (Pre-2008)	Year 0 2008/2009 (Pre-CMP)	Year 1 2009/2010	Year 2 2010/2011	Year 3 2011/2012	Year 4 2012/2013	Year 5 2013/2014	Year 6 2014/2015	Year 7 2015/2016	Year 8 2016/2017
11	2	2	4	4	4	4	4	4	3	3
14	-	3	6	13	13	12	14	14	10	11
AURORA MFL TOTAL	2	5	10	17	17	16	18	18	13	14

Table 3 Numbers of Matted Flax-lily (MFL) observed yearly by reserve







Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Hobart, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Figure 2 The distribution of Matted Flax-lily (MFL) within conservation reserves managed by Development Victoria

Acknowledgements: Vicmap ©State of Victoria, NearMap Imagery Oct 2016

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Coordinate System: GDA 1994 MGA Zone 55



3.2 Plant health

A comparison of data collected from years 3 to 8 is provided in Table 4. Please note, health calculations to year 6 are inclusive of all Matted Flax-lily from Aurora landholdings. Health data collected from year 7 onwards includes only Matted Flax-lily from reserves managed by Development Victoria.

A fire burnt all of Reserve 14 in December 2015, including the rocky knolls where Matted Flax-lily are located. When this last occurred in the summer of 2012/2013 the following monitoring season recorded the highest number of Matted Flax-lily producing inflorescences on record. It is possible the fire has been a factor in the increase in inflorescences in year 8.

The overall health of the Matted Flax-lily population recorded in year 8 was relatively good with 64 per cent of plants recorded in good health, compared to 54 per cent in year 7. It is likely that below average rainfall and higher maximum daily temperatures during spring and summer of year 7 contributed to the results (Table 3).

	Aurora dev	elopment area (/		Development Victoria reserves (plants in reserves 11 & 14).		
	Year 3:	Year 4:	Year 5:	Year 6:	Year 7:	Year 8:
Health						
Poor	10%	9%	0%	1%	8%	0%
Moderate	76%	20%	1%	8%	38%	36%
Good	14%	71%	99%	91%	54%	64%
# Inflorescences						
<5	51%	66%	40%	83%	53%	43%
5-10	21%	14%	13%	8%	23%	14%
10+	28%	20%	47%	9%	23%	43%
# Leaf Tufts						
<5	5%	13%	5%	11%	15%	14%
5-10	21%	13%	8%	17%	0%	7%
10+	74%	74%	87%	72%	85%	79%

Table 4 Percentages of Matted Flax-lily health, inflorescences and leaf tufts

3.3 Seasonal conditions of 2016

Weather data from Epping (the closest meteorological recording stations to Aurora) show on average 2016 was similar to the mean for temperature but with above average rainfall for most of the year. Most of the months with significantly higher rainfall were in the latter half of 2016, which is a critical time for MFL reproduction (Figures 3 & 4). By contrast, in 2015, October had 8.8 millimetres of rain recorded, which is well below the average of 66.3 millimetres. It was also the warmest month on record and recorded the hottest October day on record. The combination of a moderate temperature and high rainfall during spring and summer is likely to have resulted in the good condition of Matted Flax-lily plants observed.





Figure 3 2016 rainfall vs mean rainfall records from Viewbank, Victoria



Viewbank (086068) 2016 maximum temperature

Figure 4 2016 maximum temperature records Viewbank, Victoria



4. Proposed actions in accordance with Condition 2(e)

At the end of year 8 the health of the natural populations of Matted Flax-lily at Aurora is stable and generally classified as good. Fluctuations in health are within the ranges of natural variability and do not represent a decline. No remedial action is required.



5. Conclusion

There was no significant change in the health of the population between year 7 and year 8.

Although five Matted Flax-lily disappeared between years 6 and 7, one was rediscovered in year 8 showing this was not necessarily a sustained drop in numbers. Matted Flax-lily are known to undergo natural cycles of dieback and it is possible that some of these plants will recover. All plants not located will continue to be searched for during each subsequent annual monitoring event.

If weather forecasting for the second half of 2017 predicts a hot, dry summer outside the normal climatic limits, year 9 monitoring will need to be conducted earlier in the season to capture Matted Flax-lily at peak flowering time. This will ensure that all Matted Flax-lily should be successfully relocated as they are easier to detect when flowering.

The population of Matted Flax-lily at Aurora is considered stable and it appears that current management of the population is appropriate. Changes in overall population health observed in year 8 are within expected natural variability.



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