

## MARIANTHUS AQUILONARIS DEMOGRAPHIC MONITORING: SPRING 2018-SPRING 2019

### 1 Objectives

The objective of the study was to establish demographic monitoring of *Marianthus aquilonaris* sub-populations to determine the population structure/ rates of growth/ reproduction and survival in order to conduct future assessments on 'effective population size' (that is plants capable of reproducing), population viability analysis (modelling of probability of plant extinction from direct disturbance) and measure potential indirect impacts to sub-populations.

### 2 Methodology

The location of the demographic monitoring quadrats were determined based on:

- Presence of suitable habitat/vegetation for *M. aquilonaris* identified during flora and vegetation surveys (Regrowth mid open mallee woodland *Eucalyptus livida* over mid open shrubland of *Hakea pendens* (P3) and open low shrubland of *Goodia medicaginea* on hillslope); and
- Elevation-to ensure at least one quadrat was located in the upper slope and lower slope of each *M. aquilonaris* sub-population<sup>1</sup>;

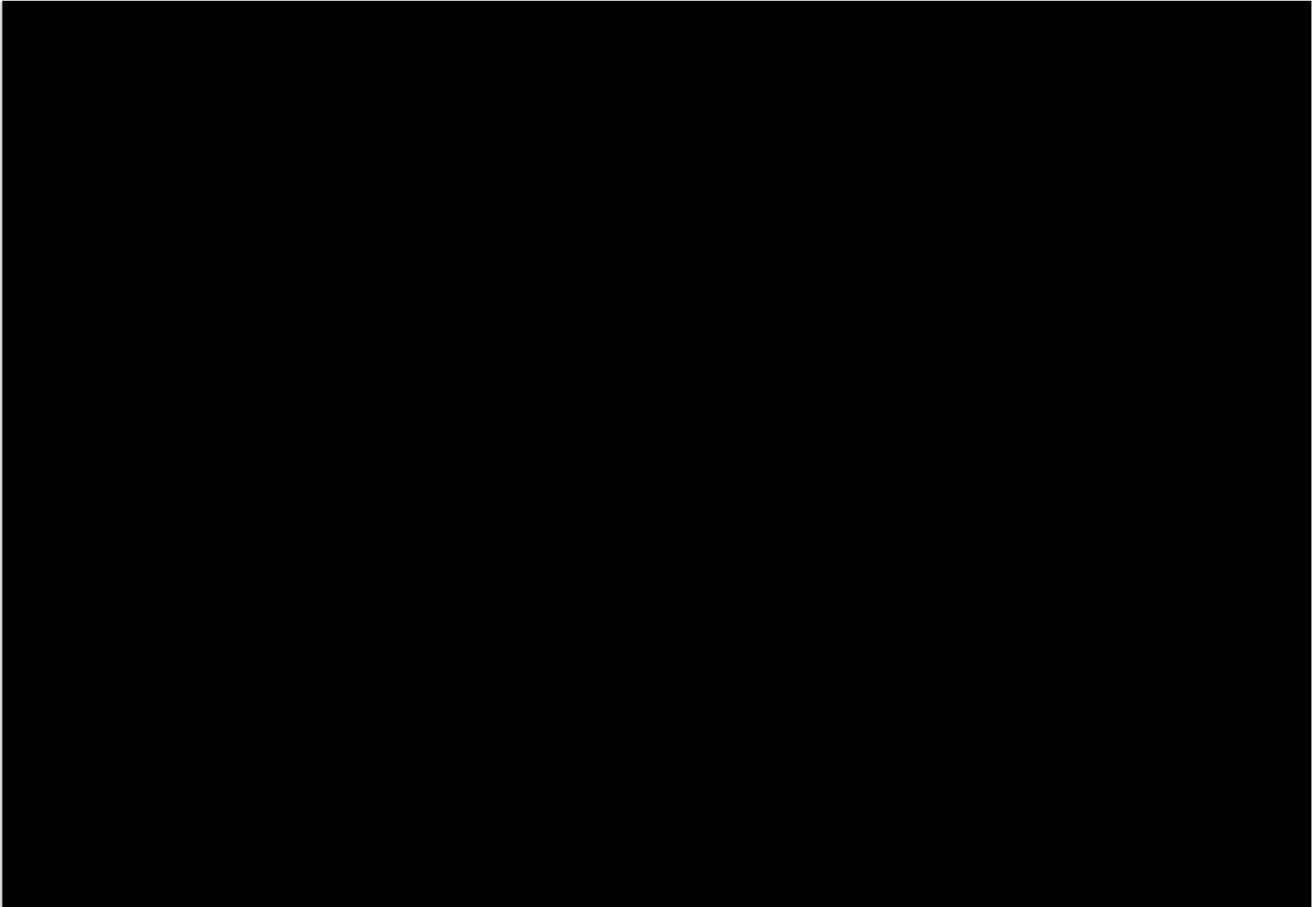
A total of twenty-seven monitoring quadrats (10m X 10m) were established within the *M. aquilonaris* sub-populations in September and November 2018 (Figure 1). These quadrats have continued to be assessed biannually (May 2019 and October 2019). Location maps of the quadrats within each sub-population are provided in Appendix 1. The location of each quadrat was recorded using a handheld GPS (Quadrat coordinates provided in Appendix 2) and the boundary of the quadrats were marked with metal fence droppers. A photographic record was taken for each quadrat (Appendix 3). Raw data for the current monitoring period (Spring 2019) is provided in Appendix 3.

The parameters measured within each quadrat are listed in Table 1. Parameters chosen are consistent with previous monitoring established by the Department of Biodiversity, Conservation and Attractions (DBCA) which are detailed in the *Implementing Recovery Actions for Bremer Marianthus*, DEC, 2011) and will enable assessment on the rate of growth, reproduction/ recruitment and survival of each sub-population. Quadrat size was determined to ensure consistency with existing population quadrats established by DBCA and due to the high density of *M. aquilonaris* populations, particularly in areas of regrowth from fire disturbance. Monitoring is to be conducted biannually (Autumn and Spring) throughout the life of the Medcalf Vanadium Project (minimum one year of monitoring pre-mining) which currently undergoing Public Environmental Review under the Part IV of the *Environmental Protection Act 1986*.

<sup>1</sup> Excluding Population 1f which comprises of a single plant.

**Table 1: Demographic Monitoring Quadrat Parameters**

<b>Demographic Properties</b>
No. mature plants
No. juvenile plants
No. dead plants
No. seedlings
No. sprouting plants
No. flowering plants
No. fruiting plants
Height/width of plants
No. fruits per plant
No. flowers per plant
Dominant species



**Figure 1: Location of demographic monitoring quadrats**

### 3 Results

As shown in Figure 2 below, Population 1d had the highest mean number of mature plants (average of 48 mature plants per 100m<sup>2</sup>) and Population 1c had the highest mean number of juvenile plants (average of six juvenile plants per 100m<sup>2</sup>). The highest mean number of dead plants was also recorded in Population 1c (average of five dead plants per 100m<sup>2</sup>). The mean number of mature, juvenile and dead plants for each population remained relatively constant across each monitoring period.

Flowers were only present during the Spring monitoring periods (2018 and 2019). The mean number of plants with flowers increased for all populations between Spring 2018 and Spring 2019, with Population 1d currently recording the highest mean number of plants in flower (average of ten flowering plants per 100m<sup>2</sup>) (Figure 3 below).

In Spring 2018, the percentage of fruiting plants ranged from 11% (Population 1e) to 38% (Population 1b). In Spring 2019, only one quadrat from Population 1d (Q1-2) has fruits present in the Spring 2019 monitoring period with the percentage of fruiting plants in Population 1e recorded at 1%. In Spring 2018, the percentage of flowering plants ranged from 1% (Population 1e) to 15% (Population 1b) (Figure 4). In Spring 2019, the percentage of flowering plants ranged from 9% (Population 1c) to 29% (Population 1b) (Figure 4).

In Spring 2018, the mean number of flowers per plant ranged from one to three flowers per plant, with the highest number of flowers per plant recorded for Population 1a (Figure 5). In Spring 2019, the mean number of flowers per plant ranged from nine to twenty-three flowers per plant, with the highest number of flowers per plant recorded for Population 1b (Figure 5).

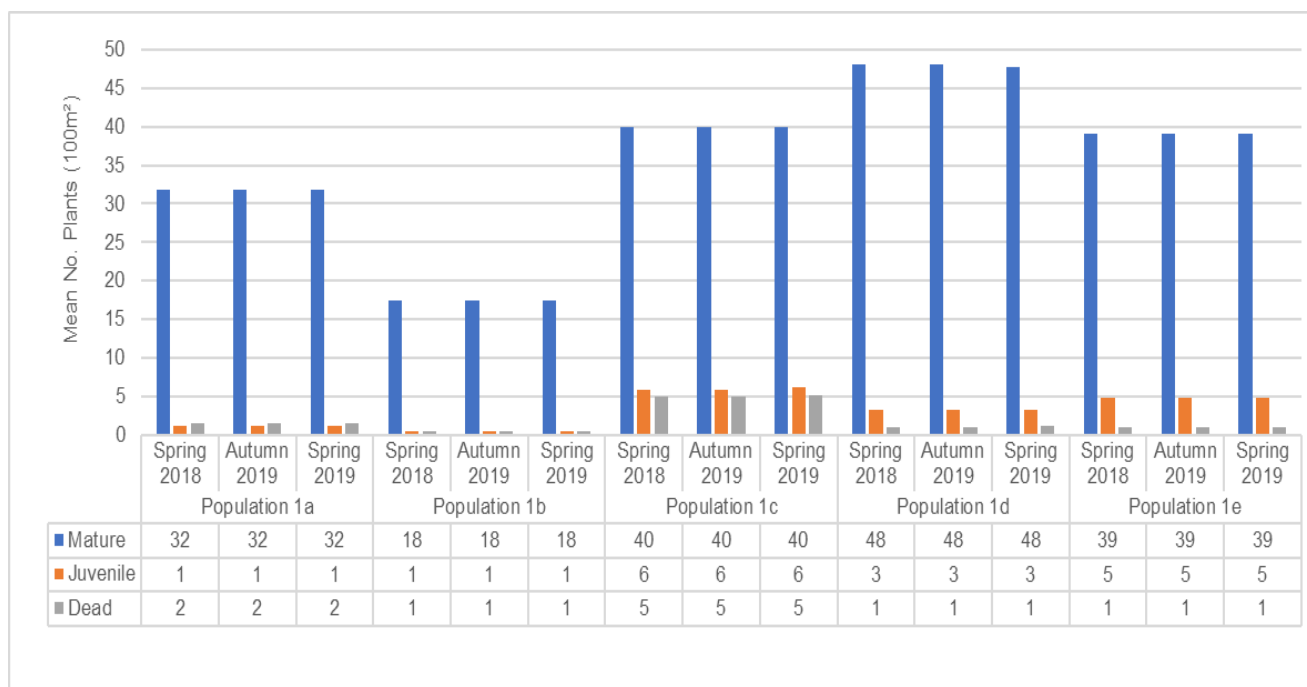
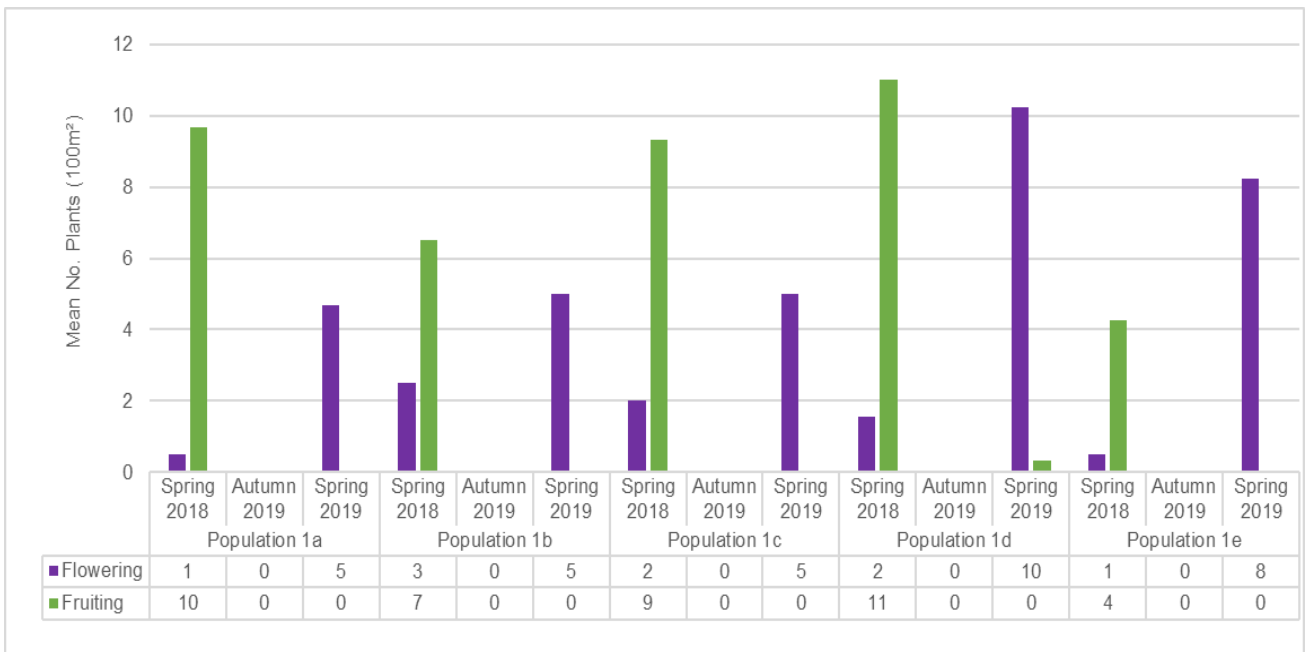
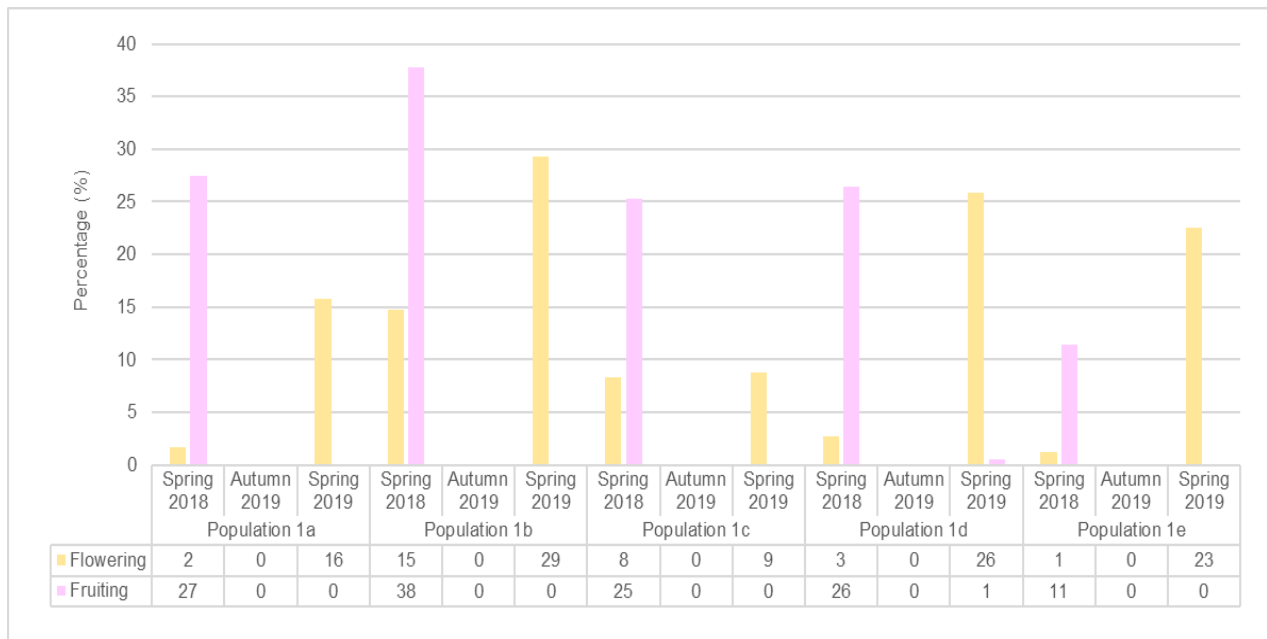


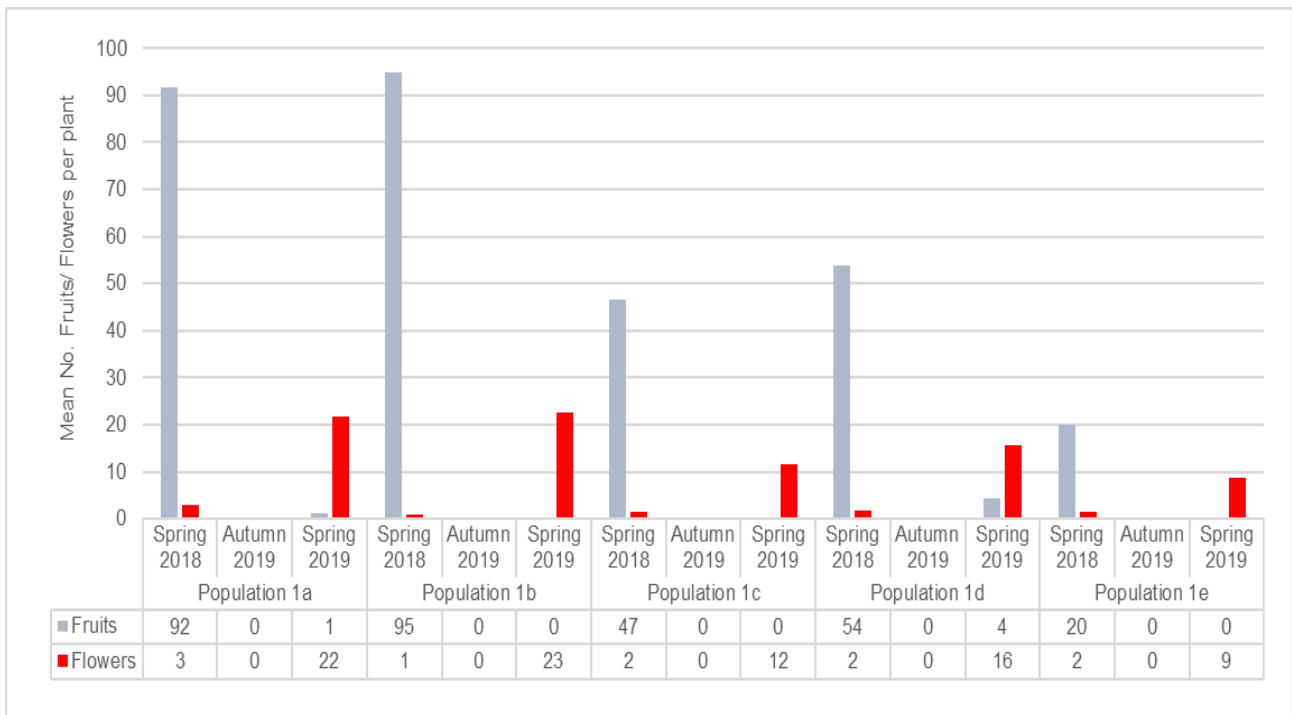
Figure 2: Age Structure of each sub-population (Spring 2018-Spring 2019)



**Figure 3: Number of Flowering/Fruiting Plants of each sub-population (Spring 2018-Spring 2019)**



**Figure 4: Percentage of Flowering/Fruiting Plants of each sub-population (Spring 2018-Spring 2019)**



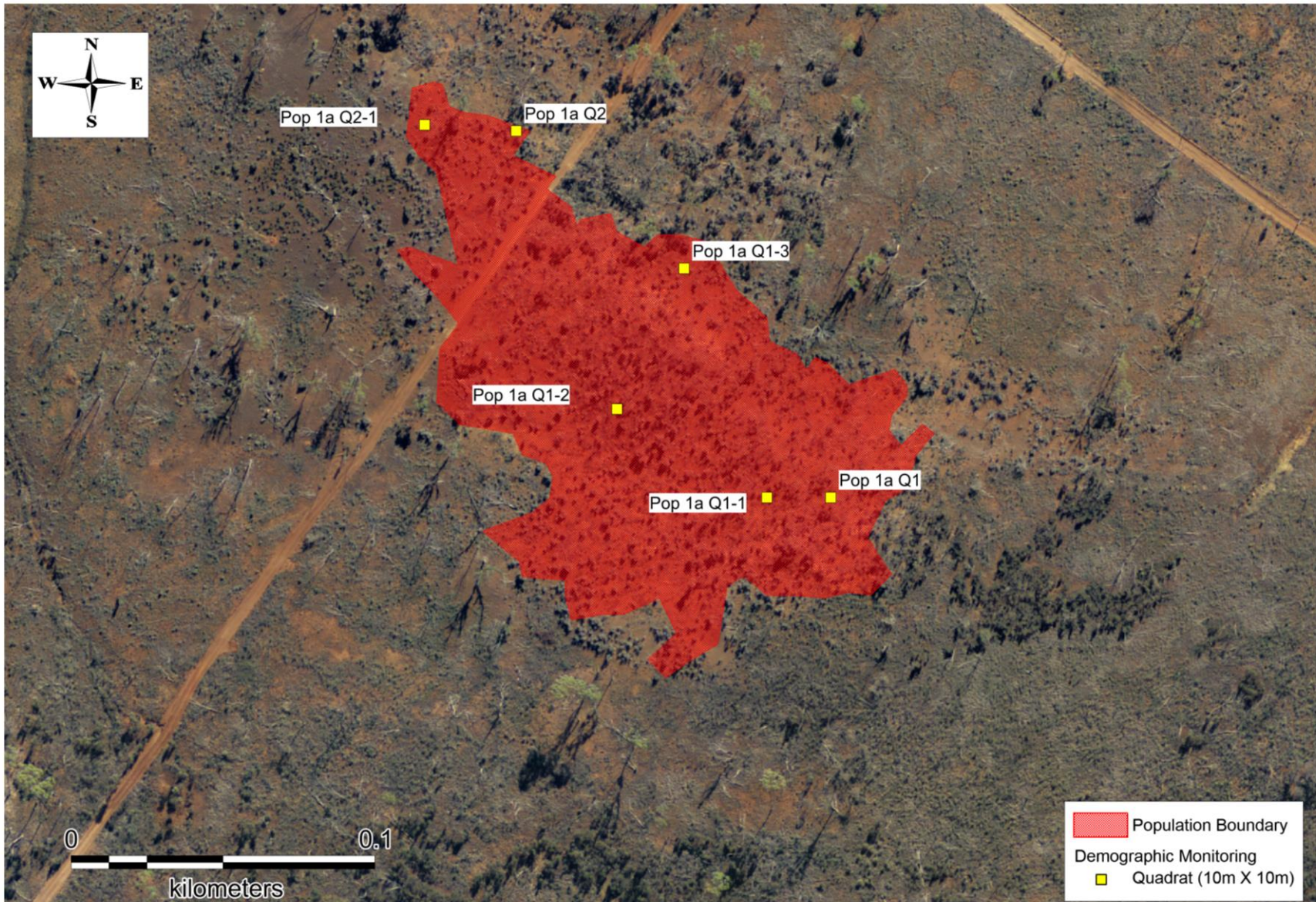
**Figure 5: Mean no. flowers/fruits per plant of each sub-population (Spring 2018-Spring 2019)**

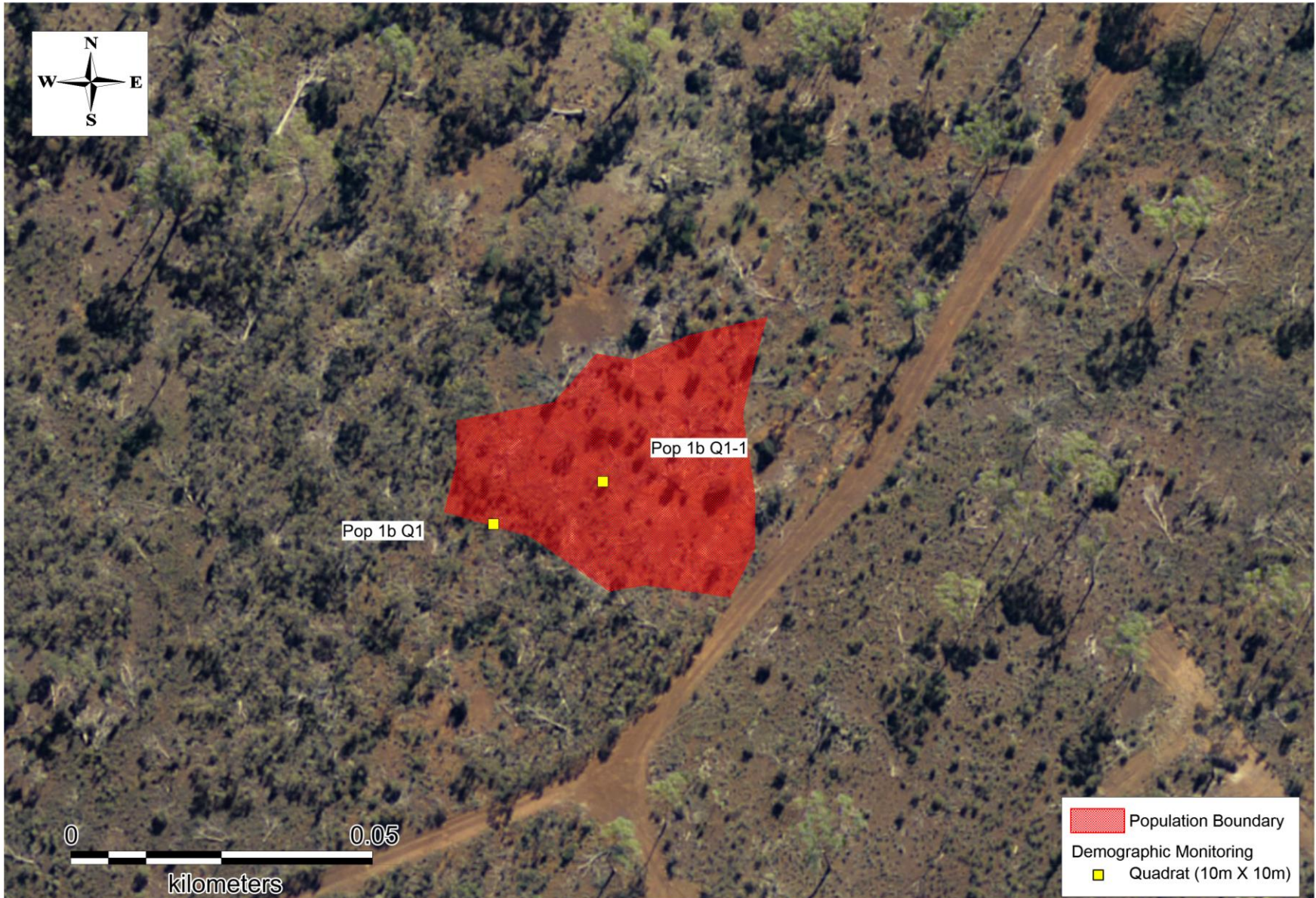
#### 4 Discussion

As this is the first year of monitoring, assessments on the reproductive or mortality rates of each population are not possible at this time. The data presented in this report only provides baseline data on the sub-populations (represents the minimum one year of monitoring proposed), with monitoring to continue biannually (autumn and spring) to determine 'effective population size' (that is the proportion of each sub-population that are mature and capable of reproducing), average mortality rates, average reproduction/recruitment rates and age distribution of each sub-population.

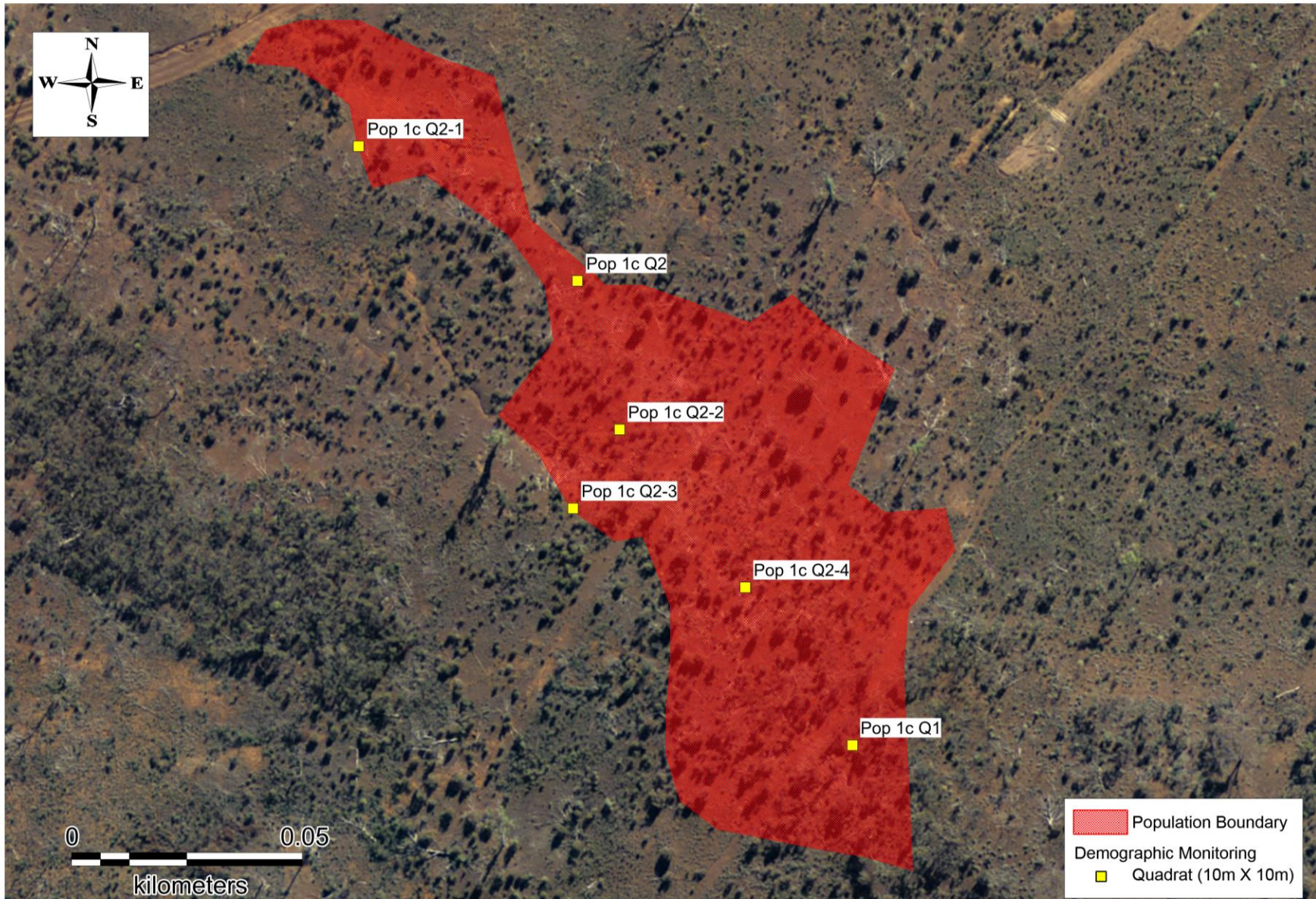
The data obtained from the ongoing monitoring (rates of mortality/ reproduction and age) will be used to conduct Population Viability Analysis modelling (using modelling programs e.g. *Vortex*) to predict the probability of extinction of each sub-population over time. Results of the analysis will assist in determining population structure and stability of the sub-populations and subsequently determine the susceptibility of *Marianthus* to direct/indirect impacts.

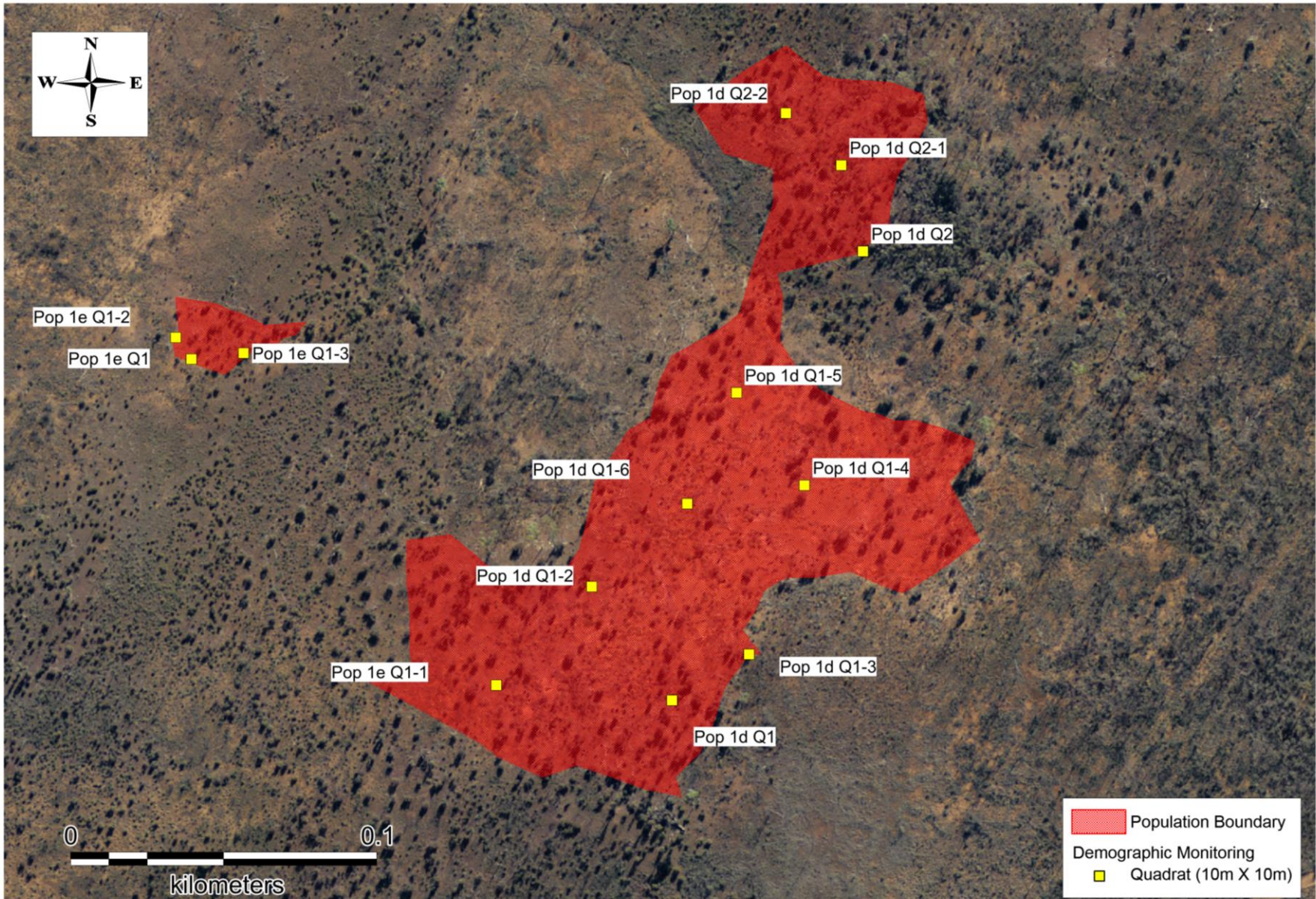
### Appendix 1: Demographic Monitoring Location Maps



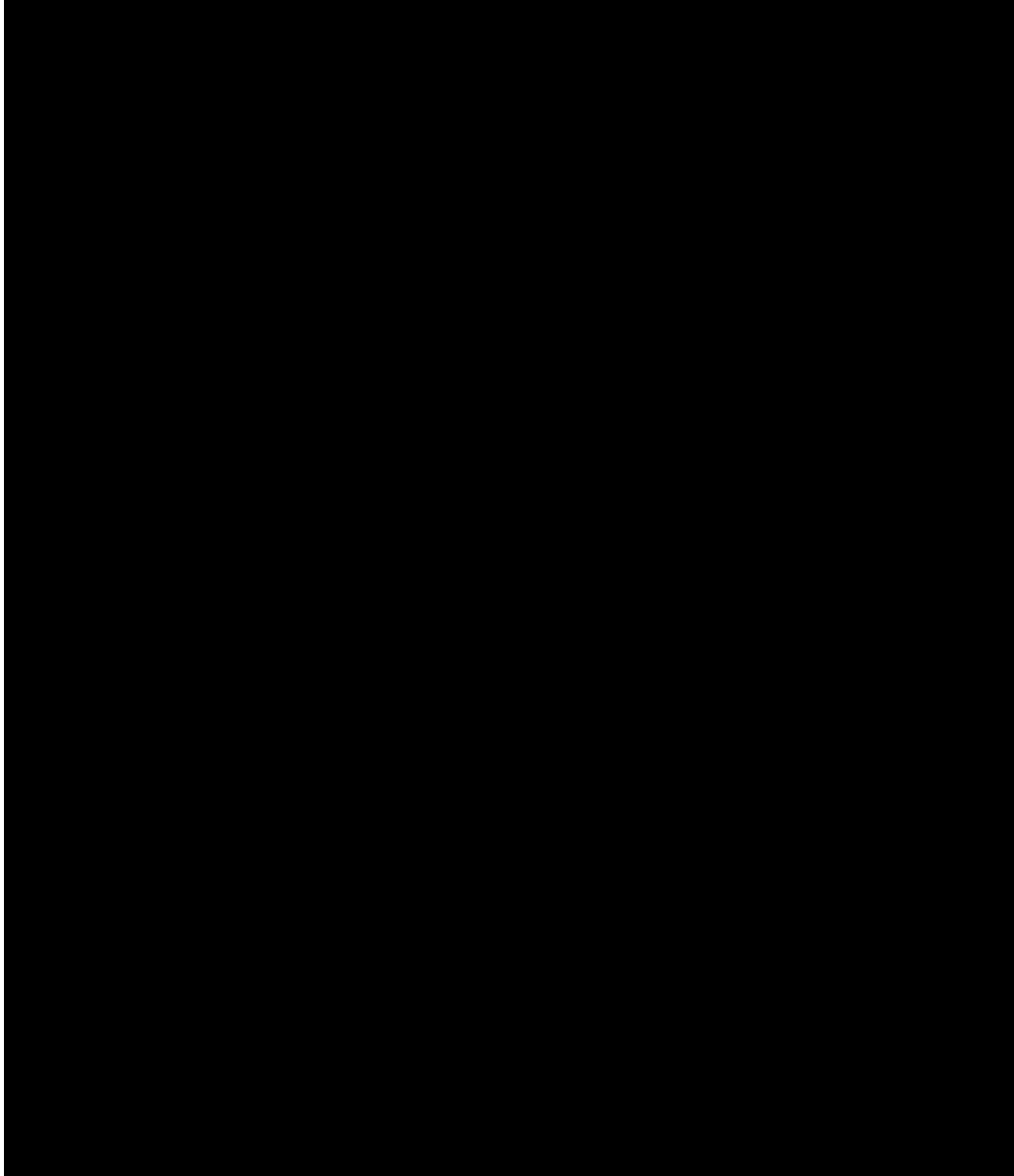

















**Appendix 2: Demographic Monitoring Quadrats GPS Coordinates**









**Appendix 3: Demographic Monitoring Quadrat Data (Spring 2019)**

<b>Population ID: 1a</b>	<b>Quadrat ID: Q1</b>
<b>WP: 9</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 392 m</b>	<b>Photo No: 1</b>
<b>No. mature plants</b>	24
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	1
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	3
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	76cm x 90cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	15
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea viscosa</i> subsp. <i>spatulata</i> , <i>Lepidosperma sanguinolentum</i> , <i>Hakea pendens</i> , <i>Allocasuarina</i> sp. sterile
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1a</b>	<b>Quadrat ID: Q1-1</b>
<b>WP: 88-91</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 401m</b>	<b>Photo No: 288</b>
<b>No. mature plants</b>	47
<b>No. juvenile plants (&lt;30cm)</b>	4
<b>No. dead plants</b>	1
<b>No. seedlings (single stem)</b>	2
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	3
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	80cm x 80cm
<b>Height/width of juvenile plants (average)</b>	20cm x 10cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	15
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea viscosa</i> subsp. <i>spatulata</i> , <i>Lepidosperma sanguinolentum</i> , <i>Hakea pendens</i> , <i>Allocasuarina</i> sp. sterile
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1a</b>	<b>Quadrat ID: Q1-2</b>
<b>WP: 92-95</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 392m</b>	<b>Photo No: 289</b>
<b>No. mature plants</b>	20
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	4
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	80cm x 60cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	20
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea viscosa</i> subsp. <i>spatulata</i> , <i>Lepidosperma sanguinolentum</i> , <i>Hakea pendens</i> , <i>Allocasuarina</i> sp. <i>sterile</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1a</b>	<b>Quadrat ID: Q1-3</b>
<b>WP: 96-099</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 391m</b>	<b>Photo No: 290</b>
<b>No. mature plants</b>	26
<b>No. juvenile plants (&lt;30cm)</b>	1
<b>No. dead plants</b>	7
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	10
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	80cm x 60cm
<b>Height/width of juvenile plants (average)</b>	20cm X 20cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	40
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea viscosa</i> subsp. <i>spatulata</i> , <i>Lepidosperma sanguinolentum</i> , <i>Hakea pendens</i> , <i>Allocasuarina</i> sp. <i>sterile</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1a</b>	<b>Quadrat ID: Q2</b>
<b>WP: 10</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 376 m</b>	<b>Photo No: 293</b>
<b>No. mature plants</b>	27
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	0
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	56cm x 60cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	0
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Westringia cephalantha</i> , <i>Eremophila saligna</i> , <i>Trymalium myrtillus</i> subsp. <i>myrtillus</i> , <i>Dodonaea inaequifolia</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	









<b>Population ID: 1a</b>	<b>Quadrat ID: Q2-1</b>
<b>WP: 100-103</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 383m</b>	<b>Photo No: 291</b>
<b>No. mature plants</b>	47
<b>No. juvenile plants (&lt;30cm)</b>	2
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	8
<b>No. fruiting plants</b>	14
<b>Height/width of mature plants (average)</b>	60cm x 60cm
<b>Height/width of juvenile plants (average)</b>	25cm x 10cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	40
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Westringia cephalantha</i> , <i>Eremophila saligna</i> , <i>Trymalium myrtillus</i> subsp. <i>myrtillus</i> , <i>Dodonaea inaequifolia</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1b</b>	<b>Quadrat ID: Q1</b>
<b>WP: 35</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 399 m</b>	<b>Photo No: 314</b>
<b>No. mature plants</b>	18
<b>No. juvenile plants (&lt;30cm)</b>	1
<b>No. dead plants</b>	1
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	1
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	75cm x 60cm
<b>Height/width of juvenile plants (average)</b>	25cm x 10cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	30
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Melaleuca hamata</i> , <i>Westringia cephalantha</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1b</b>	<b>Quadrat ID: Q1-1</b>
<b>WP: 121-124</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 401m</b>	<b>Photo No: 294</b>
<b>No. mature plants</b>	17
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	9
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	70cm x 60cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	15
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Melaleuca hamata</i> , <i>Westringia cephalantha</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	

<b>Population ID: 1c</b>	<b>Quadrat ID: Q1</b>
<b>WP: 36</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 417 m</b>	<b>Photo No: 315</b>
<b>No. mature plants</b>	17
<b>No. juvenile plants (&lt;30cm)</b>	2
<b>No. dead plants</b>	1
<b>No. seedlings (single stem)</b>	2
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	0
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	70cm x 60cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	2
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Westringia cephalantha</i> , <i>Beyeria brevifolia</i> , <i>Lepidosperma sanguinolentum</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1c</b>	<b>Quadrat ID: Q2</b>
<b>WP: 50</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 404 m</b>	<b>Photo No: 335</b>
<b>No. mature plants</b>	24
<b>No. juvenile plants (&lt;30cm)</b>	3
<b>No. dead plants</b>	2
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	0
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	60cm x 30cm
<b>Height/width of juvenile plants (average)</b>	30cm x 8cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	0
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Gahnia ancistrophylla</i> , <i>Eremophila saligna</i> , <i>Trymalium myrtillus</i> <i>subsp. myrtillus</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID:</b> 1c	<b>Quadrat ID:</b> Q2-1
<b>WP:</b> 165-168	<b>Coordinates:</b> [REDACTED]
<b>Elevation:</b> 401m	<b>Photo No:</b> 298
<b>No. mature plants</b>	40
<b>No. juvenile plants (&lt;30cm)</b>	3
<b>No. dead plants</b>	1
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	0
<b>No. fruiting plants</b>	3
<b>Height/width of mature plants (average)</b>	60cm x 60cm
<b>Height/width of juvenile plants (average)</b>	25cm x 8cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	15
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Gahnia ancistrophylla</i> , <i>Eremophila saligna</i> , <i>Trymalium myrtillus</i> subsp. <i>myrtillus</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1c</b>	<b>Quadrat ID: Q2-2</b>
<b>WP: 169-172</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 402m</b>	<b>Photo No: 302</b>
<b>No. mature plants</b>	41
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	5
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	6
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	70cm x 50cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	15
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Gahnia ancistrophylla</i> , <i>Eremophila saligna</i> , <i>Trymalium myrtillus</i> subsp. <i>myrtillus</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1c</b>	<b>Quadrat ID: Q2-3</b>
<b>WP: 173-176</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 400m</b>	<b>Photo No: 303</b>
<b>No. mature plants</b>	48
<b>No. juvenile plants (&lt;30cm)</b>	26
<b>No. dead plants</b>	10
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	1
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	80cm x 55cm
<b>Height/width of juvenile plants (average)</b>	27cm x 4cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	9
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Gahnia ancistrophylla</i> , <i>Eremophila saligna</i> , <i>Trymalium myrtillus</i> subsp. <i>myrtillus</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	









<b>Population ID: 1c</b>	<b>Quadrat ID: Q2-4</b>
<b>WP: 177-180</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 406m</b>	<b>Photo No: 305</b>
<b>No. mature plants</b>	70
<b>No. juvenile plants (&lt;30cm)</b>	3
<b>No. dead plants</b>	12
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	20
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	90cm x 80cm
<b>Height/width of juvenile plants (average)</b>	25cm x 4cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	30
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Gahnia ancistrophylla</i> , <i>Eremophila saligna</i> , <i>Trymalium myrtillus</i> subsp. <i>myrtillus</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1d</b>	<b>Quadrat ID: Q1</b>
<b>WP: 62</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 403 m</b>	<b>Photo No: 350</b>
<b>No. mature plants</b>	24
<b>No. juvenile plants (&lt;30cm)</b>	5
<b>No. dead plants</b>	1
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	3
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	70cm x 70cm
<b>Height/width of juvenile plants (average)</b>	30cm x 10cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	6
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1d</b>	<b>Quadrat ID: Q1-2</b>
<b>WP: 282-285</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 409m</b>	<b>Photo No: 313</b>
<b>No. mature plants</b>	58
<b>No. juvenile plants (&lt;30cm)</b>	2
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	18
<b>No. fruiting plants</b>	3
<b>Height/width of mature plants (average)</b>	90cm x 30cm
<b>Height/width of juvenile plants (average)</b>	20cm x 3cm
<b>No. fruits per plant (average)</b>	40
<b>No. flowers per plant (average)</b>	20
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	

<b>Population ID: 1d</b>	<b>Quadrat ID: Q1-3</b>
<b>WP: 186-189</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 399m</b>	<b>Photo No: 314</b>
<b>No. mature plants</b>	60
<b>No. juvenile plants (&lt;30cm)</b>	2
<b>No. dead plants</b>	2
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	1
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	60cm x 40cm
<b>Height/width of juvenile plants (average)</b>	15cm x 4cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	14
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID: 1d</b>	<b>Quadrat ID: Q1-4</b>
<b>WP: 290-293</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 406m</b>	<b>Photo No: 315</b>
<b>No. mature plants</b>	31
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	1
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	14
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	80cm x 40cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	30
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID:</b> 1d	<b>Quadrat ID:</b> Q1-5
<b>WP:</b> 294-297	<b>Coordinates:</b> [REDACTED]
<b>Elevation:</b> 403m	<b>Photo No:</b> 316
<b>No. mature plants</b>	15
<b>No. juvenile plants (&lt;30cm)</b>	15
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	8
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	70cm x 40cm
<b>Height/width of juvenile plants (average)</b>	10cm x 3cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	15
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID:</b> 1d	<b>Quadrat ID:</b> Q1-6
<b>WP:</b> 307-310	<b>Coordinates:</b> [REDACTED]
<b>Elevation:</b> 407m	<b>Photo No:</b> 320
<b>No. mature plants</b>	54
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	14
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	90cm x 70cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	25
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	




<b>Population ID:</b> 1d	<b>Quadrat ID:</b> Q2
<b>WP:</b> 68	<b>Coordinates:</b> [REDACTED]
<b>Elevation:</b> 399 m	<b>Photo No:</b> 360
No. mature plants	14
No. juvenile plants (<30cm)	0
No. dead plants	3
No. seedlings (single stem)	1
No. sprouting plants (multi-stem)	0
No. flowering plants	4
No. fruiting plants	0
Height/width of mature plants (average)	60cm x 40cm
Height/width of juvenile plants (average)	N/A
No. fruits per plant (average)	0
No. flowers per plant (average)	5
Dominant species	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	








<b>Population ID: 1d</b>	<b>Quadrat ID: Q2-1</b>
<b>WP: 298-301</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 403m</b>	<b>Photo No: 318</b>
<b>No. mature plants</b>	89
<b>No. juvenile plants (&lt;30cm)</b>	5
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	15
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	55cm x 40cm
<b>Height/width of juvenile plants (average)</b>	15cm x 4cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	12
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	

<b>Population ID: 1d</b>	<b>Quadrat ID: Q2-2</b>
<b>WP: 302-305</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 397m</b>	<b>Photo No: 319</b>
<b>No. mature plants</b>	85
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	3
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	15
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	60cm x 60cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	14
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Dodonaea bursariifolia</i> , <i>Gahnia ancistrophylla</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	

<b>Population ID: 1e</b>	<b>Quadrat ID: Q1</b>
<b>WP: 81</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 402 m</b>	<b>Photo No: 378</b>
No. mature plants	57
No. juvenile plants (<30cm)	3
No. dead plants	0
No. seedlings (single stem)	0
No. sprouting plants (multi-stem)	0
No. flowering plants	4
No. fruiting plants	0
Height/width of mature plants (average)	55cm x 50cm
Height/width of juvenile plants (average)	30cm x 10cm
No. fruits per plant (average)	0
No. flowers per plant (average)	5
Dominant species	<i>Eucalyptus livida</i> , <i>Westringia cephalantha</i> , <i>Lepidosperma sanguinolentum</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	

<b>Population ID: 1e</b>	<b>Quadrat ID: Q1-1</b>
<b>WP: 278-281</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 409m</b>	<b>Photo No: 312</b>
<b>No. mature plants</b>	32
<b>No. juvenile plants (&lt;30cm)</b>	0
<b>No. dead plants</b>	3
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	23
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	80cm x 30cm
<b>Height/width of juvenile plants (average)</b>	N/A
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	25
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Westringia cephalantha</i> , <i>Lepidosperma sanguinolentum</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	

<b>Population ID: 1e</b>	<b>Quadrat ID: Q1-2</b>
<b>WP: 270-273</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 400m</b>	<b>Photo No: 308</b>
<b>No. mature plants</b>	14
<b>No. juvenile plants (&lt;30cm)</b>	4
<b>No. dead plants</b>	0
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	0
<b>No. fruiting plants</b>	0
<b>Height/width of mature plants (average)</b>	60cm x 30cm
<b>Height/width of juvenile plants (average)</b>	10cm x 3cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	0
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Westringia cephalantha</i> , <i>Lepidosperma sanguinolentum</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
	

<b>Population ID: 1e</b>	<b>Quadrat ID: Q1-3</b>
<b>WP: 274-277</b>	<b>Coordinates:</b> [REDACTED]
<b>Elevation: 395m</b>	<b>Photo No: 309</b>
<b>No. mature plants</b>	53
<b>No. juvenile plants (&lt;30cm)</b>	12
<b>No. dead plants</b>	1
<b>No. seedlings (single stem)</b>	0
<b>No. sprouting plants (multi-stem)</b>	0
<b>No. flowering plants</b>	0
<b>No. fruiting plants</b>	6
<b>Height/width of mature plants (average)</b>	60cm x 60cm
<b>Height/width of juvenile plants (average)</b>	20cm x 4cm
<b>No. fruits per plant (average)</b>	0
<b>No. flowers per plant (average)</b>	5
<b>Dominant species</b>	<i>Eucalyptus livida</i> , <i>Westringia cephalantha</i> , <i>Lepidosperma sanguinolentum</i>
<b>Spring 2018</b>	<b>Spring 2019</b>
	
<b>Autumn 2019</b>	
