

FINAL REPORT:

Annual Report for the Caroline Springs Railway Station Grassland – Year 3

PREPARED FOR

Public Transport Victoria

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GLOSSARY

| Acronym | Description |
|----------|---|
| CMP | Conservation Management Plan |
| DELWP | Victorian Department of Environment, Land, Water and Planning |
| DoEE | Commonwealth Department of Environment and Energy |
| EPBC Act | <i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Commonwealth) |
| NTGVVP | Natural Temperate Grassland of the Victorian Volcanic Plain |
| OMP | Offset Management Plan |
| PsRT | <i>Pimelea spinescens</i> Recovery Team |
| PTV | Public Transport Victoria |
| SLL | Striped Legless Lizard <i>Delma impar</i> |
| SRF | Spiny Rice-flower <i>Pimelea spinescens</i> subsp. <i>spinescens</i> |
| WLS | Western Land Services |

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1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was commissioned by Public Transport Victoria (PTV) to undertake and oversee management and monitoring works relating to a 2.04 hectare conservation reserve area, and associated areas of retained grassland at the site of the Caroline Springs Railway Station, located on Christies Road, Caroline Springs (Figure 1).

The management, monitoring and auditing works required to be undertaken at Caroline Springs are detailed in the Conservation Management Plan (CMP) (Ecology and Heritage Partners 2014a) and Offset Management Plan (OMP) (Ecology and Heritage Partners 2014b) prepared for the site, and approved by the Commonwealth Department of the Environment and Energy (DoEE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC 2010/5463), and the Victorian Department of Environment, Land, Water and Planning (DELWP) (formerly the Department of Environment and Primary Industries [DEPI]).

Specifically, the works relate to the protection and ecological monitoring of the quality of the EPBC Act-listed community Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP), weed and pest control works, biomass control methods such as prescribed ecological burns, and management and monitoring of the existing populations of the EPBC Act-listed Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* and Striped Legless Lizard *Delma impar*.

Ecology and Heritage Partners subcontracted Western Land Services Pty Ltd (WLS) in June 2014 to implement pest plant and animal control, biomass reduction, revegetation and fencing works for the ecological management works between Years 1-3.

The annual monitoring report presented below, outlines the management and monitoring actions undertaken throughout the conservation area (referred to herein as the offset site) and the other area of retained grassland between 24 June 2016 and 23 June 2017 (i.e. the third year of the overarching CMP and OMP), with the beginning of Year 1 being 24 June 2014 (being the date of approval of the CMP and OMP) (Figure 2). The monitoring report for Year 1 and Year 2 is detailed in Ecology and Heritage Partners (2015; 2016). The methods utilised for the monitoring and management actions follow those set out in the CMP (Ecology and Heritage Partners 2014a) and the OMP (Ecology and Heritage Partners 2014b).

Sections 2.1 and 2.2 predominately relate to the monitoring and management of the Striped Legless Lizard and Spiny Rice-flower as prescribed by the CMP, while Section 2.3 relates to the monitoring and management of the offset site as a whole as required by the OMP.

1.2 Vegetation and Site Condition

Biomass across the offset site is relatively dense, with vegetation condition ranging from moderate to high (Appendix 1). The eastern half of the offset site was subject to an ecological burn in April 2015, and although biomass was significantly reduced compared to the remainder of the site for approximately 12 months, over the past 12 months, biomass has returned to levels close to that observed prior to the ecological burn predominantly due to the high cover of Kangaroo Grass *Themeda triandra*.

With exception of the eastern section of the offset site, which is dominated by Kangaroo Grass, the remainder of the offset site and retained grassland consists of a mosaic of native and non-native vegetation, with weed cover and native vegetation cover comprising approximately 50% respectively. Weeds of national significance are present, including Chilean Needle-grass *Nassella neesiana*, Serrated Tussock *Nassella trichotoma*. These species were previously present in high abundance, however, recent weed management works has results in a significant decrease in the cover abundance of these two species. Other weed species present throughout the offset site and retained grassland include Galenia *Galenia pubescens* var. *pubescens*, Spear Thistle *Cirsium vulgare*, Common Sow-thistle *Sonchus oleraceus*, Patterson's Curse *Echium plantagineum* and Artichoke Thistle *Cynara cardunculus*. Although formerly present in high abundance, African Boxthorn *Lycium ferocissimum* has almost been eliminated from the site since the inception of the management plan. Only occasional, scattered seedlings were observed during Year 3.

Despite the high biomass of vegetation and density of weeds within sections of the conservation reserve and retained grassland, a range of native herbaceous flora species persist throughout, including the nationally significant Spiny Rice-flower, Smooth Rice-flower *Pimelea glauca*, Slender Bindweed *Convolvulus angustissimus* subsp. *omnigracilis*, Cotton Fireweed *Senecio quadridentatus*, Narrow-leaf Plantain *Plantago gaudichaudii*, Berry Saltbush *Atriplex semibaccata*, Cotton Fireweed *Senecio quadridentalis*, Common Woodruff *Asperula conferta*, and Plains Candles *Stackhousia subterranea*. In addition to Kangaroo grass, other native grasses present throughout include Knead Spear-grass *Austrostipa bigeniculata*, Rigid Panic *Walwhalleya proluta*, Windmill Grass *Chloris truncata*, Common Wallaby-grass *Rytidosperma caespitosa* and the State-significant Rye Beetle-grass *Tripogon loliiformis*.

Three habitat zones of differing quality were recorded in the offset site. Habitat zone PG1 was present along the eastern boundary of the offset site and is dominated by Knead Spear-grass, with a low diversity of other grasses and herbs. Zone PG2 is located in the eastern half of the offset site and is dominated by Kangaroo Grass, but also contains occurrences of Knead Spear-grass, Wallaby-grasses, Windmill Grass, and a wide range of herbs within the understory. Weed cover is relatively low in this habitat zone. Habitat zone PG3, present across the western half of the offset site comprises a similar species composition to PG2. However, a greater cover of weeds is present which results in reduced recruitment opportunities and lower herb diversity within the understory (Figure 2).

1.3 Security

Condition 1 of the EPBC Act approval specifies that the land identified in Annexure 1 of approval 2010/5463 (the protected land) adjacent to the clearing site must be protected in perpetuity to compensate for impacts to the nationally significant Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP), Spiny Rice-flower and Striped Legless Lizard using a conservation covenant under the *Victorian Conservation Trust Act 1972*. This conservation covenant was agreed between the Public Transport Development Authority and Trust for Nature (TfN) and signed on 27 June 2014.

The offset site is a total of 2.04 hectares, comprising 1.92 hectares of Plains Grassland vegetation, and 0.12 hectares of exotic vegetation.

2 ANNUAL REPORT 2016/2017

2.1 Striped Legless Lizard Monitoring

Monitoring is required of both the status of the Striped Legless Lizard (SLL) population and their habitat for a period of ten years within the offset site. Monitoring will determine if management actions and habitats are suitable for the longevity of a viable Striped Legless Lizard population, and determine when remedial actions are required. Two tile grids have been established within the offset site to assist with population monitoring for the species (Figure 3).

Monitoring of the SLL population and habitat was undertaken in accordance with Section 8.8.2 of the CMP (Ecology and Heritage Partners 2014a).

2.1.1 Population Monitoring Results

A total of 14 Striped Legless Lizard (SLL) captures were recorded within the study area during targeted surveys (Plate 1; Plate 2) (Table 1). This is in contrast to Years 1 and 2 when no more than three individuals were overserved during the targeted surveys. It is possible that some of the individuals were recaptures.

The locally common reptile species Common Blue-tongue Lizard *Tiliqua scincoides*, Tiger Snake *Notechis scutatus* and Little Whip Snake *Parasuta flagellum* were also recorded in the study area during tile grid checks (Table 1). No other vertebrate fauna species of note were recorded during targeted surveys.

Table 1. Summary of targeted survey results

| Date | Observer | Time (am) | Air Temp | Cloud Cover | Wind Direction and Spd | Above Tile Temp | Under Tile Temp | Grid 1 (east) | Grid 2 (west) |
|----------|----------|-----------|----------|-------------|------------------------|-----------------|-----------------|--|---|
| 6/10/16 | BH | 7:40 | 11 | 1/8 | N (13km/hr) | 9.5 | 9.7 | - | 4 x SLL, 1 x Little Whip Snake |
| 12/10/16 | BH/CM | 8:45 | 12 | 7/8 | WNW (24km/hr) | 13.5 | 13.2 | - | 3 x SLL |
| 2/11/16 | BH/CM | 8:30 | 11.8 | 7/8 | WSW (22km/hr) | 14.05 | 13.75 | 1 x SLL, 1 x Tiger Snake (juv) | 1 x Little Whip Snake, 1 x Blue Tongue |
| 22/11/16 | BH | 8:30 | 15 | 8/8 | S (11km/hr) | 15.9 | 16.12 | 2 x SLL (Row 2, tile 5: 7g) (row 5, tile 5: 12.5g) | 2 x SLL (row 1, tile 2 NW corner: 10g) (row 1 tile 3: 5g) |
| 2/12/16 | BH | 8:45 | 17 | 4/8 | WSW (19km/hr) | 21.2 | 20.2 | - | 1 x SLL (western side: 10.5g) |

| Date | Observer | Time (am) | Air Temp | Cloud Cover | Wind Direction and Spd | Above Tile Temp | Under Tile Temp | Grid 1 (east) | Grid 2 (west) |
|----------|----------|-----------|----------|-------------|------------------------|-----------------|-----------------|---|---------------|
| 9/12/16 | CM | 9:15 | 12.6 | 6/8 | SSW (35km/hr) | 18.2 | 18.6 | - | - |
| 15/12/16 | CM | 8:00 | 14 | 7/8 | SSE (30km/hr) | 17.9 | 17.2 | - | - |
| 20/12/16 | RF | 8:46 | 16.2 | 8/8 | SW (28km/hr) | 15.6 | 17 | 1 x SLL female: 9g, Head to vent = 110mm, vent to tail = 130mm | - |



Plate 1. Grid 2 – Striped Legless Lizard (Ecology and Heritage Partners 12/10/2016)



Plate 2. Grid 1 – Striped Legless Lizard (Ecology and Heritage Partners 22/11/2016)

2.1.2 Habitat Monitoring Results

The CMP details the requirements for Striped Legless Lizard habitat rehabilitation and management. For each habitat variable the recorded value must be compared to the trigger value to determine if a management response is triggered and the nature of the response required. Table 2 summarises the monitoring categories and trigger thresholds for Striped Legless Lizard monitoring, while Table 3 summarises the results of Year 3 habitat monitoring (Plate 3; Plate 4). No trigger values were exceeded and no management response is required following Year 3 of Striped Legless Lizard habitat monitoring.

Table 2. Striped Legless Lizard habitat monitoring criteria.

| Habitat variable | Ideal level [^] | Trigger level for action | Response if triggered | Response Triggered? |
|-----------------------------|--------------------------|--------------------------|-------------------------------|---------------------|
| Native clumping grass cover | 50% | <30% | Plant native clumping species | No |

| | | | | |
|------------------------|----------------|---------|-------------------------------|-----------|
| Introduced grass cover | <10% | >20% | Remove weeds | No |
| Bare ground | 20% | <5% | Removal of vegetation | No |
| | | >50% | Plant native clumping species | No |
| Exposed rock | 10% | <5% | Removal of vegetation | No |
| Inter-tussock spacing | 30 centimetres | <10 cms | Removal of vegetation | No |
| | | >50 cms | Plant native clumping species | No |

Note. ^The ideal level value is the average value for each tile grid.



Plate 3. Grid 1 Habitat (Ecology and Heritage Partners 02/11/2016)



Plate 4. Grid 2 Habitat (Ecology and Heritage Partners 02/11/2016)

Table 3. Striped Legless Lizard habitat monitoring results

| Habitat Variable | Grid 1 (East) | | | | | Grid 2 (West) | | | | | Response Triggered |
|-----------------------------|---------------|-------|-------|-------|--------------|---------------|-------|-------|-------|---------------|--------------------|
| | Q 1 | Q 2 | Q 3 | Q 4 | Average | Q 1 | Q 2 | Q 3 | Q 4 | Average | |
| Native clumping grass cover | 50% | 55% | 70% | 60% | 59% | 80% | 35% | 60% | 70% | 61% | No |
| Introduced grass cover | 10% | 15% | 5% | 20% | 13% | 5% | 45% | 10% | 20% | 20% | No |
| Bare ground | 30% | 25% | 20% | 10% | 21% | 15% | 15% | 20% | 15% | 16% | No |
| Exposed rock | 10% | 5% | 5% | 10% | 8% | 0% | 5% | 10% | 5% | 5% | No |
| Inter-tussock spacing | 10 cm | 20 cm | 10 cm | 20 cm | 15 cm | 25 cm | 20 cm | 35 cm | 20 cm | 25 cm% | No |

2.1.3 Conclusion

A population of Striped Legless Lizard is still present in the study area, with the species being recorded during six of the eight tile grid checks.

Striped Legless Lizard is a highly cryptic species and as such there is currently no reliable method for assessing the size of a given Striped Legless Lizard population (O'Shea 2013). With minimal data pertaining to the study area and surrounding suitable habitat areas, a long-term pattern of distribution and abundance for Striped Legless Lizard cannot be inferred for the local population until the results of monitoring over the subsequent years are available. However, it is noted that there was a total of 14 individuals recorded during Year 3, up from two and three individuals in Year 1 and Year 2 respectively. Continued monitoring in accordance with the CMP will improve this data over time and photographs of dorsal head scale pattern of individuals captured in subsequent monitoring years will continue to be undertaken to assist in identifying individual lizards.

Monitoring indicated habitat within the offset site remains in good condition for Striped Legless Lizard and no trigger values were exceeded for any of the measured habitat components. No management responses are currently required at the site for Striped Legless Lizard habitat. Continued monitoring in line with the CMP will ensure habitat for the Striped Legless Lizard is maintained or improved within the site over the coming years.

2.2 Spiny Rice-flower Salvage and Translocation - July 2017

Initial salvage and translocation activities relating to the nationally significant Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* were initially completed on 26 June 2014 and 30 June 2015.

A variation to EPBC 2010/5463 approved on 29 June 2017 resulted in the removal of an additional 0.137 hectares of retained grassland, comprising 0.137 hectares of NTGVVP. Prior to the commencement of construction activities, the entire 0.137 hectares was surveyed by a qualified botanist (Shannon LeBel – Senior Botanist), on 31 May and 30 June 2017 in transects approximately two metres apart to locate Spiny Rice-flower, required to be salvaged prior to construction. In total, three (3) individual plants were recorded and marked for salvage and translocation (Figure 4a).

These activities were undertaken to address the following Condition of Approval (CoA) (EPBC 2010/5463) issued by DoEE (Condition 4a):

The person taking the action must submit to the Minister a plan including provisions and measures for the mitigation and compensation of impacts on the Spiny Rice-flower.... The plan must include:

'the salvage and translocation of all Spiny Rice-flower plants from the site of the proposed action to the protected land or other site as approved by the Department'

Following liaison with Alan Webster and Vanessa Craigie from the Department of Environment, Land, Water and Planning (DELWP) (email dated 12/07/2017), and Ruth Crabb from DoEE (email dated 04/07/2017), salvage and translocation was undertaken on 25 July 2017 using a tractor-mounted tree-spade by Established Tree Transplanters Pty Ltd into the approved, pre-existing recipient site (Figure 4a and 4b) (Plate 5; Plate 6).

The entire plant (including the root system) of each Spiny Rice-flower was removed from the impact site, with the soil maintained around the root system during removal. This process was carefully monitored by the supervising ecologist to ensure plants were excavated with minimal damage and to enable accurate tracking of the future location and outcome of each plant.



Plate 5. Spiny Rice-flower identified for removal



Plate 6. Spiny Rice-flower salvage with tree-spade

It should be noted that the number attributed to the Spiny Rice-flowers removed from the impact site equates to the same individual with the equivalent number translocated into the recipient site (Figure 4a and 4b).

In total, three (3) Spiny Rice-flower were successfully translocated into the recipient site comprising one male, and two plants of indeterminable sex due to the lack of flowering material (Table 4). Photos of all translocated individuals are provided in Appendix 4.

Ongoing monitoring and maintenance of the translocated individuals will be undertaken in accordance with the actions defined in the approved Conservation Management Plan (Ecology and Heritage Partners Pty Ltd 2014), and will be detailed in all future annual reports provided annually for a period of 10 years, commencing with Year 4.

Table 4. Translocated Spiny Rice-flower status (2017 Transplants)

| Plant ID# | Sex | Flowering? |
|-----------|------|------------|
| 56 | TBC | No |
| 57 | Male | Yes |
| 58 | TBC | No |

Note. Plant #'s 1-55 were assigned to those SRF translocated in 2014 and 2015.

2.3 Spiny Rice-flower Monitoring

Monitoring is required of both the status of the translocated Spiny Rice-flower (SRF) population within the designated recipient site, and a sample of the existing *in-situ* population and their habitat for a period of ten years within the offset site. Monitoring will determine if management actions to improve habitat are

suitable for the longevity of a viable Spiny Rice-flower population, and determine when remedial actions are required.

2.3.1 Monitoring Methods

Long-term independent monitoring of translocated plants within the recipient site is crucial to ensuring ongoing survival (Vallee *et al.* 2004). Monitoring must be undertaken in accordance with the current PSRT protocols (PSRT 2013) which are summarised in Section 8 of the CMP (Ecology and Heritage Partners 2014a).

Monitoring was undertaken by a qualified botanist, familiar with the ecology and growth habits of Spiny Rice-flower. The site was visited at least once every three months over the course of the Year 3 management period, with additional visits during summer to ensure translocated specimens were watered during periods of high drought stress where the watering requirements were triggered.

To ensure that monitoring provided an accurate and ongoing assessment of the health of the translocated plants, the following variables were measured on each plant:

- Sex (Male or Female);
- Presence of flowering material and percentage of the plant in flower;
- Growth;
- Survival;
- Presence of germinants (recruitment); and,
- Health.

In addition to the indicators of growth and reproductive success, monitoring looked at drought stress, pest plant and animal impacts, biomass and other site disturbances that may negatively impact the translocated plants.

A subset of 25 individuals from the existing *in situ* SRF population was monitored concurrently with the translocated specimens. These plants were monitored on a quarterly basis.

2.3.2 Recipient Site Conditions

As the recipient site is located near the entrance to the offset site and the carpark for Caroline Springs Railway Station, the potential for disturbance is therefore higher due to access issues. As such, a post and wire fence with flagging tape was established around the recipient site to highlight the location of this area, and a 2 metre tall fixed wire fence has been built adjacent to the railway station site to discourage unintended access by vehicles entering the offset site.

Kangaroo Grass is dominant within the recipient site as well as Knead Spear-grass *Austrostipa bigeniculata* and Windmill Grass. However, relative to other areas within PG2 elsewhere within the offset site, the recipient site contains low to moderate levels of exotic grasses and herbs including Wild Oat, Common Sow-thistle, Chilean Needle-grass and Patterson's Curse. .

The majority of perennial weeds having been eliminated over Years 1 and 2 due to regular herbicide treatment. No 'floating rock' is present within the recipient site, and no rocks were disturbed or removed as part of the translocation process.

A remnant population of Spiny Rice-flower is present within the southern section of the recipient site, and care was taken to ensure these plants were not disturbed as part of the translocation, and ongoing monitoring and management activities.

Overall, due to the ongoing weed control taking place, the recipient site is considered to be in good condition.

2.3.3 Plant Deaths and Disturbances

2.3.3.1 Vehicular Disturbance

During a site visit undertaken on 31 January 2017, it was noted that the Spiny Rice-flower translocation site had been subject to recent significant vehicular disturbance (Plate 7; Plate 8).

It is understood that a grass-fire broke out in the property located immediately north of the offset in early January 2017. Due the presence of a broken padlock on the gate entering the offset site, multiple vehicular tracks, and a flattened post and wire fence around the recipient site, it appears that access into the northern property was undertaken via the offset site (Plate 9). This action resulted in several translocated Spiny Rice-flower specimens (#'s 6, 9, 19, 27, 28, 35, 37, 43, 44, 51, and 52) being run over (some repeatedly).

Of these specimens #s 9 and 35 were in very poor health, and #s 51 and 52 were dead at the time of the final Year 3 monitoring event (April 2017). All other specimens that were subject to vehicular disturbance appeared to be in good health.

2.3.3.2 June 2014 Transplants

As of the most recent monitoring event of Year 3 (20 April 2017), there was one (1) death during Year 3 from the original 23 SRF salvaged specimens, with the remaining 16 alive and in good condition (Appendix 2). Of this cohort of SRF transplanted individuals, six (6) specimens perished in Year 1, with no plant deaths in Year 2.

2.3.3.3 June 2015 Transplants

As of 20 April 2017, there was a total of one (1) death during Year 3 from the original 32 SRF salvaged specimens, with a total of 13 of the 32 SRF specimens transplanted in June 2015 appearing dead (12 SRF deaths in Year 2), and the remaining 19 specimens in moderate condition (Appendix 2). The single plant death (# 51) can be attributed to the vehicular disturbance that occurred in early January 2017. At several times during the year, various individual plants appeared to decline in health, only to rapidly recover following a watering event. This indicates that drought stress was likely a major factor in plant death and growth rate on the transplanted individuals.

2.3.3.4 In-situ monitoring

All 25 in-situ SRF specimens are in excellent condition at the end of Year 3 despite not being subject to the watering regime applied to the translocated plants.



Plate 7. Vehicular disturbance through the recipient site (Ecology and Heritage Partners 31/01/2017)



Plate 8. Vehicular disturbance through the recipient site (Ecology and Heritage Partners 31/01/2017)



Plate 9. Looking into the northern property where grassfire was located (Ecology and Heritage Partners 31/01/2017)

2.3.4 General Health and Growth

The health of all SRF plants was assessed at each monitoring event in accordance with the metric detailed in Table 5.

2.3.4.1 June 2014 Transplants

Of the 16 plants (of the original 23) to survive Year 3, 14 are in at least very good health (i.e. – a health score of 2.5 or better [Figure A2.1]), with two specimens with a health rating of 4 as of 20 April 2017.

Only two of the 16 plants were flowering at the date of the most recent monitoring event (20 April 2017), with a moderate number of germinants (15) observed throughout summer and autumn 2017. Monitoring also recorded an increase in biomass over Year 3, with new several new shoots of regrowth observed sprouting from the base of most plants. This may indicate that these specimens have successfully re-established since the transplant event, and are now able to redirect resources to continued growth and reproduction.

2.3.4.2 June 2015 Transplants

Of the 19 plants (of the original 32) to survive Year 3 (Year 2 of their translocation [12 perished in the previous year]), the majority range between poor and good health (i.e. – a health score of between 2 - 4 [Figure A2.2.1]), as of 20 April 2017.

Six of the 19 plants were flowering at the date of the most recent monitoring event (20 April 2017), with a moderate number of germinants observed. Although several new shoots of regrowth were observed sprouting from the base of some plants, no overall increase in biomass was recorded, as the regrowth often replaced existing biomass that suffered from die-back.

Table 5. Health Rating Metric for Spiny Rice-flower

| Health Rating | Description | Health Indicator |
|---------------|-------------|-----------------------------|
| 1 | Excellent | Less than 5% dieback |
| 2 | Good | Between 15 < 30% dieback |
| 3 | Moderate | Between 30 < 75% dieback |
| 4 | Poor | Between 75 < 99% dieback |
| 5 | Dead | No evidence of live biomass |

Overall, the Year 3 results indicate a high level of survivorship from Year 2, with a total of two specimens perishing during Year 3, with one of these deaths attributed to vehicular disturbance.

The risk of mortality so far appears to be during the first year post-salvage and translocation, with survivorship increasing from the second year post translocation.

The surviving individuals from the 2015 cohort during their second year are generally in moderate health, with the surviving individuals from the 2014 cohort in excellent health. The presence of SRF germinants near several plants, and the survival rate for the 2014 cohort in the third year indicates that the population

should persist in the long-term provided management of the recipient site and the greater offset site continues to address and mitigate any threats to the current SRF population.

Based on the monitoring actions undertaken during Years 1-3 to date, drought stress appears to be the main driver of plant health, and this should be monitored closely during the 2017/2018 summer period.

Summaries of the 2016/2017 recorded data are presented in Appendix 2.

2.3.5 Threatening Processes

Weed invasion, biomass accumulation and drought stress present the greatest threats to the health and survival of translocated plants at the recipient site. In all cases, remedial actions to mitigate these threats were undertaken throughout the year, and these actions are summarised below in Section 2.4.

Weeds such as Serrated Tussock, Common Sow-thistle, Patterson's Curse and Spear Thistle, and native grasses including Kangaroo-grass have the potential to out-compete or smother translocated Spiny Rice-flower plants and prevent recruitment. However, ongoing weed control, biomass removal and implementation of the watering regime are anticipated to continue to mitigate these threats as the translocated plants further establish.

2.3.6 Management Actions

Given the threats posed by weed invasion and biomass accumulation, Ecology and Heritage Partners botanists undertook maintenance activities when required during each monitoring event. The activities predominantly comprised hand weeding, and biomass removal around each of the translocated specimens to open inter-tussock spaces, reduce competition for resources and space, and encourage growth and establishment. Western Land Services also conducted selective herbicide application on those high-threat weeds within the recipient site and surrounds (with a particular focus on Serrated Tussock, thistles, and Patterson's Curse) that have a higher potential to impact the Spiny Rice-flower population.

As undertaken in previous years, to mitigate against potential drought stress, additional watering was undertaken for all SRF translocated individuals in December 2016, and February 2017.

An ecological burn was conducted in June 2017 in the recipient site, as well as selected areas in the western half of the offset site. Additional details are provided in Section 2.4.5.

As per the contingency measures detailed in the CMP (Ecology and Heritage Partners 2014a), seed was collected from a total of 15 of the 55 translocated SRF following the 2016 flowering season. Collected seed will be used for propagation purposes should the performance targets specified in the CMP at the end of Year 4 not be met, and the contingency plan is enacted.

2.3.6.1 Performance Targets

The ultimate aim of translocation is to ensure the conservation of the genetic diversity of a species. The conservation of genetics is especially critical for endangered species and the loss of genetics from even a single plant can be seen as a failure of the translocation process.

Vallee *et al.* (2004) and the PsRT have detailed stringent criteria for determining the success of translocated plant species. The outlined criteria are detailed in the CMP.

In order to meet the short term performance target of 50% survival, a total of 28 plants should be alive at the end of Year 5. As of the end of Year 3, 35 plants are alive (with 6 lost in Year 1, 12 lost in Year 2, and 2 lost in Year 3).

Monitoring indicated that the condition and structure of habitat within the recipient site, and offset site in general remains in good condition for Spiny Rice-flower persistence and no trigger values were exceeded for any of the measured habitat components. Aside from monitoring for cracks around each 'plug', ongoing weed control and additional watering during the summer months, no further management responses are currently required at the site for Spiny Rice-flower. Continued monitoring in line with the CMP will ensure habitat for the Spiny Rice-flower and survival rates for translocated and *in-situ* individuals is maintained or improved within the site over the coming years.

2.4 Management Actions for Year 3 (as per Table 12 of the OMP)

The following section relates to the management actions and targets summarised in Table 12 of the OMP prepared for the offset site (Ecology and Heritage Partners 2014b).

2.4.1 Undertake control of woody weeds

2.4.1.1 *Timing of Action and key performance target*

Before seed heads mature in summer. Ensure cover of woody weeds is <1%.

Status – Year 3

Action Completed. Western Land Services mechanically removed woody weed infestations during Year 1 and Year 2, with woody weed control works during Year 3 focussed on the control of small numbers of African Box-thorn *Lycium ferocissimum* recruits that were observed re-sprouting from previously removed infestations (Plate 10). Emergent Box-thorn was treated via cut and paint method, herbicide (Tricopyr), and ecological burning (Plate 11).

Based on the removal of existing infestations within the offset site and areas of retained grassland, woody weed cover is now considered to be at approximately 1%.



Plate 10. Re-sprouting Box-thorn from a previously removed infestation (Western Land Services March 2017)



Plate 11. Box-thorn seedlings being burnt during ecological burn (Ecology and Heritage Partners 14/06/2017)

Actions Required

The performance target for the cover of woody weeds is being met. Due to the existing stored soil seedbank, further monitoring and control will be required over the coming years to ensure additional woody weed infestations do not re-establish within the site.

2.4.2 Undertake control of exotic grasses and herbaceous broadleaves

2.4.2.1 Timing of Action and key performance target

Before seed heads mature in spring/summer. Reduce perennial grass cover <40%, and annual grasses/broadleaves <5%.

Status – Year 3

Action Completed. Western Land Services undertook several visits during the Year 3 management works to control grassy and herbaceous weeds, with a particular focus on exotic C4 grasses (Couch, Paspalum, Kikuyu, Setaria), particularly in the area subjected to the April 2015 ecological burn. The offset site and retained grassland formerly contained large infestations of Serrated Tussock *Nassella trichotoma* throughout (Plate 12). However, much of the Serrated Tussock has been successfully treated, and Year 3 efforts focussed on monitoring for, and treating new infestations. Exotic grasses were sprayed multiple times with Glyphosate bi-active and selective herbicide was used for Broadleaf weeds, particularly Patterson’s Curse, Oxtongue, Galenia and Brassica. Paterson’s Curse and Artichoke Thistle were a particular problem during late Spring and Summer, and additional effort was made during this period to treat any observed individuals of these species prior to seed set (Plate 13).



Plate 12. Treated Serrated Tussock (Ecology and Heritage Partners 31/01/2017).



Plate 13. Artichoke Thistle subjected to herbicide treatment fence along the northern boundary of the offset site (June 2017).

Based on management actions undertaken during Years 1-3, the cover of exotic perennial grasses is now considered to be at approximately 20%, with the majority of this located in the western half of the offset site. Broadleaf weed cover is low and is estimated at 5%. Annual grass cover demonstrated considerable variation across the year, with the cover negligible between February to early October (Plate 14). Between mid-October and February, the cover of annual grasses is high (approximately 60%) predominantly due to the presence of Oat *Avena* spp., and the Spring-growing perennial species, Toowoomba Canary-grass *Phalaris aquatica* (Plate 15).



Plate 14. Low cover of annual grasses in April 2017 (Ecology and Heritage Partners 20/04/2017).



Plate 15. High cover of annual grasses in November 2016 (Ecology and Heritage Partners 02/11/2017).

Actions Required.

Based on the initial extent of annual grassy and herbaceous weed cover in the offset site, cover is not anticipated to be reduced to <5% for at least 4-5 years of intensive management. Continued intensive weed control will be required in Year 4 to ensure the current levels weeds to not increase. Serrated Tussock, Chilean Needle Grass *Nassella neesiana* and Patterson's Course will continue to be a priority, and

it is anticipated that the ongoing ecological burning regime will assist in controlling these, and other weeds currently present.

Future management of annual grasses within the offset site should be re-visited in consultation with the management contractor to determine an appropriate technique to successfully reduce the cover of annual grass within the offset site.

2.4.3 Conduct Rabbit Control

2.4.3.1 Timing of Action and key performance target

Peak breeding season: late summer/early autumn. Significant reduction in number/signs of rabbits

Status – Year 3

Action Completed. All harbour has been removed from the site during Year 1. No pest animals were observed in Year 3 of monitoring with the pest-animal proof fence appearing to be successfully excluding pest fauna from the offset site.

Actions Required

Continued monitoring for the presence of pest fauna during Year 4 is required. If pest fauna (rabbits, foxes) are observed, or signs thereof, appropriate control measures should be undertaken.

2.4.4 Maintain Perimeter Fence

2.4.4.1 Timing of Action and key performance target

Ongoing; Fence is maintained and repaired if broken.

Status – Year 3

Action Completed. Western Land Services and Ecology and Heritage Partners regularly check on the fencing during site visits.

New locks were installed on both gates to the offset site as both were cut during the January 2017 grassfire event. Western Land Services installed new signage on the fences to replace old/damaged signs, and maintained existing signs as per the requirements of the CMP (Plate 16; Plate 17). At the end of Year 3, all fences/access gates, and signage are currently in good order. No maintenance is currently required.

Action Required.

Continued monitoring of fence condition to ensure signage and the integrity of the pest fauna-proof fence is maintained during Year 3 of the management plan.



Plate 16. New signage installed on offset site fence (Western Land Services June 2016).



Plate 17. New signage installed on access gate (Ecology and Heritage Partners 20/04/2017).

2.4.5 Undertake biomass reduction via mosaic burning/weeding in selected areas

2.4.5.1 *Timing of Action and key performance target*

Autumn; Areas of inter-tussock space opened up to allow for recruitment.

Status – Year 3

Action Completed. Hand weeding has been undertaken around all transplanted Spiny Rice-flower to ensure that the presence and/or recruitment of grasses do not limit the growth, or detrimentally impact the Spiny Rice-flower plants. This was undertaken by Ecology and Heritage Partners during monitoring visits, and also undertaken by Western Land Services during management visits.

An ecological burn was undertaken on 14 June 2017, and focused on areas not subject to the April 2015 ecological burn (Figure 5), with the aim of reducing biomass within the western half of the offset area.

Due to the wet conditions at the time of the burn, low cloud, and dew present on foliage, the results of the ecological burn were varied, with the thick grassland in the western half of the offset site not igniting. The use of kerosene torches assisted with igniting a fire within the recipient site, and removing some biomass on, and around the translocated Spiny Rice-flower (Plate 18; Plate 19), although efforts in the remainder of the site were not as successful.

Although some small, discrete areas were able to be at least partially burnt, the ecological burn did not result in the desired outcome of wholesale biomass reduction, and the opening up of inter-tussock space between perennial tussock-grasses which would ultimately assist with weed control, and improve habitat for Striped Legless Lizard.

Actions Required

Another ecological burn should be undertaken in the western half of the offset site during autumn 2018 to ensure biomass can be reduced to an acceptable level.



Plate 18. Kerosene torches used to ignite fire (Western Land Services 14/06/2017).



Plate 19. SRF recipient site after ecological burn (Western Land Services 14/06/2017).

2.4.6 Undertake supplementary planting of herbs

2.4.6.1 Timing of Action and key performance target

Winter; in areas of inter-tussock space.

Status – Year 3

Action Completed. In order to increase floristic diversity within the offset site, a total of 436 herbs were planted comprising the following (Plates 20 – 23):

- 50 Bluebells *Wahlenbergia* spp.,
- 50 Blue Flax-lily *Dianella longifolia*;
- 100 Common Everlasting *Chrysocephalum apiculatum*;
- 100 Lemon Beauty-heads *Calocephalus citreus*;
- 20 Common Eutaxia *Eutaxia microphylla*;
- 50 Spur Velleia *Velleia paradoxa*;
- 35 Small-leaf Glycine *Glycine microphylla*; and,
- 31 Tough Scurf-pea *Cullen tenax*.



Plate 20. Treated area of exotic grass (Western Land Services June 2017).



Plate 21. Herb planting preparation within the offset site (Western Land Services June 2017).



Plate 22. Herb plantings within offset site (Western Land Services June 2017).



Plate 23. Herb plantings within the offset site (Western Land Services June 2017).

Actions Required

Survivorship of the herbs will be monitored during October 2017. Where survivorship drops below 80%, supplementary planting will be required to replace those specimens that have perished during Year 4.

2.4.7 Monitor status of vegetation condition, Spiny Rice-flower and Striped Legless Lizard.

2.4.7.1 Timing of Action and key performance target

Progress report to the satisfaction of DELWP/DoE

Status – Year 3

Action Completed. This report satisfies this requirement.

2.4.8 Removal of all existing rubbish from site

2.4.8.1 *Timing of Action and key performance target*

At least every 2 months. All rubbish removed and removed immediately if dumping occurs.

Status – Year 3

Action Completed. Western Land Services undertake bi-monthly inspections across the year to monitor and remove rubbish from the offset site and areas of retained grassland. The majority of rubbish removed from within the site was windblown.

Actions Required

Continued monitoring of rubbish within the site, and immediate removal where appropriate during Year 4 of management.

3 CONCLUSION

Following the management and monitoring activities undertaken during Year 3 of the works as required under the approval conditions of EPBC 2010/5463, no trigger thresholds have been activated, and no contingency measures are currently required to mitigate impacts to Spiny Rice-flower and/or Striped Legless Lizard.

A total of 35 Spiny Rice-flower are alive, and 20 have perished since the commencement of management, and it is anticipated that providing the current management and monitoring regime is continued, the survival target for Spiny Rice-flower of 50% survival at the end of Year 5 will be achieved.

Monitoring indicated habitat within the offset site remains in good condition for Striped Legless Lizard and no trigger values were exceeded for any of the measured habitat components. No management responses are currently required at the site for Striped Legless Lizard habitat

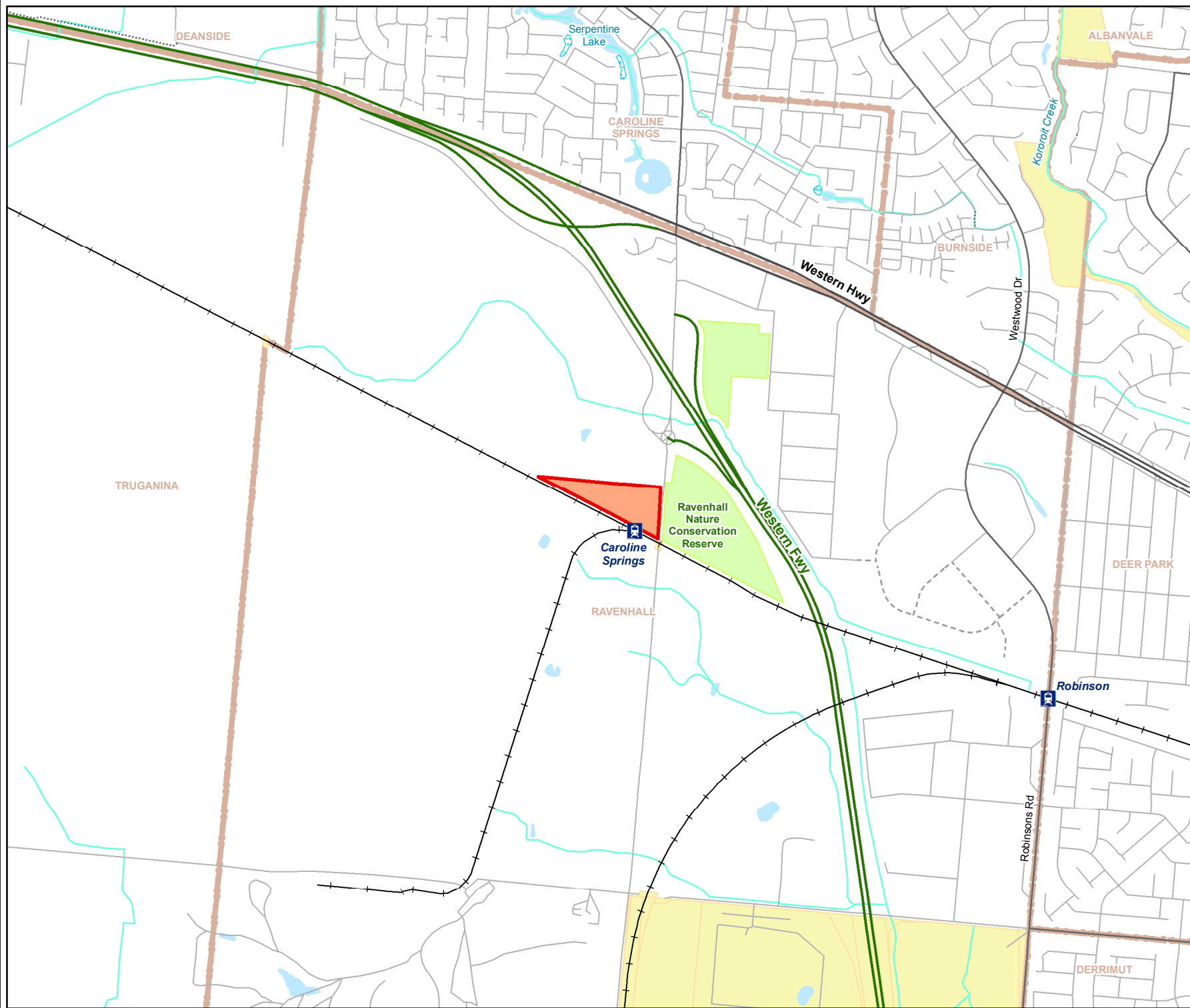
The condition of the offset site and retained grassland is good, with perennial and woody weeds intensively managed during Years 1-3, resulting in the current cover of these species below the performance targets at the end of Year 3.

Based on management actions undertaken during Years 1-3, the cover of exotic perennial grasses is now considered to be at approximately 20%, with the majority of this located in the western half of the offset site. Broadleaf weed cover is low and is estimated at 5%. Annual grass cover demonstrated considerable variation across the year, with the cover negligible between February to early October. Future management of annual grasses should be re-visited in consultation with the management contractor to determine an appropriate technique to successfully reduce the cover of annual grass within the offset site.

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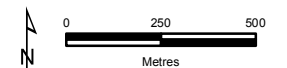
FIGURES



- Legend**
- Study Area
 - Freeway
 - Major Road
 - Collector Road
 - Minor Road
 - Proposed Road
 - Walking Track
 - Minor Watercourse
 - Permanent Waterbody
 - Wetland/Swamp
 - Parks and Reserves
 - Crown Land
 - Localities



Figure 1
Location of the study area
Caroline Springs Year 3 Management



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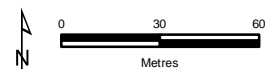
- Legend**
-  Offset site
 -  Spiny Rice-flower recipient site
 -  Retained areas of NTGVVP and SLL habitat
 -  Removed areas of NTGVVP and SLL habitat



Figure 2
Ecological features and extent of NTGVVP and Striped Legless Lizard habitat
Caroline Springs Year 3 Management



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8577_Fig02_EcoFeat_NTGVVP_SLL_19/10/2017_melsley



- Legend**
- Study Area
 - Tile grids

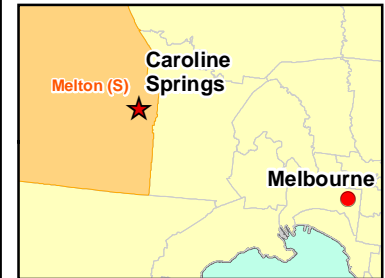
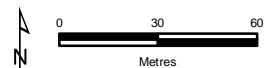


Figure 3
Striped Legless Lizard grid locations and records
Caroline Springs Year 3 Management



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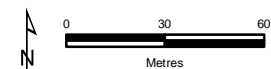


Legend

- Spiny Rice-flower recipient site
- Monitored *In-situ* Spiny Rice-flower
- Translocated Spiny Rice-flower (2017)
- Translocated Spiny Rice-flower (2015)
- *In-situ* Spiny Rice-flower population (August 2014)
- *In-situ* Spiny Rice-flower population (August 2015)
- Translocated Spiny Rice-flower (2014)
- Offset site
- Retained areas of Grassland



Figure 4a
Spiny Rice-flower recipient site, and monitored and translocated Spiny Rice-flowers
Caroline Springs Year 3 Management



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B577 Fig04a SRF 19/10/2017 melslev



- Legend**
- Spiny Rice-flower recipient site
 - Monitored *In-situ* Spiny Rice-flower
 - Translocated Spiny Rice-flower (2017)
 - Translocated Spiny Rice-flower (2015)
 - Translocated Spiny Rice-flower (2014)
 - Offset site
 - Ecological burn

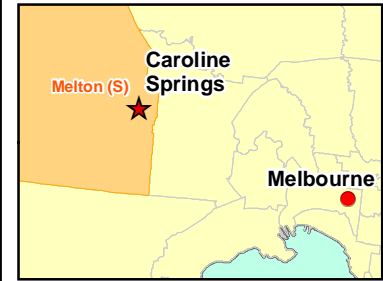
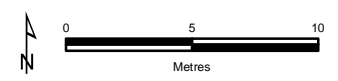






Figure 4b
Spiny Rice-flower recipient site, and monitored and translocated Spiny Rice-flowers
Caroline Springs Year 3 Management



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- Legend**
-  Photo points
 -  Ecological burn 2017
 -  Offset site
 -  Spiny Rice-flower recipient site

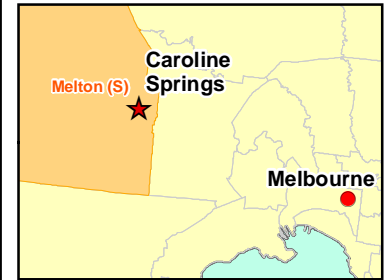
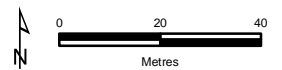


Figure 5
Location of photo points and ecological burn
Caroline Springs Year 3 Management



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8577 Fig05 Photopoints, Ecoburn 19/10/2017 melsley

APPENDICES

Appendix 1. Habitat Hectare Assessment

Table A1.1. Habitat hectare assessment

| Vegetation Zone | | PG ₁ | PG ₂ | PG ₃ | |
|-------------------------|---------------------|----------------------------------|----------------------------------|----------------------------------|-------|
| Bioregion | | Victorian Volcanic Plain | Victorian Volcanic Plain | Victorian Volcanic Plain | |
| EVC / Tree | | Plains Grassland (Heavier Soils) | Plains Grassland (Heavier Soils) | Plains Grassland (Heavier Soils) | |
| EVC Number | | 132_61 | 132_61 | 132_61 | |
| EVC Conservation Status | | Endangered | Endangered | Endangered | |
| Patch | Large Old Trees /10 | | | | |
| | Canopy Cover /5 | | | | |
| | Under storey /25 | 5 | 15 | 15 | |
| | Lack of Weeds /15 | 9 | 9 | 6 | |
| | Recruitment /10 | 6 | 6 | 3 | |
| | Condition | Organic Matter /5 | 5 | 5 | 3 |
| | | Logs /5 | | | |
| | | Treeless EVC Multiplier | 1.36 | 1.36 | 1.36 |
| | | Subtotal = | 34.00 | 47.60 | 36.72 |
| | Landscape Value /25 | | 16 | 16 | 16 |
| Habitat Points /100 | | 50 | 64 | 53 | |
| Habitat Score | | 0.50 | 0.64 | 0.53 | |

Note: Habitat zones are shown in Figure 2.

Appendix 2. Spiny Rice-flower Monitoring Data

A2.1. 2014/2015 Transplant Cohort – End of Year 3 Data

Table A2.1. Sex of translocated Spiny Rice-flower.

| Plant # | Sex | End of Year 2 Status |
|---------|--------|----------------------|
| #1 | Female | Dead |
| #2 | Male | Alive |
| #3 | Female | Dead |
| #4 | Female | Alive |
| #5 | Female | Alive |
| #6 | Female | Alive |
| #7 | Female | Dead |
| #8 | Female | Alive |
| #9 | Female | Alive |
| #10 | Male | Alive |
| #11 | Male | Alive |
| #12 | Male | Dead |
| #13 | Female | Alive |
| #14 | Female | Alive |
| #15 | Male | Alive |
| #16 | Male | Alive |
| #17 | Male | Alive |
| #18 | Female | Alive |
| #19 | Male | Alive |
| #20 | Male | Dead |
| #21 | Female | Dead |
| #22 | Female | Alive |
| #23 | Male | Dead |

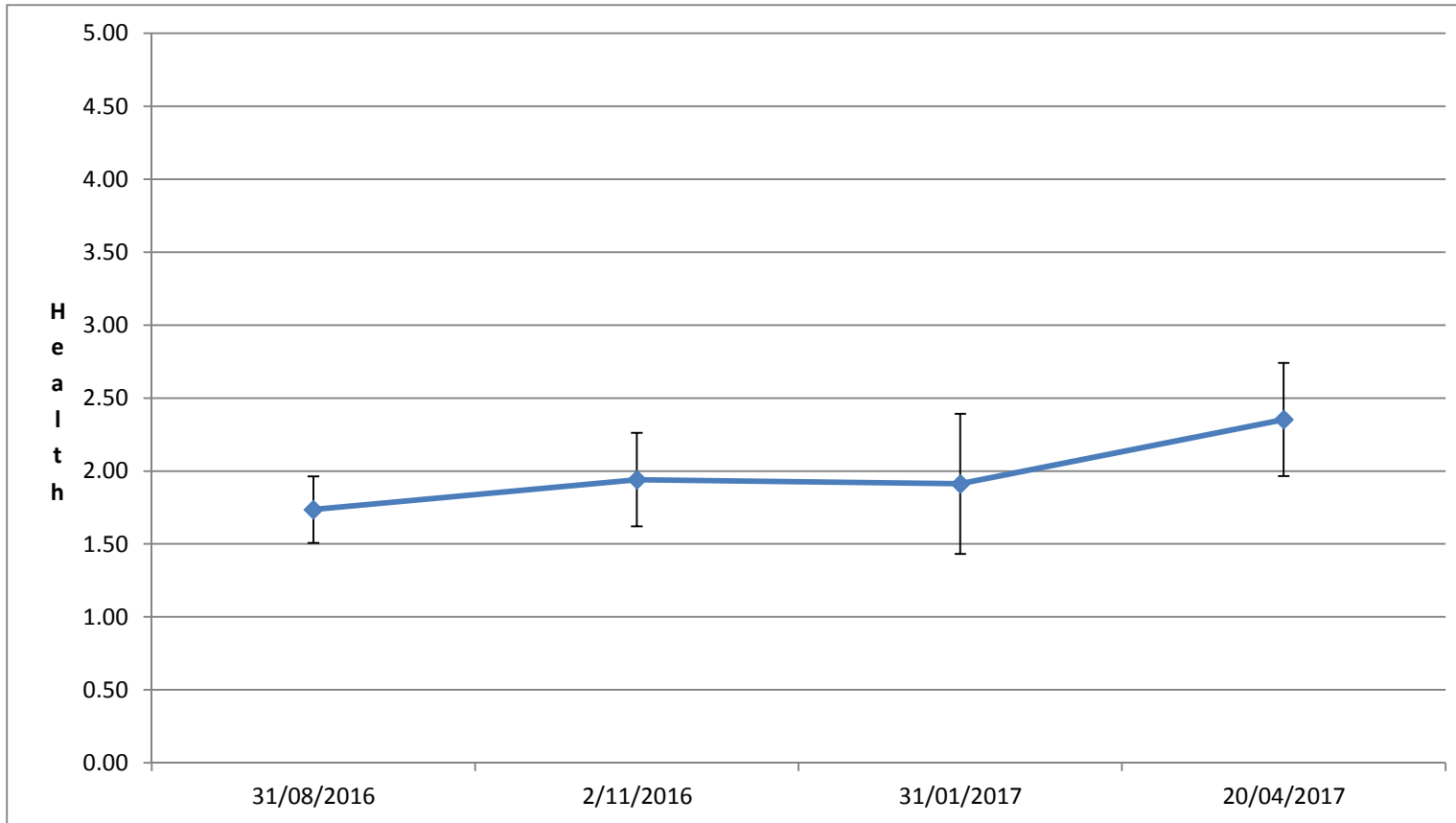


Figure A2.1.1 Average Spiny Rice-flower Health Year 3 (+/- 1 standard deviation) (refer to Table 3 for Health metric)

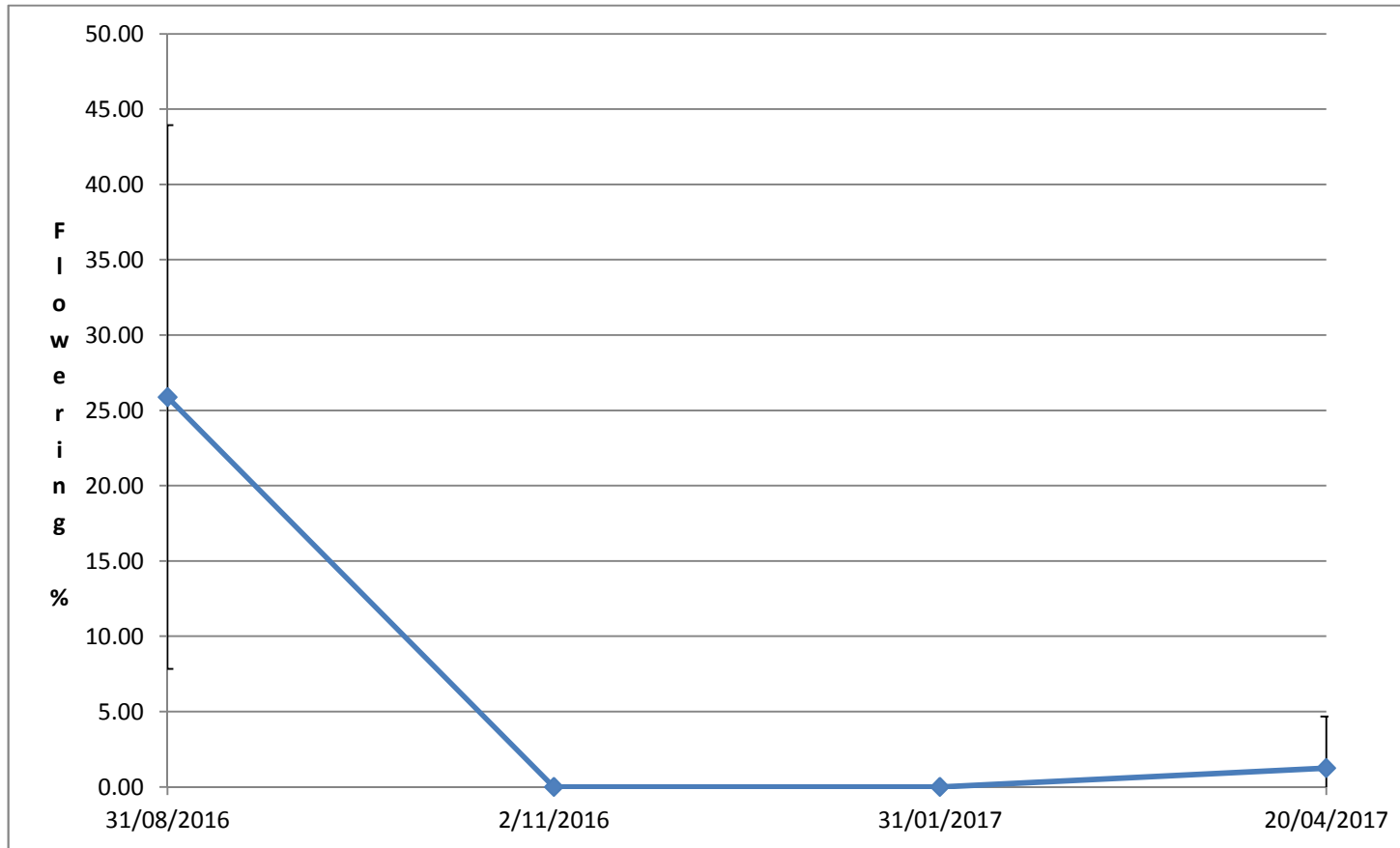


Figure A2.1.2. Average percentage of Spiny Rice-flower plant in flower (+/- 1 standard deviation).

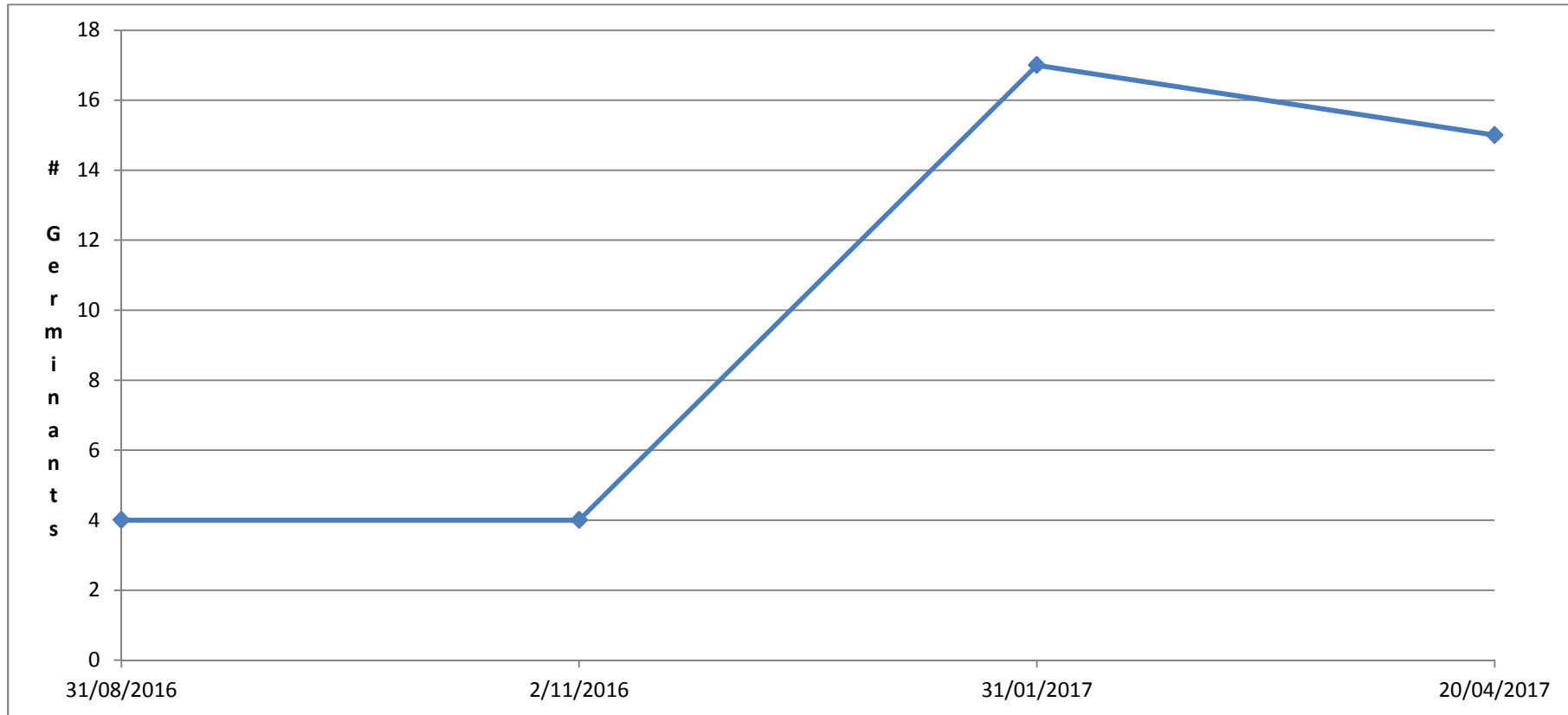


Figure A2.1.3. # Total germinants observed within the 2014/2015 transplant cohort – Year 3.

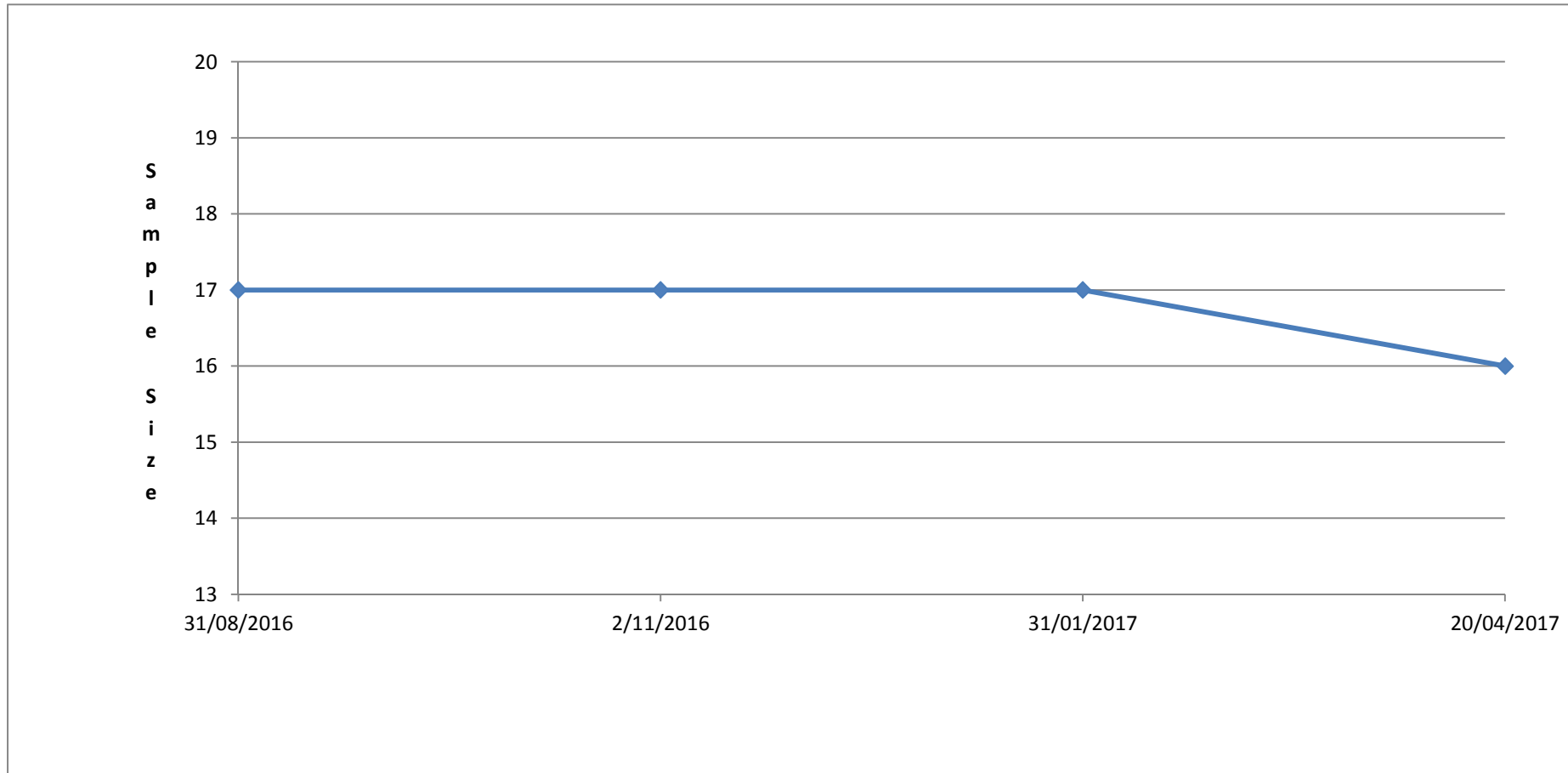


Figure A2.1.4. Sample size of (live) Spiny Rice-flower during each sampling event in Year 3 (Out of 23)

A2.2. 2015/2016 Transplant Cohort – Year 2 Data (Year 3 of CMP)

Table A2.2. Sex of translocated Spiny Rice-flower.

| Plant # | Sex | End of Year 1 Status |
|---------|--------|----------------------|
| #24 | Male | Dead |
| #25 | Male | Alive |
| #26 | Female | Alive |
| #27 | Female | Alive |
| #28 | Male | Alive |
| #29 | Female | Dead |
| #30 | Male | Alive |
| #31 | Male | Dead |
| #32 | Female | Alive |
| #33 | Male | Dead |
| #34 | Male | Alive |
| #35 | Female | Alive |
| #36 | Male | Dead |
| #37 | Female | Alive |
| #38 | Male | Alive |
| #39 | Female | Dead |
| #40 | Male | Alive |
| #41 | Male | Dead |
| #42 | Female | Alive |
| #43 | Male | Alive |
| #44 | Female | Alive |
| #45 | Male | Alive |
| #46 | Female | Alive |
| #47 | Female | Alive |
| #48 | Male | Dead |
| #49 | Male | Alive |
| #50 | Male | Dead |
| #51 | Male | Dead |
| #52 | Female | Dead |
| #53 | Female | Alive |
| #54 | Female | Dead |
| #55 | Female | Dead |

2015/2016 Transplant Cohort

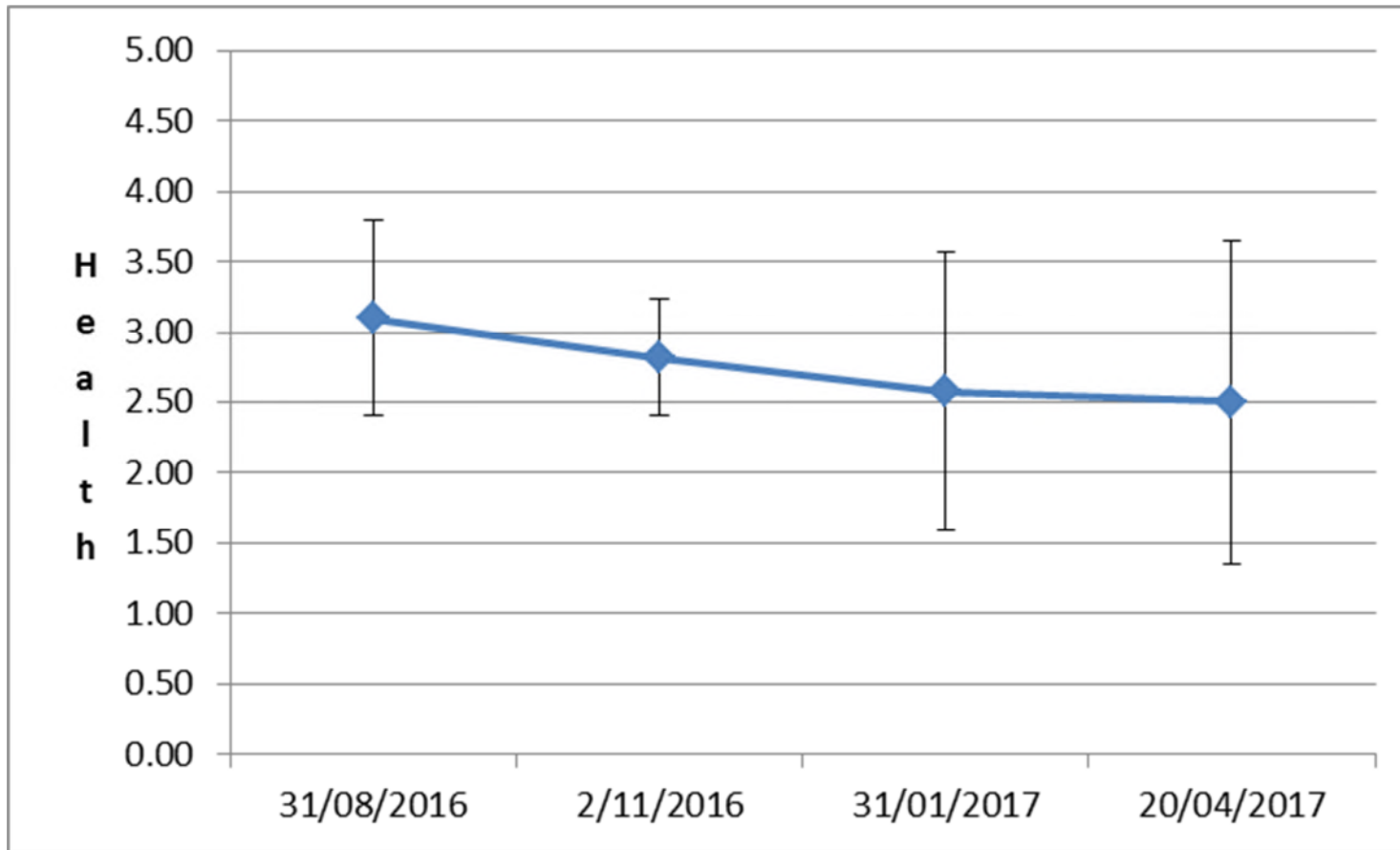


Figure A2.2.1 Average Spiny Rice-flower Health Year 1 (+/- 1 standard deviation) (refer to Table 3 for Health metric)

2015/2016 Transplant Cohort

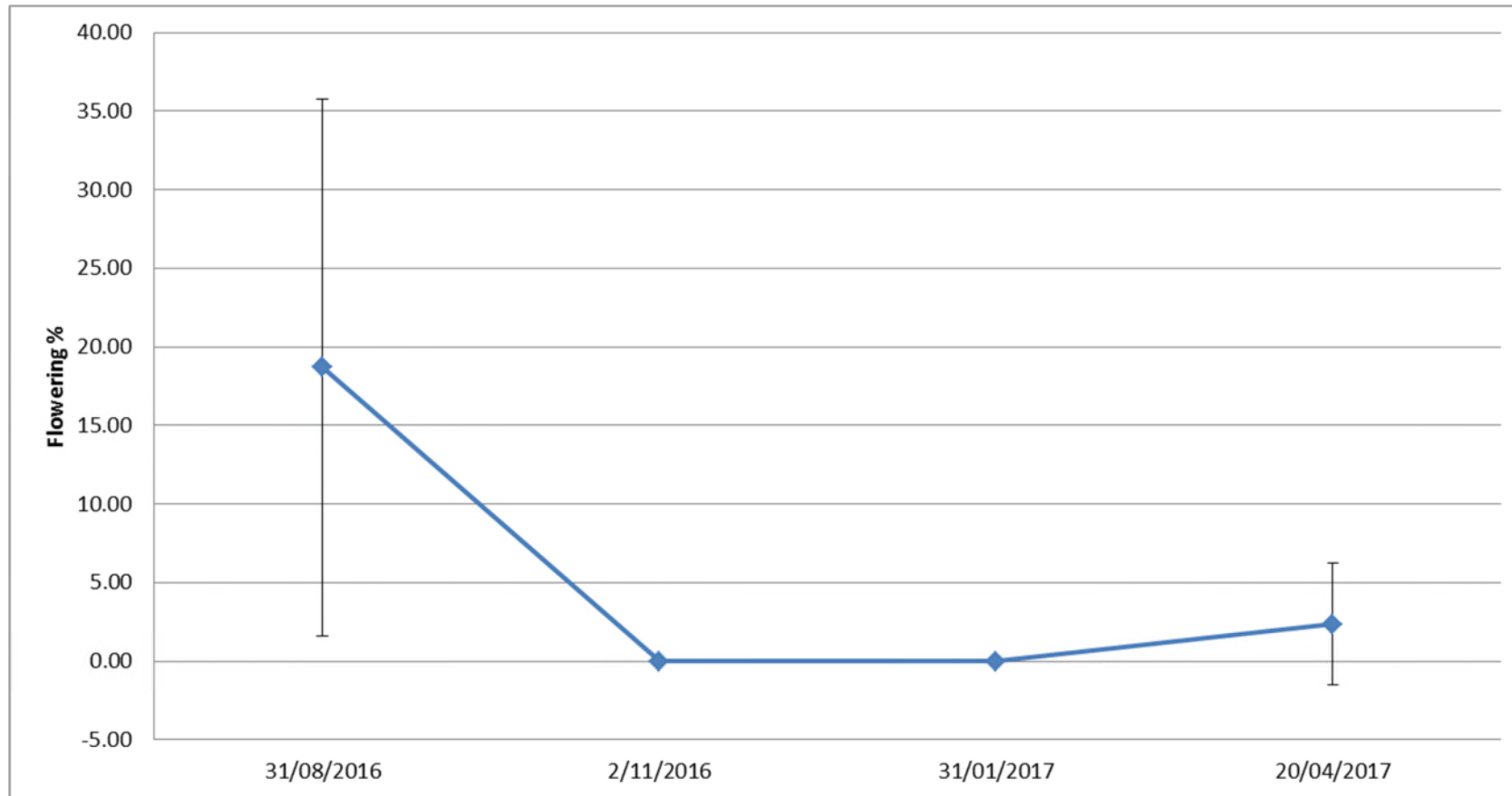


Figure A2.2.2. Average percentage of Spiny Rice-flower plant in flower (+/- 1 standard deviation).

2015/2016 Transplant Cohort

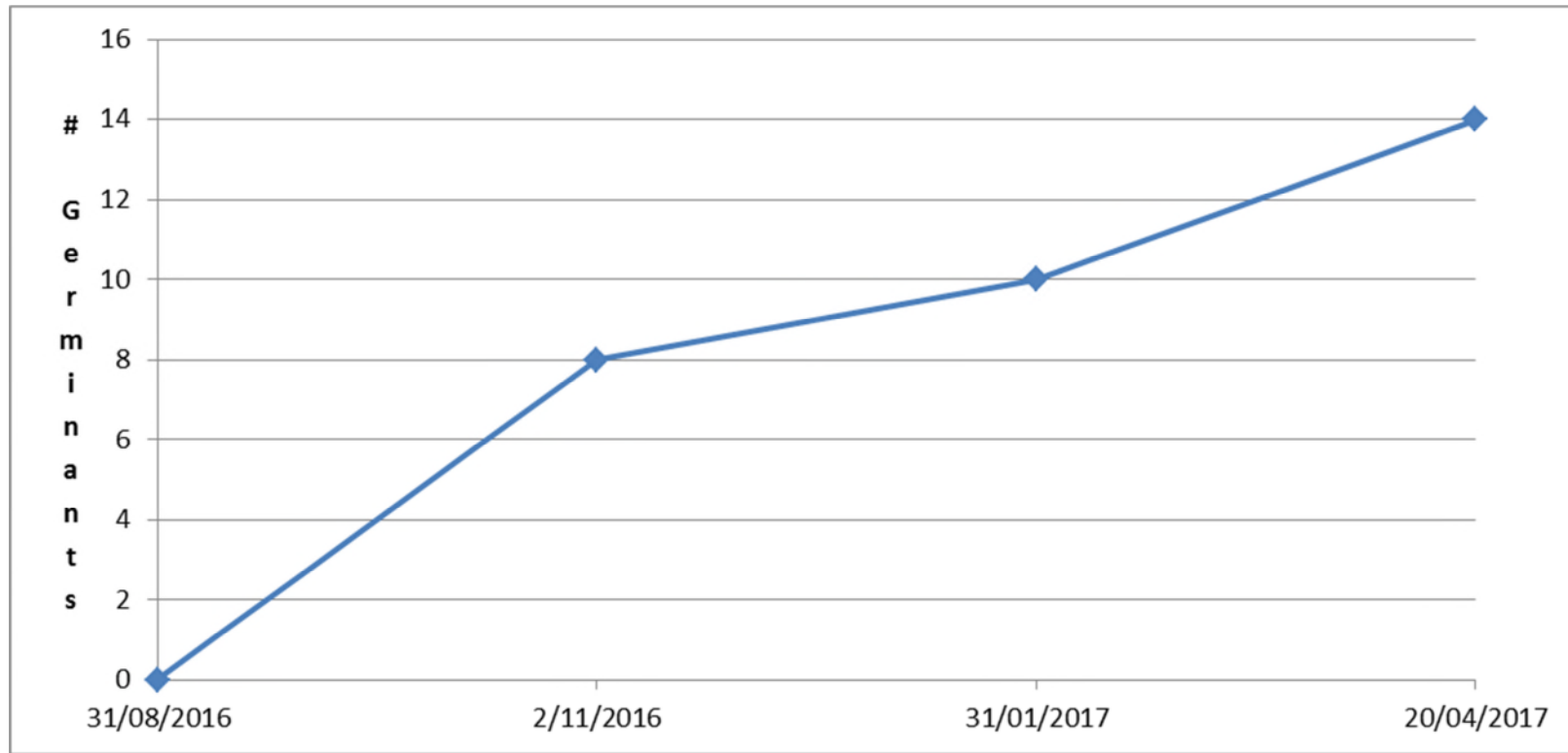


Figure A2.2.3. # Total germinants observed within the 2015/2016 transplant cohort – Year 1.

2015/2016 Transplant Cohort

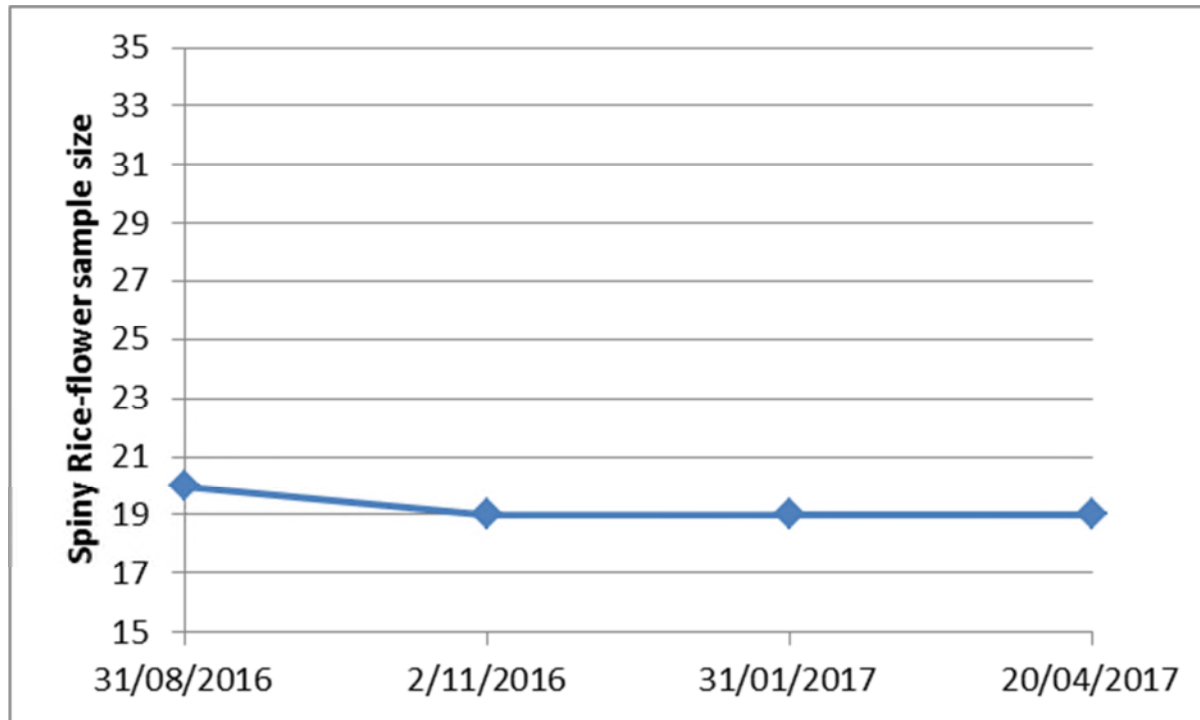


Figure A2.2.4. Sample size of (live) Spiny Rice-flower during each sampling event in Year 2 (Out of 32)

Appendix 3. Photopoints

2016/2017 (Year 3) Photopoints



Plate A2.1. Photopoint 1 (April 2017)



Plate A2.2. Photopoint 2 (April 2017)



Plate A2.3. Photopoint 3 (April 2017)



Plate A2.4. Photopoint 4 (April 2017)



Plate A2.5. Photopoint 5 (April 2017)



PlateA2.6. Photopoint 6 (April 2017)



PlateA2.7. Photopoint 7 (April 2017)



Plate A2.8. Photopoint 8 (April 2017)



Plate A2.9. Photopoint 9 (April 2017)



Plate A2.10. Photopoint 10 (April 2017)

Appendix 4. Translocated Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* photos.

All photos taken by Ecology and Heritage Partners (20/04/2017)

2014/2015 Transplant cohort



Plate A3.1. Transplant 1



Plate A3.2. Transplant 2



Plate A3.3. Transplant 3



Plate A3.4. Transplant 4

Plate A3.5. Transplant 5 (N/A)



PlateA3.7 Transplant 7 (N/A)

PlateA3.6. Transplant 6



Plate A3.9. Transplant 9

Plate A3.8. Transplant 8



Plate A3.10. Transplant 10



Plate A3.11. Transplant 11



Plate A3.13. Transplant 13

Plate A3.12. Transplant 12 (N/A)



Plate A3.14. Transplant 14



Plate A3.15. Transplant 15



Plate A3.16. Transplant 16



Plate A3.17. Transplant 17



Plate A3.18. Transplant 18



Plate A3.19. Transplant 19

Plate A3.20. Transplant 20 (N/A)



Plate A3.21. Transplant 21 (N/A)

Plate A3.22. Transplant 22



Plate A3.23. Transplant 23

2015/2016 Transplant cohort



Plate A3.24. Transplant 24



Plate A3.25. Transplant 25



Plate A3.26. Transplant 26



Plate A3.27. Transplant 27



Plate A3.28. Transplant 28



Plate A3.29. Transplant 29



Plate A3.30 Transplant 30

Plate A3.31. Transplant 31 (N/A)



Plate A3.32. Transplant 32

Plate A3.33. Transplant 33 (N/A)



Plate A3.34. Transplant 34

PlateA3.36. Transplant 36 (N/A)



PlateA3.35. Transplant 35



Plate A3.37. Transplant 37



Plate A3.38. Transplant 38



Plate A3.39. Transplant 39



Plate A3.40. Transplant 40



Plate A3.42. Transplant 42

Plate A3.41. Transplant 41 (N/A)



Plate A3.43. Transplant 43



Plate A3.44. Transplant 44



Plate A3.45. Transplant 45



Plate A3.46. Transplant 46

Plate A3.48. Transplant 48 (N/A)



Plate A3.47. Transplant 47



Plate A3.49. Transplant 49

Plate A3.50. Transplant 50 (N/A)



Plate A3.51. Transplant 51



Plate A3.52 Transplant 52

Plate A3.54. Transplant 54 (N/A)



Plate A3.53. Transplant 53

Plate A3.55. Transplant 55 (N/A)

2015/2016 Transplant cohort



Plate A3.56. Transplant 56



Plate A3.57. Transplant 57



Plate A3.58. Transplant 58