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South Australian Arid Lands Natural
Resources Management Board

Arckaringa Daisy (*Olearia arckaringensis*) Survey Report

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Catherine Lynch – Community Ecologist



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Cover image: An Arckaringa Daisy plant in flower on Arckaringa station. Photo taken by Cat Lynch.

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INTRODUCTION

The Arckaringa Daisy (*Olearia arckaringensis*) is endemic to the Arckaringa Hills in northern South Australia. It is restricted to a small area within the Breakaways subregion of the Stony Plains biogeographic region (IBRA). The species is listed as *Endangered* under national legislation (*Environment Protection and Biodiversity Conservation Act 1999*), owing to the species being known only from two locations covering < 100 km² and occupying < 10 km² within that area. It may also be subject to a variety of threats that could cause a decline in the species' extent of occurrence, area of occupancy and the number of individuals.

The Arckaringa Daisy is a small, compact, rounded perennial shrub, which grows to 30 cm high from a woody base. Leaves are greyish-white to light greenish-grey with woolly hairs. Flowers are usually pale purple in colour or occasionally white (Lang, 2008). It was originally thought to be a very long-lived plant due to the gnarled appearance of its thick woody base, however propagation of the species from seed has shown that plants take that form after only 6-7 years (D. Duval, pers. comm., 2017), suggesting it may not be as long-lived as first thought.

The Arckaringa Daisy occurs in association with low, very open woodland of Western Myall (*Acacia papyrocarpa*) and/or Beaked Red Mallee (*Eucalyptus socialis* ssp. *socialis*) with sparse Dead Finish (*Acacia tetragonophylla*) shrubs. It is typically found in the soft, eroding slopes of the breakaway escarpment in powdery, white gypseous substrate (Figure 1), and can regrow from its woody basal parts (Figures 2 and 3), which is useful in the arid zone (Lang, 2008). The total population size of this species has been estimated to be around 250 plants (Lang, 2008), and much less than 1000 plants (Brandle, unpublished data).

Grazing and trampling by livestock and feral herbivores such as donkeys and horses have been identified as a threat to the Arckaringa Daisy. Other potential threats include disturbance from mining and illegal collection of plants (Threatened Species Scientific Committee, 2016, EPBC Conservation Advice). The small population size also makes it especially susceptible to potential impacts of climate change (Lang, 2008).

The Arckaringa Daisy was first discovered in 2000, with a small cluster of plants found in the gullies of the breakaways on Arckaringa station. Peter Lang (State Herbarium of South Australia) collected the information needed to formally describe the daisy-bush as a new species, *Olearia arckaringensis* (Lang, 2008). Several visits to the area were undertaken by scientists in the following years to look for and learn more about the daisy, with only minor expansion to the known single population in adjacent gullies. A further two populations were discovered in 2011 (Brandle, unpublished data) along the same breakaway escarpment on the neighbouring property, Evelyn Downs, approximately 22 km north-west from the Arckaringa colonies (Figure 4). It was therefore proposed that the Arckaringa Daisy could have a continuous distribution throughout suitable habitat right along the Arckaringa valley breakaway escarpment on Arckaringa and Evelyn Downs stations, and a possibility that undiscovered populations occur more widely in the area, given the remoteness and inaccessibility of the terrain (Lang, 2008).



The aim of this survey was to search areas that had not previously been investigated within a predicted extent of occurrence (Brandle, predicted distribution supplied for EPBC Conservation Advice, 2016) along the breakaway escarpment predominantly on Evelyn Downs and Arckaringa stations (see Figure 4), to determine the distribution of the Arckaringa Daisy in the potential habitat between known records, and to gather information on population size, habitat preferences, and potential threatening processes relevant to the species' conservation.



Figure 1. The soft, white slopes of the breakaway escarpment, favoured by the Arckaringa Daisy.





Figure 2. An Arckaringa Daisy plant with a woody base (bottom left).



Figure 3. A white-flowered form of the Arckaringa Daisy, showing thick dead woody stems. (left).



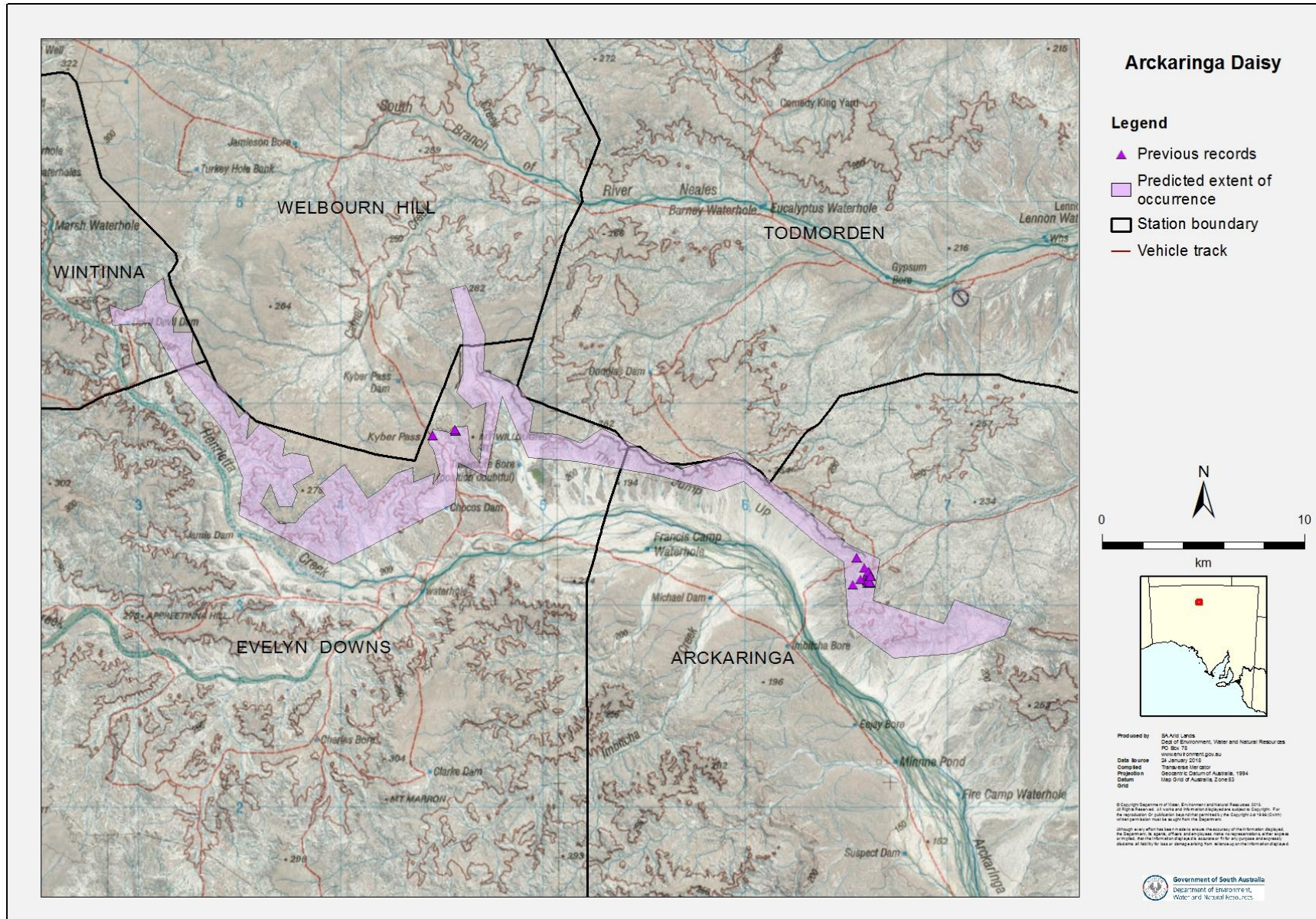


Figure 4. The location of known populations of the Arckaringa Daisy prior to the 2017 survey and the predicted extent of occurrence.



METHODS

Survey areas

A team of up to nine observers at a time searched areas within the predicted extent of occurrence (Figure 4) to determine the presence of the Arckaringa Daisy. The survey was undertaken from 25-29 October and on 31 October and 1 November 2017. The area between the original Arckaringa population and the Todmorden boundary was not searched during this survey as this area had been searched previously by other scientists (D. Duval, pers. comm., 2017). High resolution aerial imagery was used to identify areas that appeared to contain white gypseous substrate, which were targeted for searches. In the field, cursory assessments of the apparent suitability of habitat were undertaken from a vehicle or from vantage points that allowed a good view of the landform to determine whether that location warranted a targeted search. Targeted searches for the Arckaringa Daisy were undertaken on foot (Figures 5, 6 and 7). Clearance to survey for the Arckaringa Daisy was provided by Antakarintja senior custodian Bill Lennon, and William Lennon.

A “site” was considered a place at which a search for the Arckaringa Daisy was undertaken at a location discrete to other search areas (either spatially and/or a different surveyor(s)), or a location at which a separate count of the Arckaringa Daisy (if detected) was undertaken. The location of each survey site was marked using a GPS.



Figure 5. Volunteer Sue Kenny, Rob Brandle, Lil Kamphorst and volunteer Jamie Dunlop excited to be heading towards their first glimpse of the Arckaringa Daisy on Arckaringa station.





Figure 6. Chevahn Hoad (Kanku-Breakaways Conservation Park), Lil Kamphorst and volunteer Sue Kenny recording Arckaringa Daisy data within the species' stronghold on Arckaringa station.



Figure 7. Part of the survey team searching for the Arckaringa Daisy on the white gypseous slopes of the breakaway escarpment on Evelyn Downs. L:R: Randall Johnson, Peter Lang, Jamie Dunlop, Rob Brandle, Sue Kenny and Dan Duval.



Population assessment, distribution and life stage

At each site at which the Arckaringa Daisy was detected, the distribution of the population was assessed by walking through the area until no more Arckaringa Daisy plants were encountered. An approximate estimate of the area of occupancy at each site was noted and later verified using GPS track logs, and the approximate boundary of the area marked using a GPS.

An estimate of the population size at each site was also recorded by tallying each plant that was observed. A tally of the number of plants in each life stage was also undertaken, based on the criteria in Table 1.

Table 1. The criteria used to score the life stage each plant.

Life Stage	Criteria
<i>Sub-adult/seedling</i>	Plant is ≤ 6 mm tall
<i>Mature</i>	Plant is > 6 mm tall, but is not senescing and does not have a large woody base
<i>Senescing</i>	Plant is > 6 mm tall, is senescent (e.g. leaves have dropped from stems) and/or has a large woody base

Threatening processes

Herbivore grazing and trampling

The condition of the Arckaringa Daisy plants at each site was also assessed by recording the “utilisation state” of each plant, based on the Native Vegetation Council Rangelands Assessment Manual (Native Vegetation Council, 2017) and using herbivore impact assessment methodology (Brandle, 2016). The level of utilisation (or browsing) of each species was determined using three utilisation states, based on the criteria in Table 2 (also see Figure 8). The presence of other signs of grazing were also recorded, such as the presence of scats and/or tracks of as macropods, goats, sheep, rabbit and donkey.

Table 2. The criteria used to score the utilisation state of each plant.

Utilisation state	Criteria
<i>Intact</i>	Plant has grown to expected functional form (woody structure of stems, branches, twigs, grass stems are not noticeably interrupted by action of herbivores).
<i>Modified</i>	Plant shape has been noticeably modified from the intact functional form – leaves, twigs, branches and/or grass stems have obviously been removed or pruned back over the whole or part of the plant.
<i>Over-utilised</i>	More than 50% of the intact functional form of the plant is absent (leaves and twigs are restricted to parts of the plant that are difficult for a herbivore to access, stems/branches ≥ 6 mm browsed back or broken off).



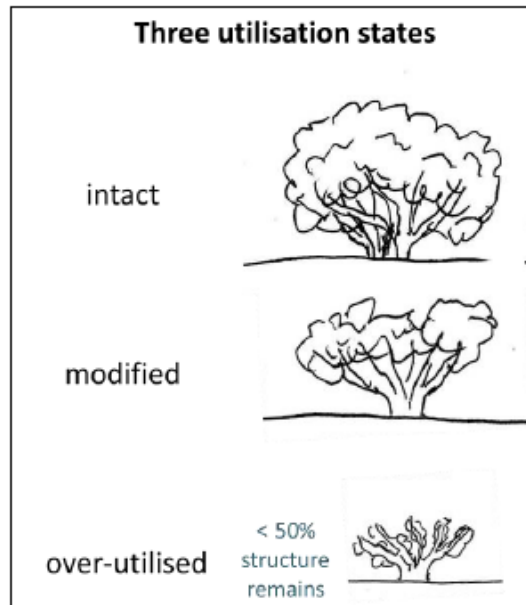


Figure 8. The three utilisation states used as an estimate of grazing pressure.

Erosion

Any evidence of or potential for erosion at survey sites was also noted, such as any obvious water runoff or absence of substrate at the base of plants.

Associated plant species

At each site at which the Arckaringa Daisy was detected, other plant species present at that location were recorded. If a site was considered continuous with an adjacent site (i.e. no difference in plant community and only signified a restart of counting of plant individuals), then a different plant species list was not recorded. An indication of the dominant species within each plant community was also noted.

For any species that could not be identified in the field, a specimen was collected and later identified using reference material, or with the assistance of staff at the State Herbarium of South Australia.



RESULTS AND DISCUSSION

Survey areas

Over 105 person hours were spent searching for Arckaringa Daisy across each of the specific survey sites, with around 1580 ha of potential habitat intensely surveyed. The majority of the survey was undertaken across Arckaringa and Evelyn Downs stations, with a small amount of potential habitat also searched on Wintinna and Todmorden station, however the Arckaringa Daisy was not detected in apparently “ideal” habitat on Wintinna, whilst Todmorden appeared to lack the characteristic geomorphology for Arckaringa Daisy habitat.

A total of 73 sites were surveyed, with the Arckaringa Daisy recorded at 42 of those sites (Figure 10). The actual size of the area searched at each site varied (see Figure 11). A full list of survey sites and the survey effort at each site is provided in Appendix 1.



Figure 9. Expedition leader Cat Lynch, Kan̄ku-Breakaways Conservation Park staff Chevahn Hoah, Shontelle Lennon and Joel Kowold, and volunteers Connie Taylor and Sue Kenny noting the lack of herbivore impact on the highly palatable Quandong, resplendent with their leaves extending to the ground and multiple cohorts of young plants. This highlighted that the main stronghold for the Arckaringa Daisy has been subject to very low levels of introduced herbivore activity.



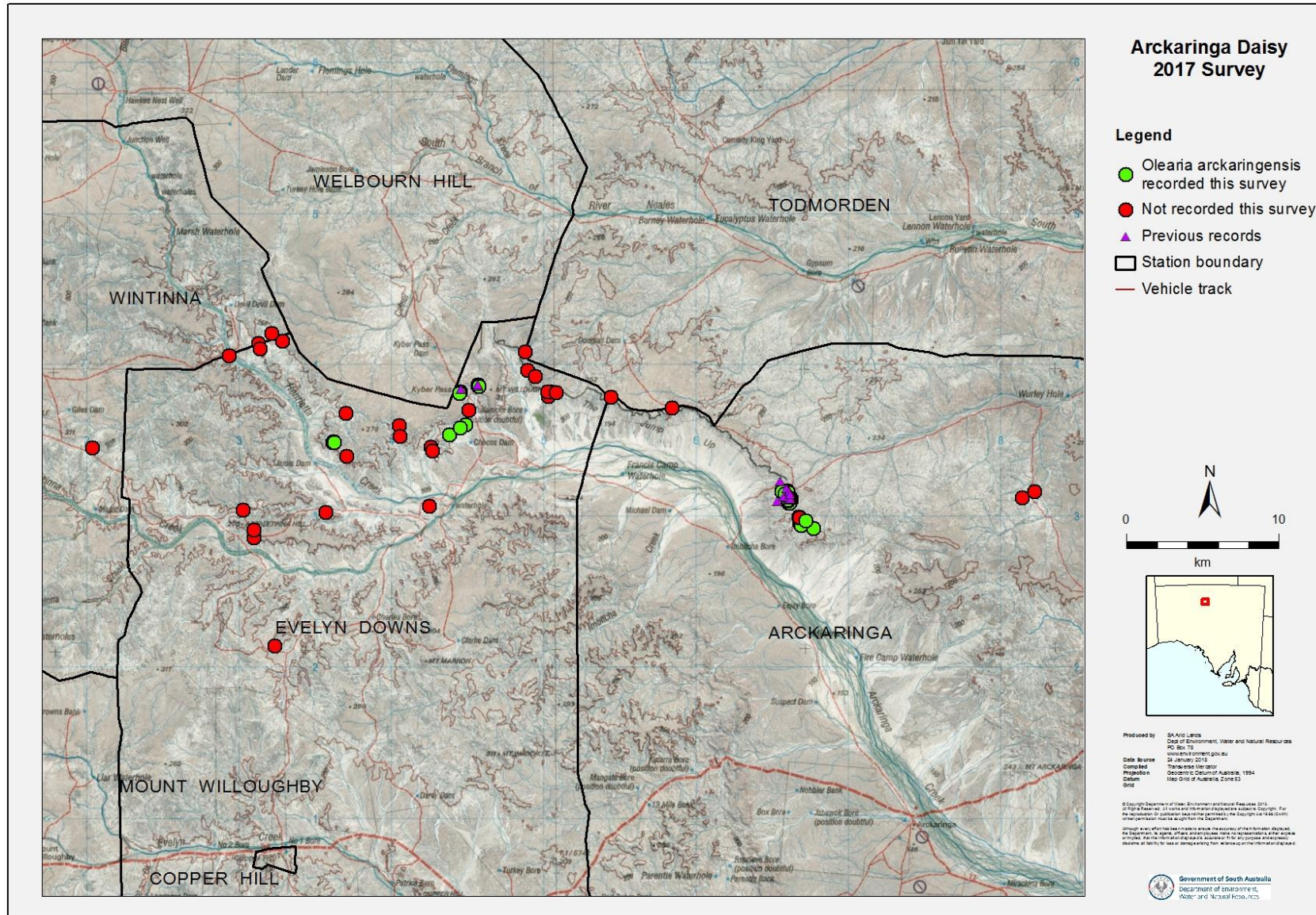


Figure 10. The location of sites surveyed during the 2017 survey. Actual areas searched at each site were more extensive than each point. Previously known populations are also shown.



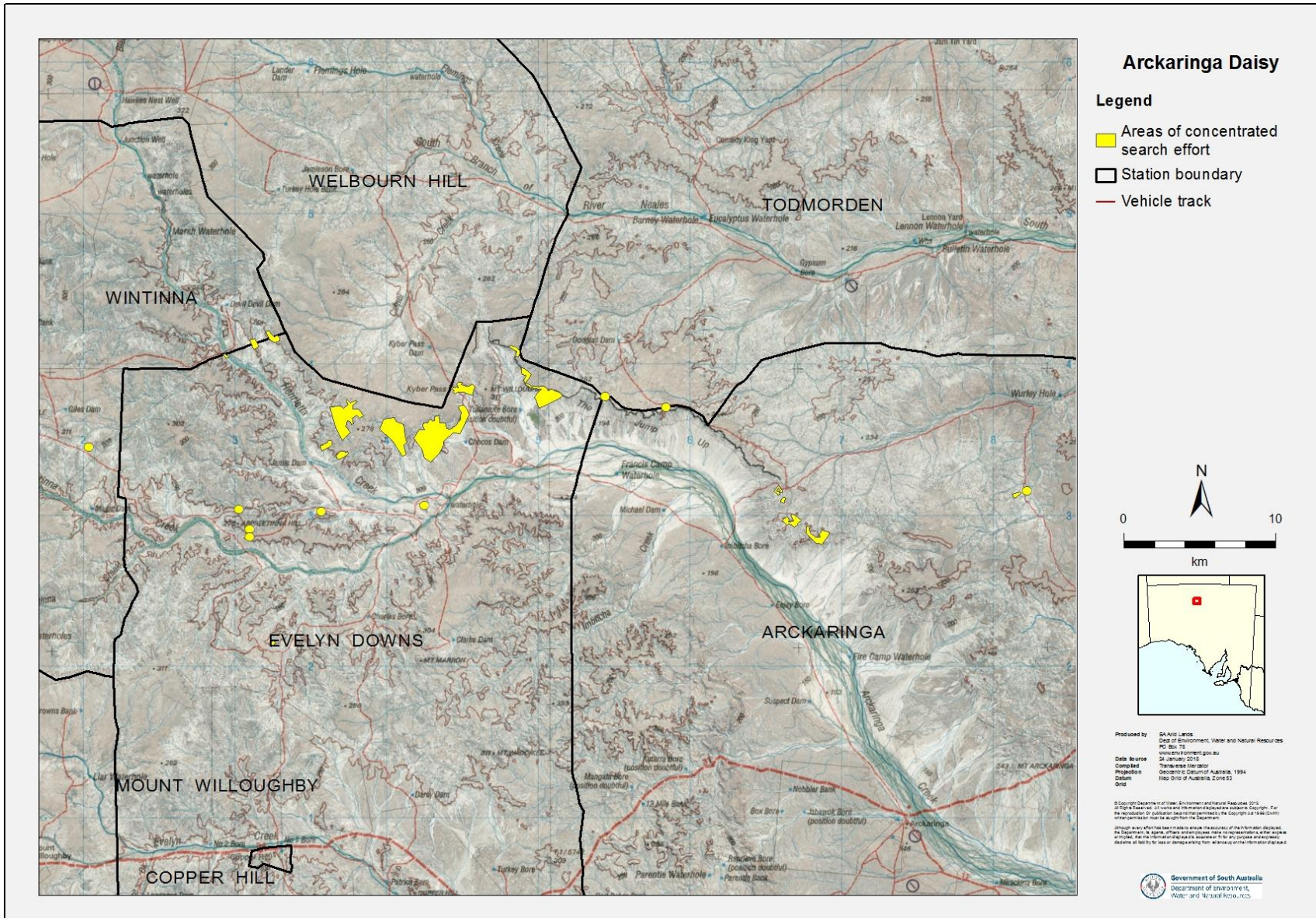


Figure 11. The location of areas of concentrated search effort during the 2017 survey.



Population assessment, distribution and life stage

A total of 2138 Arckaringa Daisy plants were counted during the survey. Some of these individuals are likely to have been included in previous counts, particularly within the original population on Arckaringa station, however the majority of plants were newly identified individuals.

Six discrete populations of the Arckaringa Daisy were identified following the survey; four on Evelyn Downs and two on Arckaringa station (Figure 13). The size of each population ranges from just 13 plants to 1370 plants, with relatively small populations detected on Evelyn Downs and two large populations recorded on Arckaringa (Figure 12). The actual number of plants in the ARCAD01 population is effectively higher than 1370, given some parts of this area were not covered during the 2017 survey, and additional locations of plants are known to exist (BDBSA Department of Environment, Water and Natural Resources, 2017).

The extent of occurrence of the Arckaringa Daisy was found to be approximately 37 km across the Arckaringa valley northern escarpment on Arckaringa and Evelyn Downs stations. The extent of occurrence was expanded by approximately 9 km to the south-west of the western extent of the known population on Evelyn Downs, and by approximately 2.5 km to the south-east of the original known population on Arckaringa station. Within this extent of occurrence, the species was found to have a very patchy distribution and limited occupancy, with six discrete populations recorded (Figure 13) and no evidence of the species occupying adjoining areas of seemingly suitable habitat, despite extensive searches.

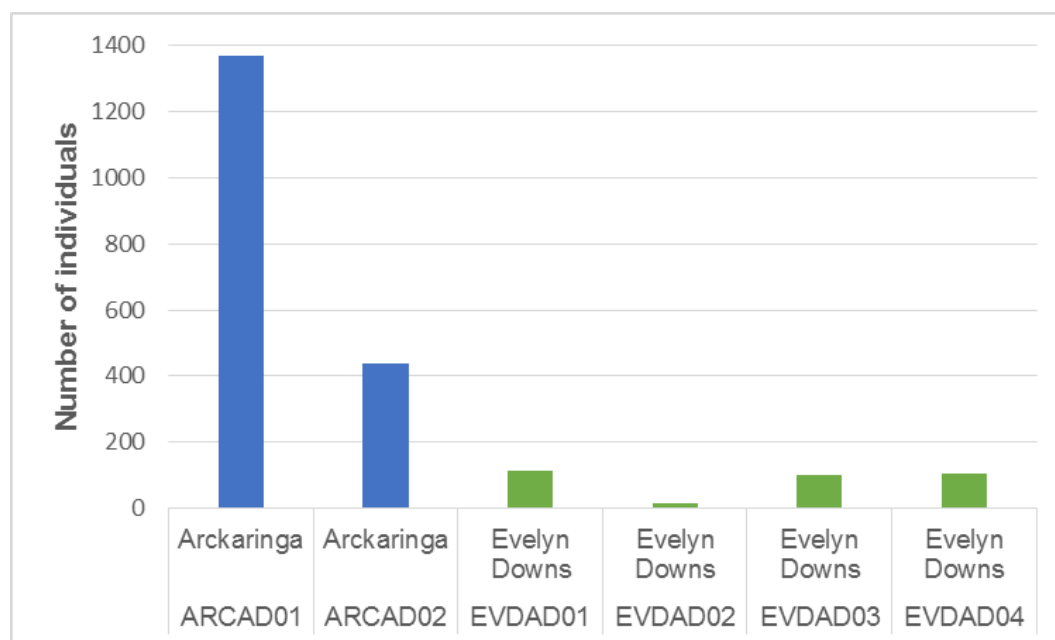


Figure 12. The number of individual Arckaringa Daisy plants counted within each population during the October 2017 survey. Blue denotes Arckaringa station and green denotes Evelyn Downs station.



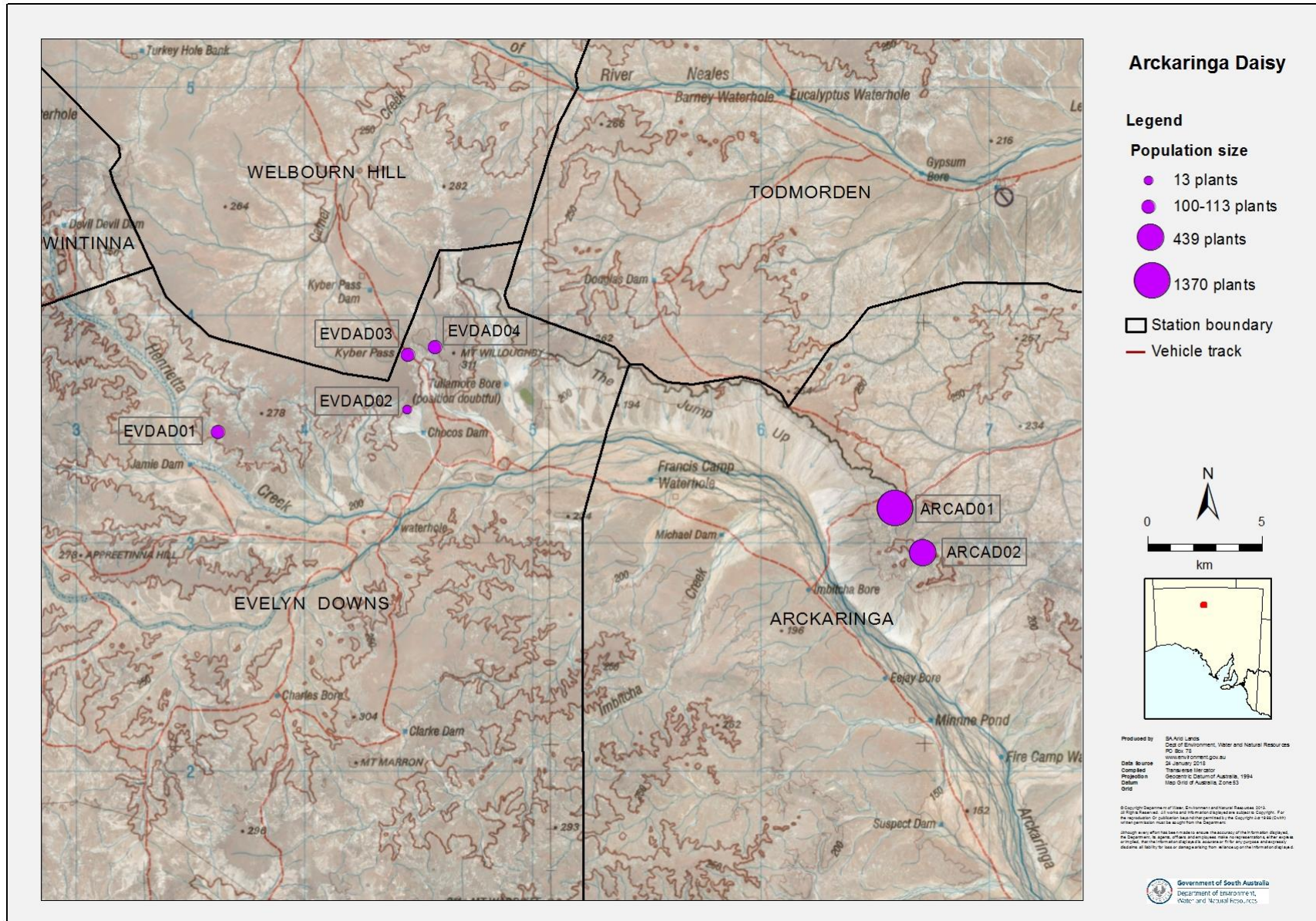


Figure 13. The location of discrete populations of the Arckaringa Daisy identified based on the results of the 2017 survey and previous records.



The majority of plants recorded were considered “mature”, with very few sub-adult/seedlings recorded (3.1 % of plants) and only 8.2 % of plants noted as being senescent or having a large woody base (Figure 14).

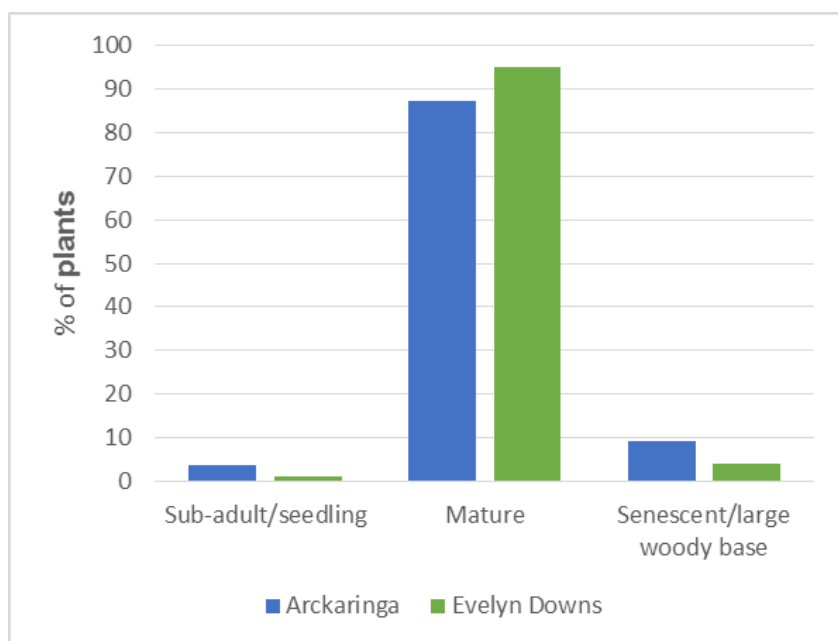


Figure 14. The proportion of Arckaringa Daisy plants recorded in each life stage.

Associated plant species

A list of plant species was recorded for 21 of the 42 sites at which the Arckaringa Daisy was detected, with a total of 69 plant species recorded across all sites. The most common plant species recorded included *Arabidella glaucescens* (Figure 16), *Anemocarpa saxatilis* (Hill Sunray) (Figure 17), *Stackhousia clementii* (Limestone Candles), *Acacia papyrocarpa* (Western Myall), and *Ptilotus nobilis* ssp. *nobilis* (Regal Fox-tail) (previously *Ptilotus exaltatus*) (Figure 18), which were recorded at more than 75 % of sites (Figure 15). Other relatively common species are shown in Figure 15. A full list of plant species recorded at each site is provided in Appendix 2.

As recorded during previous surveys (Lang, 2008), the plant community present at the majority of sites at which the Arckaringa Daisy was detected during this survey was Low Very Open Woodland of *Acacia papyrocarpa* and/or *Eucalyptus socialis* with sparse *A. tetragonophylla*. Furthermore, prominent species in the ground layer were somewhat analogous with that found previously, with *Arabidella glaucescens*, *Anemocarpa saxatilis*, *Stackhousia clementii*, *Ptilotus whitei* (Small-leaf Mulla Mulla) (Figure 19) and *Zygophyllum crassissimum* (Thick Twinleaf) (Rare in SA) (Figure 20) recorded at the majority of sites.

Interestingly, some of the species which have previously been identified as being prominent in the ground layer in association with the Arckaringa Daisy (Lang, 2008) were not found to be as prominent during this survey. This is likely partly due to the original findings being based



only on the original core population on Arckaringa station whereas this survey covered a more extensive area, and conditions at the time of the survey limit the presence of annual species such as *Goodenia calcarata* (Streaked Goodenia), *Flaveria trinervia* (Speedy Weed), and *Minuria annua* (Annual Minuria).

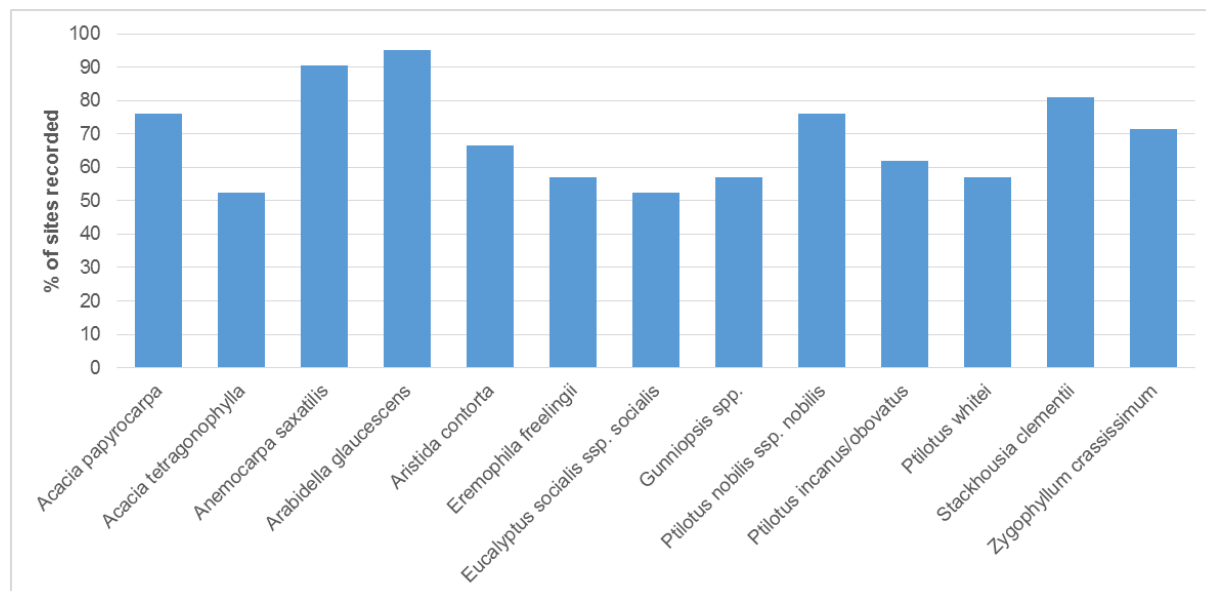


Figure 15. Plant species recorded at more than 50 % of sites at which the Arckaringa Daisy was detected (n = 21).

The conservation listed *Ptilotus barkeri* (Barker's Mulla Mulla) (Rare in SA) (Figure 21) was also recorded at a number of sites on both Arckaringa and Evelyn Downs, and is similarly confined to powdery, white, gypseous substrates. However, this species was only recorded at 28.6 % of all sites and so it may not be of use as an indicator of potential habitat as previously speculated (Lang, 2008).

Differences between localities

There were differences in the dominance of certain plant species between sites on Arckaringa station compared to sites on Evelyn Downs station. Most notably, overstorey species typically present at Arckaringa station populations, such as *Acacia papyrocarpa*, *Eucalyptus socialis* and *A. tetragonophylla*, were less prevalent at Evelyn Downs station populations (Figure 22). Similarly, some ground layer species, such as *Gunniopsis spp.*, *Ptilotus whitei* and *Stackhousia clementii* were also less frequent at Evelyn Downs populations. However, other ground layer species, such as *Anemocarpa saxatilis*, *Arabidella glaucescens*, and *Zygophyllum crassissimum* were relatively equally common, and therefore could perhaps be used as indicators of potential habitat for the Arckaringa Daisy more confidently than other species previously considered as ecological associates. While detailed plant species lists were not recorded for sites at which the Arckaringa Daisy was not detected, these species were also common at many of those null sites, so their use as indicators warrants further investigation.





Figure 16. *Arabidella glaucescens* plant (L) and flowers and fruit (R).



Figure 17. *Anemocarpa saxatilis* (Hill Sunray).





Figure 18. *Ptilotus nobilis* ssp. *nobilis* (Regal Fox-tail) (previously *Ptilotus exaltatus*), with *Arabidella glaucescens* to the right.



Figure 19. *Ptilotus whitei* (Small-leaf Mulla Mulla).



Figure 20. *Zygophyllum crassissimum* (Thick Twinleaf) plant and flowers (L) and fruit (R) (Rare in SA).



Figure 21. *Ptilotus barkeri* (Barker's Mulla Mulla) (Rare in SA).



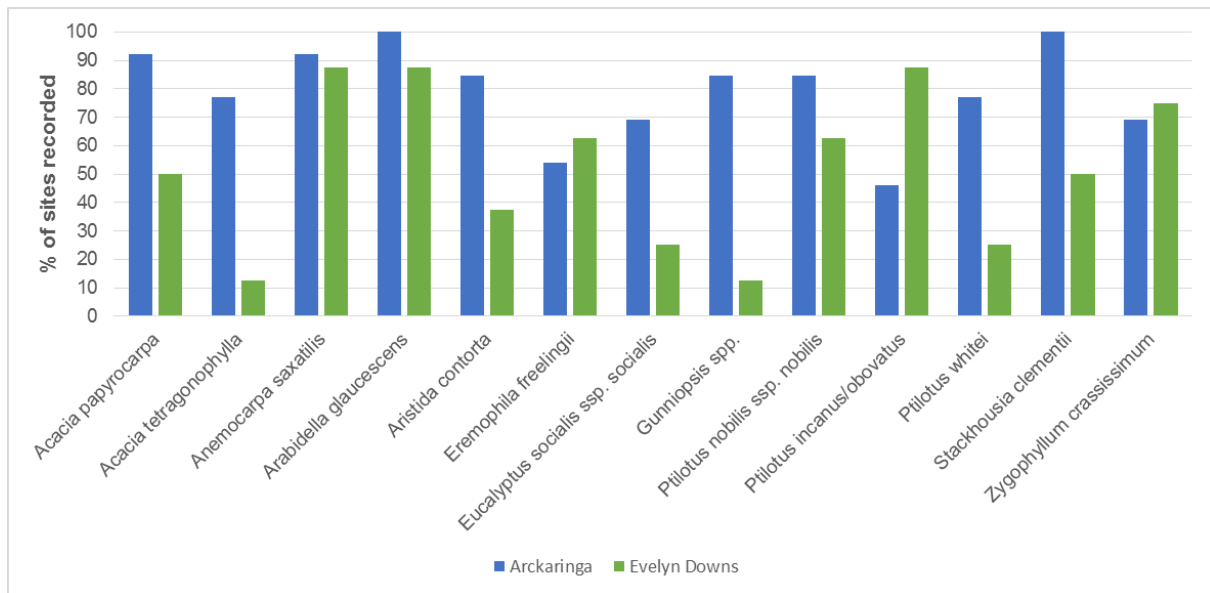


Figure 22. The proportion of plant species recorded at sites at which the Arckaringa Daisy was detected on Arckaringa and Evelyn Downs station (n = 13 and 8, respectively). Only species recorded at more than 50 % of all sites are shown.

Threat assessment

Herbivore grazing and trampling

While evidence of browse was noted on some individual plants, browsing by herbivores was not identified as significantly impacting the surveyed populations of Arckaringa Daisy. Only minor grazing impacts were recorded, with the majority of plants considered to be “intact” (Figure 23). A small proportion of plants were in the “modified” state and had obvious signs of having been browsed, while no plants were considered to be “over-utilised”.

All plants recorded as “modified” were on Arckaringa station, predominantly at only two sites, however it was unclear which herbivore species was responsible for the impact, with minimal evidence of herbivory at sites on Arckaringa station, kangaroo scats at one site and tracks noted at two sites.

More extensive evidence of the presence of herbivores was observed on Evelyn Downs station, with donkey, cattle, kangaroo and/or rabbit scats recorded at 42.9 % of sites. Donkeys, camels and horses were also observed at some sites. Evidence of herbivore activity was recorded at more sites where the Arckaringa Daisy was detected compared to those where it was not detected (30.0 vs. 20.0% of sites, respectively), perhaps indicating that Arckaringa Daisy are relatively unpalatable, and would therefore only be at risk when herbivore numbers exceed availability of more palatable alternatives.

All of the four sites surveyed on Wintinna had evidence of the presence of herbivores, with both scats and tracks of cattle, camel, donkey, kangaroo and rabbit recorded, and camels and donkeys also observed.



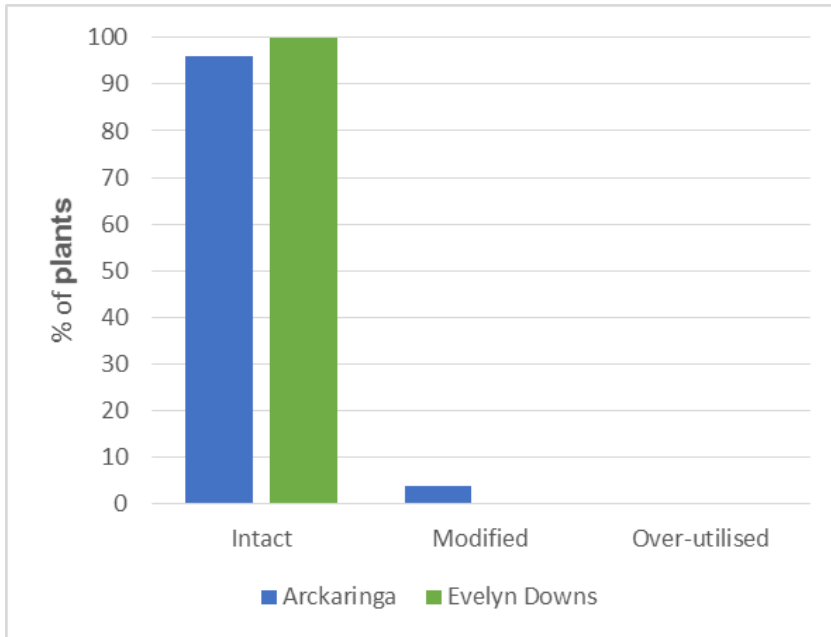


Figure 23. The proportion of Arckaringa Daisy plants recorded in each utilisation state.

Trampling by large herbivores may be a threat to Arckaringa Daisy populations where it causes direct damage or excessive erosion around the roots of plants. Donkey, horse and camel activity was relatively widely noted at sites on Evelyn Downs and Wintinna stations, although no actual evidence of damage from trampling was detected during the survey. As no Arckaringa Daisy plants were found at sites on Wintinna station and there were relatively low numbers recorded on Evelyn Downs, it is difficult to assess the threat risk. Evidence of relatively high grazing impact was noted on other species on Wintinna station, particularly *Ptilotus barkeri* and *Santalum acuminatum* (Quandong), suggesting that herbivore impact as a potential threat to Arckaringa Daisy populations should not be discounted. Research aimed at determining nutrition value of the daisy and palatability to the various herbivore species would assist in determining the species' conservation needs. .

A notable finding was that only relatively young, more vigorous plants were recorded on Evelyn Downs, whereas a wider range of age classes was recorded on Arckaringa (Figure 14). It is unclear why this is the case, but perhaps individuals on Evelyn Downs are not surviving to the senescent, woody base form. This could be a result of higher grazing pressure.

The Evelyn Downs populations of the Arckaringa Daisy are closer to permanent waterpoints than the populations on Arckaringa station (Table 3), with three waterpoints to the south, east and north of three of the four Evelyn Downs populations (EVDAD02, EVDAD03 and EVDAD04) compared to just one waterpoint to the south-west of the Arckaringa populations, and the next closest waterpoint over 17 km to the east. Fewer Arckaringa Daisy individuals were counted within the Evelyn Downs populations, which may be another indication of relatively higher herbivore pressure within Arckaringa Daisy habitat. The EVDAD02 population, for example, is only 1.2 km from the nearest waterpoint. This population comprises only 13 plants and, in fact, only one plant was counted at one "site" within that population. The sites that were surveyed on Wintinna station are only around 3 km to the closest waterpoint,



which may also be a factor in why the Arckaringa Daisy was not detected at those sites, despite being in seemingly “ideal” habitat.

Table 3. The distance between the Arckaringa Daisy populations and permanent waterpoints.

Population ID	Property	No. of individuals	Distance to water (km)
ARCAD01	Arckaringa	1370	5.20
ARCAD02	Arckaringa	439	5.25
EVDAD01	Evelyn Downs	113	1.85
EVDAD02	Evelyn Downs	13	1.22
EVDAD03	Evelyn Downs	100	3.33
EVDAD04	Evelyn Downs	103	3.53

Erosion

Erosion was noted at the base of some plants in the south-east portion of the original core population on Arckaringa station (ARCAD01) (Figure 13), with the woody base of plants exposed, however it did not appear to be affecting the health of plants. Erosion from water runoff and disturbance from rock falls were also noted as potential threats to plants at one site within the south-eastern population on Arckaringa station (ARCAD02). The potential for erosion from water runoff was also highlighted as a potential threat to the western-most population on Evelyn Downs (EVDAD01), however it was considered that plants are generally protected given they exist on higher ground between drainage channels.

It was noted that Arckaringa Daisy plants appeared to be reasonably shallow-rooted and easy to dislodge from the soil, which suggests they could potentially be susceptible to impacts from major flash flooding events which could strip away the surface soil and dislodge plants, thereby potentially causing localised declines and extinctions. However, water runoff could in fact also aid the dispersal of seed, with a number of plants noted growing within minor drainage channels at some sites, downslope of the soft, white, gypseous breakaway slopes typical of where the Arckaringa Daisy is usually found.



Implications and further work

The results of this survey indicate that the Arckaringa Daisy is rare and highly restricted. While the original population on Arckaringa is relatively large and appears stable, the other populations are relatively small in size, and therefore more susceptible to disturbance episodes by herbivores that kills young and adult plants (e.g. during long dry spells, potentially leading to localised extinctions).

Ongoing monitoring and targeted research across a subset of the easily accessible sites assessed during this survey would provide a long-term understanding of the responses of the Arckaringa Daisy to a range of variables over time. Recommended activities include:

Monitoring known populations

- Establish a quantitative sampling regime to determine plant density, numbers, recruitment, and impacts on plant population health and condition state.
- Include relative abundance of other plant species using similar methods to that used in this survey.
- Established sample plots using identical protocols where the Arckaringa Daisy is not currently present within areas of seemingly suitable habitat, to monitor whether the Arckaringa Daisy colonises additional areas, perhaps after high rainfall events.
- Monitor the population size of the currently relatively small populations on Evelyn Downs in particular (e.g. EVDAD02). This would be valuable to determine if numbers fluctuate in response to environmental factors, such as high rainfall events which may trigger large recruitment events, or times of rainfall deficiency which may limit recruitment and impact plant survival.
- Herbivore exclusion cages can be incorporated into the survey design to assess if herbivores have a significant impact on this species.

Research to fill knowledge gaps

- Undertake demographic monitoring of specific individual plants to provide valuable information on the fate of individuals over time; including recruitment, mortality, rate of growth and flowering, and browsing impacts.
- Investigate the soil requirements and nutrient value of the Arckaringa Daisy to further improve understanding of the ecological requirements of the species, through testing of soil type and chemistry evaluation at sites with and without the Arckaringa Daisy. This could potentially be undertaken in combination with seed germination and propagation trials with the Seed Conservation Centre to better understand what variables determine successful establishment, and may help to explain why plants have not been detected in seemingly “ideal” habitat.
- Involve university Honours students and/or PhD candidates to assist with targeted research.



Wider surveys

- Work with traditional owners and staff on Mount Willoughby IPA and the Kan^uku-Breakaways Conservation Park to investigate areas of suitable habitat to determine the presence or absence of the Arckaringa Daisy on these properties to add to existing knowledge on the extent of occurrence and ecological requirements of this species.
- Map out areas of suitable habitat on these properties, and investigate soil type and chemistry within each area. This information could be used to inform establishment of additional populations to supplement existing populations and safeguard against extinction.

Formal protection

- Work with landholders to develop protection measures for the Arckaringa Daisy against key threats, such as through environmental stewardship options which can provide alternative income opportunities for landholders while protecting areas of high biodiversity value and threatened species habitat that are not found in national parks or reserves.



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REFERENCES

Department of Environment, Water and Natural Resources (2017). *Biological Databases of SA (BDBSA)*. Data of Extraction: June 2017.

Threatened Species Scientific Committee (2016). *Conservation Advice* *Olearia arckaringensis* *Arckaringa daisy*. Canberra: Department of the Environment and Energy. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/86648-conservation-advice-07122016.pdf>.

Lang, P. (2008). *Olearea arckaringensis* (Asteraceae: Astereae), a new endangered daisy-bush from northern South Australia. *Journal of the Adelaide Botanic Gardens*, 22, 57-61.



APPENDICES

Appendix 1. Summary of sites and search effort for the Arckaringa Daisy during the 2017 survey. *denotes previously known population.

Site ID	Property	Easting	Northing	Location description	Date	No. of observers	Total search time (person hours)	Approx search area (ha)	Arckaringa Daisy detected
ARC01	Arckaringa	465947	6931682	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	25/10/2017	5	2.92	2.0	Y
ARC02	Arckaringa	465994	6931568	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	25/10/2017	8	4.67	5.0	Y
ARC03	Arckaringa	465615	6931659	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	25/10/2017	2	1.33	0.6	Y
ARC04	Arckaringa	465643	6931636	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	25/10/2017	2	2.00	0.2	Y
ARC05	Arckaringa	465642	6931606	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	25/10/2017	2	2.67	1.1	Y
ARC06	Arckaringa	465601	6931632	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	25/10/2017	2	0.50	0.1	Y
ARC07	Arckaringa	465786	6931469	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	25/10/2017	2	0.50	0.3	Y
ARC08	Arckaringa	465821	6931438	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	25/10/2017	2	0.67	0.3	Y
EVD01	Evelyn Downs	444502	6938230	Kyber Pass, approx 3.5km N of Chocos Dam	26/10/2017	2	1.00	0.3	Y
EVD02	Evelyn Downs	444445	6938131	Kyber Pass, approx 3.3km N of Chocos Dam	26/10/2017	2	2.00	2.0	Y



Site ID	Property	Easting	Northing	Location description	Date	No. of observers	Total search time (person hours)	Approx search area (ha)	Arckaringa Daisy detected
EVD03	Evelyn Downs	450272	6937893	1.7km NE of Tullamore Bore	26/10/2017	2	1.33	21.0	N
EVD04	Evelyn Downs	450424	6938208	2km NE of Tullamore Bore	26/10/2017	2	0.83	3.5	N
EVD05	Evelyn Downs	450211	6938214	1.8km NE of Tullamore Bore	26/10/2017	2	1.57	25.0	N
EVD06	Evelyn Downs	445628	6938645	Kyber Pass, approx 3.8km N of Chocos Dam	26/10/2017	2	3.00	0.0	Y
EVD07	Evelyn Downs	445658	6938623	Kyber Pass, approx 3.8km N of Chocos Dam	26/10/2017	2	0.00	0.4	Y
EVD08	Evelyn Downs	445699	6938558	Kyber Pass, approx 3.8km N of Chocos Dam	26/10/2017	2	0.00	0.0	Y
EVD09	Evelyn Downs	450783	6938176	2.3km NE of Tullamore Bore	26/10/2017	2	5.00	65.0	N
EVD10	Evelyn Downs	444841	6936046	Approx 1.2km NE of Chocos Dam	26/10/2017	2	6.00	10.0	Y
EVD11	Evelyn Downs	442576	6934537	Approx 2km W of Chocos Dam	26/10/2017	2	4.33	75.0	N
EVD12	Evelyn Downs	445064	6936968	Kyber Pass, approx 1.7km N of Chocos Dam	26/10/2017	2	3.00	21.0	N
EVD13	Evelyn Downs	442658	6934302	Approx 2km SW of Chocos Dam	26/10/2017	2	6.00	49.0	N
ARC09	Arckaringa	466223	6931133	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	4.67	9.0	Y



Site ID	Property	Easting	Northing	Location description	Date	No. of observers	Total search time (person hours)	Approx search area (ha)	Arckaringa Daisy detected
ARC10	Arckaringa	466190	6931145	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC11	Arckaringa	466164	6931128	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC12	Arckaringa	466170	6931116	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC13	Arckaringa	466110	6931099	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC14	Arckaringa	466201	6931026	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC15	Arckaringa	466112	6930970	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC16	Arckaringa	466101	6931047	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC17	Arckaringa	466086	6930844	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC18	Arckaringa	466120	6930850	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC19	Arckaringa	466001	6930980	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC20	Arckaringa	466016	6930987	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC21	Arckaringa	466017	6931003	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y



Site ID	Property	Easting	Northing	Location description	Date	No. of observers	Total search time (person hours)	Approx search area (ha)	Arckaringa Daisy detected
ARC22	Arckaringa	466027	6931020	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC23	Arckaringa	466038	6931059	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	Included with ARC09	0.0	Y
ARC24	Arckaringa	466762	6929550	Breakaways approx. 5km ENE of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	0.17	10.0	Y
ARC25	Arckaringa	466813	6929460	Breakaways approx. 5km ENE of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	0.17	1.5	Y
ARC26	Arckaringa	466870	6929356	Breakaways approx. 5km ENE of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	0.67	0.8	Y
ARC27	Arckaringa	466724	6929934	Breakaways approx. 5km ENE of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	1.00	20.0	Y
ARC28	Arckaringa	467708	6929174	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	4.00	60.0	Y
ARC29	Arckaringa	458408	6937135	5.4 km SE of Douglas Dam, Arckaringa/Todmorden boundary, Arckaringa Station	27/10/2017	2	0.33	0.3	N
ARC30	Arckaringa	454397	6937851	3.8 km SE of Douglas Dam, Arckaringa/Todmorden boundary	27/10/2017	2	0.33	0.3	N
EVD14	Evelyn Downs	448895	6939627	Approx 700m SW of Todmorden boundary, approx 2.5km N of Tullamore Bore	27/10/2017	2	3.00	21.0	N
ARC31	Arckaringa	466796	6929892	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	2.00	0.1	N
ARC32	Arckaringa	467184	6929655	Breakaways approx. 5 km E of Arckaringa Creekline where track heads E from Imbitcha Bore	27/10/2017	2	0.67	0.4	Y



Site ID	Property	Easting	Northing	Location description	Date	No. of observers	Total search time (person hours)	Approx search area (ha)	Arckaringa Daisy detected
ARC33	Arckaringa	482191	6931610	Approx 20.4km E of Imbitcha Bore, track S to Arckaringa HS from top of escarpment	27/10/2017	4	2.00	0.3	N
ARC34	Arckaringa	481401	6931217	Approx 19.6km E of Imbitcha Bore, track S to Arckaringa HS from top of escarpment	27/10/2017	2	1.00	10.0	N
EVD15	Evelyn Downs	449429	6939242	Approx 2km N of Tullamore Bore, approx 1km W of Todmorden boundary	27/10/2017	2	5.00	50.0	N
EVD16	Evelyn Downs	436167	6934860	Approx 1.8km NE of Jamie Dam	28/10/2017	2	1.67	38.0	Y
EVD17	Evelyn Downs	436153	6934897	Approx 1.8km NE of Jamie Dam	28/10/2017	2	Included with EVD16	As for EVD16	Y
EVD18	Evelyn Downs	436138	6934888	Approx 1.8km NE of Jamie Dam	28/10/2017	2	Included with EVD16	As for EVD16	Y
EVD19	Evelyn Downs	436119	6934836	Approx 1.8km NE of Jamie Dam	28/10/2017	2	Included with EVD16	As for EVD16	Y
EVD20	Evelyn Downs	436223	6934854	Approx 1.9km NE of Jamie Dam	28/10/2017	2	1.67	0.0	Y
EVD21	Evelyn Downs	437004	6933931	Approx 2km NE of Jamie Dam	28/10/2017	2	3.33	20.0	N
EVD22	Evelyn Downs	436980	6936794	Approx 3.5km N of Jamie's Dam	28/10/2017	2	4.00	40.0	N
EVD23	Evelyn Downs	440471	6936000	Approx 4.5km west of Choco's Dam, approx 6km north-east of Jamie's Dam, Evelyn Downs	28/10/2017	2	3.00	40.0	N
EVD24	Evelyn Downs	440542	6935262	Approx 4km W of Chocos Dam	28/10/2017	2	3.00	35.0	N



Site ID	Property	Easting	Northing	Location description	Date	No. of observers	Total search time (person hours)	Approx search area (ha)	Arckaringa Daisy detected
EVD25	Evelyn Downs	435670	6930241	Approx 1.3km W of Jamie Dam track T-junction, approx 3.3km S of Jamie Dam	28/10/2017	2	0.33	0.3	N
EVD26	Evelyn Downs	431034	6928583	Appreetinna Hill, approx 12km W of Jamie Dam track T-junction	28/10/2017	2	0.33	0.3	N
EVD27	Evelyn Downs	430762	6929020	Appreetinna Hill, approx 12.5km W of Jamie Dam track T-junction	28/10/2017	2	0.33	0.3	N
EVD28	Evelyn Downs	442434	6930649	Approx 1.6km W of Big Hole waterhole	28/10/2017	2	0.67	1.5	N
EVD29	Evelyn Downs	448754	6940868	Just over Todmorden boundary fence, approx 2.5km S of Todmorden/Welbourn Hill/Evelyn Downs junction, approx 4km N of Tullamore Bore	29/10/2017	3	2.50	20.0	N
EVD30	Evelyn Downs	443749	6935377	Approx 1.5km W of Chocos Dam	29/10/2017	2	2.00	25.0	Y
EVD31	Evelyn Downs	444465	6935824	Approx 1.2km NW of Choco's Dam	29/10/2017	2	0.50	6.5	Y
EVD32	Evelyn Downs	430194	6930406	NW of Evelyn Downs, just N of Appreetinna Hill, approx 5.5km SW of Jamie Dam	31/10/2017	2	0.17	0.3	N
WIN01	Wintinna	429313	6940615	Wintinna/Evelyn Downs boundary adjacent to western bank of Henrietta Creek	31/10/2017	2	1.00	2.0	N
WIN02	Wintinna	432801	6941551	1km W of Welbourn Hill/Evelyn Downs/Wintinna boundary, 3.5km SW of Devil Devil Dam	31/10/2017	1	0.75	10.0	N
EVD33	Evelyn Downs	432072	6942062	1km W of Welbourn Hill/Evelyn Downs/Wintinna boundary, 3.5km SW of Devil Devil Dam	31/10/2017	1	0.75	17.5	N
WIN03	Wintinna	431245	6941406	2km W of Welbourn Hill/Evelyn Downs/Wintinna boundary, 3km SE of Devil Devil Dam	31/10/2017	1	0.83	9.0	N



Site ID	Property	Easting	Northing	Location description	Date	No. of observers	Total search time (person hours)	Approx search area (ha)	Arckaringa Daisy detected
EVD34	Evelyn Downs	431331	6941076	2km W of Welbourn Hill/Evelyn Downs/Wintinna boundary, 3km SE of Devil Devil Dam	31/10/2017	1	0.83	7.5	N
WIN04	Wintinna	420336	6934497	2.5km NW of Wintinna/Evelyn Downs boundary gate, approx 4km N of Magic Dam	31/10/2017	2	0.50	0.8	N
EVD35	Evelyn Downs	432306	6921385	Along track to Appreetinna Hill N of Copper Hills, approx 6.7km SW of Charles Bore	1/11/2017	4	3.00	6.0	N



Appendix 2. Plant species recorded at sites at which the Arckaringa Daisy was detected and the percentage of sites at which the species was recorded.

Species name	Common name	Conservation rating		% of sites recorded
		AUS	SA	
<i>Abutilon fraseri ssp. fraseri</i>	Dwarf Lantern-bush			4.8
<i>Abutilon halophilum</i>	Plains Lantern-bush			4.8
<i>Acacia aneura</i> complex	Mulga			4.8
<i>Acacia calcicola</i>	Northern Myall			9.5
<i>Acacia kempeana</i>	Witchetty Bush			23.8
<i>Acacia papyrocarpa</i>	Western Myall			76.2
<i>Acacia salicina</i>	Willow Wattle			9.5
<i>Acacia sibirica</i>	Bastard Mulga			14.3
<i>Acacia tetragonophylla</i>	Dead Finish			47.6
<i>Acetosa vesicaria</i>	Rosy Dock			4.8
<i>Anemocarpa podolepidium</i>	Rock Everlasting			14.3
<i>Anemocarpa saxatilis</i>	Hill Sunray			90.5
<i>Arabidella glaucescens</i>				95.2
<i>Aristida contorta</i>	Kerosene/Mulga Grass			66.7
<i>Aristida jerichoensis</i>	Jericho Three-awn			4.8
<i>Atriplex vesicaria</i>	Bladder Saltbush			28.6
<i>Calandrinia remota</i>	Round-leaf Parakeelya			9.5
<i>Dodonaea microzyga</i> var. <i>microzyga</i>	Brilliant Hop-bush			4.8
<i>Enchylaena tomentosa</i> var.	Ruby Saltbush			19.0
<i>Enneapogon avenaceus</i>	Common Bottle-washers			14.3
<i>Enneapogon caerulescens</i>	Blue Bottle-washers			14.3
<i>Enneapogon cylindricus</i>	Jointed Bottle-washers			23.8
<i>Enneapogon polyphyllus</i>	Leafy Bottle-washers			28.6
<i>Eremophila alternifolia</i>	Narrow-leaf Emubush			4.8



Species name	Common name	Conservation rating		% of sites recorded
		AUS	SA	
<i>Eremophila freelingii</i>	Rock Emubush			57.1
<i>Eremophila neglecta</i>				9.5
<i>Eremophila rotundifolia</i>	Round-leaf Emubush			19.0
<i>Eriochiton sclerolaenoides</i>	Woolly-fruit Bluebush			4.8
<i>Eucalyptus socialis</i> ssp. <i>socialis</i>	Beaked Red Mallee			52.4
<i>Goodenia chambersii</i>			R	14.3
<i>Goodenia lobata</i>				38.1
<i>Gunniopsis papillata</i>	Twin-leaf Pigface			38.1
<i>Gunniopsis tenuifolia</i>	Narrow-leaf Pigface			4.8
<i>Gunniopsis zygophylloides</i>	Twin-leaf Pigface			19.0
<i>Lawrencia squamata</i>	Thorny Lawrencia			4.8
<i>Lepidium strongylophyllum</i>				23.8
<i>Maireana astrotricha</i>	Low Bluebush			4.8
<i>Maireana campanulata</i>	Bell-fruit Bluebush			28.6
<i>Maireana</i> sp.	Bluebush			9.5
<i>Marsdenia australis</i>	Native Pear			38.1
<i>Neurachne munroei</i>	Window Mulga-grass			38.1
<i>Olearia arckaringensis</i>	Arckaringa Daisy	E		100.0
<i>Ptilotus barkeri</i>	Barker's Mulla Mulla		R	28.6
<i>Ptilotus nobilis</i> ssp. <i>nobilis</i>	Regal Fox-tail			76.2
<i>Ptilotus incanus/obovatus</i>	Silver Mulla Mulla			61.9
<i>Ptilotus</i> sp. Arckaringa (D.J.Duval 1958)				9.5
<i>Ptilotus whitei</i>	Small-leaf Mulla Mulla			57.1
<i>Rhyncharrhena linearis</i>	Bush Bean			4.8
<i>Salsola australis</i>	Buckbush			9.5



Species name	Common name	Conservation rating		% of sites recorded
		AUS	SA	
<i>Santanum acuminatum</i>	Quandong			19.0
<i>Scaevola spinescens</i>	Spiny Fanflower			19.0
<i>Sclerolaena cuneata</i>	Tangled Bindyi			9.5
<i>Sclerolaena lanicuspis</i>	Spinach Bindyi			19.0
<i>Sclerolaena obliquicuspis</i>	Oblique-spined Bindyi			4.8
<i>Senna artemisioides</i> ssp. <i>alicia</i>	Desert Senna			19.0
<i>Senna artemisioides</i> ssp. <i>coriacea</i>	Broad-leaf Desert Senna			28.6
<i>Senna artemisioides</i> ssp. <i>filifolia</i>	Fine-leaf Desert Senna			4.8
<i>Senna artemisioides</i> ssp. <i>sturtii</i>	Grey Senna			9.5
<i>Senna cardiosperma</i> ssp. <i>microphylla</i>	Curved-leaf Senna			14.3
<i>Sida fibulifera</i>	Pin Sida			14.3
<i>Solanum ellipticum</i>	Velvet Potato-bush			9.5
<i>Solanum quadriloculatum</i>	Plains Nightshade			14.3
<i>Stackhousia clementii</i>	Limestone Candles			81.0
<i>Trachymene glaucifolia</i>	Blue Parsnip			4.8
<i>Zygophyllum aurantiacum</i> ssp. <i>aurantiacum</i>	Shrubby Twinleaf			38.1
<i>Zygophyllum crassissimum</i>	Thick Twinleaf		R	71.4

