FINAL REPORT

Annual Report for the Caroline Springs Railway Station Grassland – Year 2

PREPARED FOR

Public Transport Victoria

August 2016

Ecology and Heritage Partners Pty Ltd

MELBOURNE: 292 Mt Alexander Road, Ascot Vale VIC 3032 **GEELONG:** 230 Latrobe Terrace, Geelong West Vic 3218
BRISBANE: Level 22, 127 Creek Street, Brisbane QLD 4000 **ADELAIDE:** 22 Greenhill Road, Wayville SA 5034
CANBERRA: PO Box 6067, O'Connor ACT 2602 **SYDNEY:** Level 5, 616 Harris Street, Ultimo, NSW, 2007
www.ehpartners.com.au | (03) 9377 0100

DOCUMENT CONTROL

Assessment	Annual Report for the Caroline Springs Railway Station Grassland – Year 2
Address	Christies Road, Caroline Springs
Project number	6169
Project manager	Shannon LeBel – Senior Botanist
Report author(s)	Shannon LeBel, Tom Schmidt
Report reviewer	Andrew Hill (Director/Principal Ecologist)
Other EHP staff	Tom Schmidt (Zoologist), Marc Freestone (Botanist), Chad Browning (Consultant Zoologist), Sandra Mijatovic (Consultant Botanist), Lyndsey Vivian (Consultant Botanist); Clio Gates Foale (Senior Ecologist); Chelsy Maloney (Research Assistant).
Mapping	Monique Elsley (GIS Officer)
File name	6169_EHP_Year2_AnnualReport_Final_16082016
Client	Public Transport Victoria
Bioregion	Victorian Volcanic Plain
CMA	Port Phillip and Westernport
Council	Melton City Council

Report versions	Comments	Comments updated by	Date submitted
Draft	Draft prepared for review by PTV		27/07/2015
Final	No Changes		16/08/2016

ACKNOWLEDGEMENTS

We thank the following people for their contribution to the project.

- James Damman and Manuelito Mitra (Project Managers) – Public Transport Victoria;
- Linda Neilson (Advisor – Natural Resource Management) – V/Line Pty Ltd;
- Steve Hammond and the crew from Western Land Services for management works;
- Department of the Environment (Commonwealth) and the Department of Environment, Land, Water, and Planning (Victoria) for legislative advice and the provision of databases and mapping programs used to inform these works;
- *Pimelea spinescens* Recovery Team (PsRT).

GLOSSARY

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

CONTENTS

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 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 first two years of the ecological management works.

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 areas of retained grassland between 24 June 2015 and 23 June 2016 (i.e. the second year of the overarching CMP), 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 is detailed in Ecology and Heritage Partners (2015). 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 is very dense across the western half of the offset site and retained grassland areas, with vegetation condition raging from poor to good. The eastern half of the offset site was subject to an ecological burn in April 2015, and biomass is significantly reduced compared to the remainder of the site. With exception of

the eastern section of the offset site, which is dominated by Kangaroo Grass *Themeda triandra*, 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. Several weeds of national significance have high cover, including Chilean Needle-grass *Nassella neesiana,* Serrated Tussock *Nassella trichotoma.* Also present throughout is Galenia *Galenia pubescens* var. *pubescens,* which is effectively closing inter-tussock spaces and smothering native herbaceous species. Spear Thistle *Cirsium vulgare,* Common Sow-thistle *Sonchus oleraceus*, Patterson's Curse *Echium plantagineum* and Artichoke Thistle *Cynara cardunculus* are present throughout in lower abundance, but still pose a threat to the long-tern ecological values to the site. A large population of African Boxthorn *Lycium ferocissimum* was formerly present, although most specimens have been removed from the site since the inception of the management plan.

Despite the high cover 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*, and Blue Heron's Bill *Erodium crinitum*. In addition to Kangaroo grass, other native grasses present throughout include Kneed Spear-grass *Austrostipa bigeniculata,* Rigid Panic *Walwhalleya proluta* and Common Wallaby-grass *Rytidosperma caespitosa*.

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 2015/2016

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.

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

Two Striped Legless Lizard (SLL) captures and one sloughed skin were recorded within the study area during targeted surveys (Plates 1-2) (Table 1). As with Year 1, all individuals were captured from Grid 2 (west) (Figure 3). It is possible that some of the individuals were recaptures and, due to the low numbers recorded, a population estimate was not undertaken. The locally common reptile species Common Blue-tongue Lizard *Tiliqua scincoides* was observed at various times throughout the year, but not recorded under the tiles. One juvenile Tiger Snake *Notechis scutatus* was recorded in the study area during tile grid checks (Table 1). No other vertebrate fauna species of note were recorded during targeted surveys.

It should be noted that since the ecological burn conducted in the eastern half of the site in April 2015, a larger number of exposed rocks are now evident, and the lack of SLL records in Grid 1 may be due to the higher abundance of existing basking sites in this part of the study area.

Table 1. Summary of targeted survey results

Date	Observer	Time	Air Temp	Wind Direction and Spd	Grid 1 (east)	Grid 2 (west)
17/11/2015	TS	8:15	22	N (15km/hr)	1 x Juv. Tiger Snake	None recorded
25/11/2016	SL	9.30	25	N (19km/hr)	None recorded	1 x SLL
27/11/2015	TS	8:30	15	W (24km/hr)	None recorded	1 x Sloughed skin from SLL
2/12/2015	TS	9:00	13	SW (24km/hr)	None recorded	1 x SLL (little one)
10/12/2015	SL	8.45	19	SW (10km/hr)	None recorded	None recorded
17/12/2015	TS	8:30	23	N (25km/hr)	None recorded	None recorded
23/12/2015	TS	7:30	18	S (5km/hr)	None recorded	None recorded
6/01/2016	TS/CM	8:00	18	SE (10 km/hr)	None recorded	None recorded

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 details the results of Year 2 habitat monitoring. No trigger values were exceeded and no management response is required following Year 2 of Striped Legless Lizard habitat monitoring. However, it should be noted that due to the ecological burn conducted within the site in April 2015, the habitat characteristics near Grid 1 (Plate 1) are considered to be of higher quality than those near Grid 2 (Plate 2). It is therefore anticipated that once an ecological burn occurs in the remainder of the site, habitat quality will also improve in and adjacent to Grid 2.

Table 2. Striped Legless Lizard habitat monitoring criteria and results.

Habitat variable	Ideal level^	Trigger level for action	Grid 1	Grid 2	Response if triggered	Response Triggered?
Native clumping grass cover	50%	<30%	50%	60%	Plant native clumping species	No
Introduced grass cover	<10%	>20%	<10%	<10%	Remove weeds	No
Bare ground	20%	<5%	40%	5%	Removal of vegetation	No
		>50%			Plant native clumping species	No
Exposed rock	10%	<5%	15%	10%	Removal of vegetation	No
Inter-tussock spacing	30 centimetres	<10 cms	15 cms	15 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 1. Grid 1 Habitat (Ecology and Heritage Partners 19/04/2016)

Plate 2. Grid 2 Habitat (Ecology and Heritage Partners 19/04/2016)

2.1.3 Conclusion

A population of Striped Legless Lizard is still present in the study area, with the species being recorded during three of 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. 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 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.

Initial salvage and translocation activities were undertaken on 26 June 2014 with a total of 23 individuals recorded during pre-salvage surveys within the construction footprint, and translocated to the recipient site (Figure 4). During surveys conducted on 19 and 22 June 2015, an additional 32 SRF individuals were identified within the construction footprint and translocated into the recipient site on 30 June 2015.

2.2.1 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 per month over the course of the management period, and often up to once per week during summer to ensure the newly translocated specimens were watered during periods of high drought stress.

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 monthly basis.

2.2.2 Recipient Site Conditions

To ensure minimal disturbance to the ecological values present within the offset site, the recipient site was located as close as possible to the lockable vehicular gate and entrance point into the conservation area in order to minimise the area of ground disturbance and compaction resulting from the use of the tree spade.

Although the floristic diversity of the offset site is high compared to the Plains Grassland EVC Benchmark, the recipient site for translocated Spiny Rice-flower plants is located in an area of lower quality. Kangaroo Grass is dominant within the recipient site, however, relative to the high quality areas elsewhere within the offset site, the recipient site contains moderate levels of exotic grasses and herbs including Wild Oat, Common Sow-thistle, Serrated Tussock, Chilean Needle-grass and Patterson's Curse. 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.

2.2.3 Monitoring Results

2.2.3.1 In-situ population

A targeted survey was undertaken on 28 August 2015 to locate and mark and record the abundance of the *in situ* Spiny Rice-flower population throughout the offset site and areas of retained grassland. A total of 103 Spiny Rice-flower were recorded and marked with a flag, up from 93 recorded in August 2014 (Figure 4).

2.2.3.2 Condition of Recipient Site

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 (Plate 3).

During the translocation activity, the ground within and adjacent to the recipient site was disturbed and compacted by repeated impacts by the tractor carrying the tree spade. This resulted in much of the biomass being compressed and flattened against the ground. However, by the end of Year 2, little or no evidence of the past disturbance is observable within the offset or recipient site (Plates 4-5).

Overall, due to the ongoing weed control taking place, the recipient site is considered to be in good condition (Plate 6-7).

2.2.4 Plant Deaths and Disturbances

2.2.4.1 June 2014 Transplants

As of 23 May 2016, no additional deaths from the original 23 SRF salvaged individuals have occurred in Year 2 of the monitoring period, with the remaining 17 alive and in very good condition (Appendix 1).

However, during Year 2, plant #3 perished suddenly, while plant #17, which appeared dead for several months suddenly exhibited new regrowth, and is currently in excellent condition (Appendix 1). Of the six SRF that died during Year 1, all plants were located in 'plugs' that sat above the surrounding groundlayer, and had developed large cracks around the base of the plug. This meant that each time these specimens were watered, rapid water runoff occurred into the cracks which likely resulted in a higher degree of drought stress relative to those specimens whose 'plugs' were translocated flush into the recipient site. It is also possible that the main tap root of some of these plants may have been damaged during salvage, reducing the likelihood of survivorship.

2.2.4.2 June 2015 Transplants

As of 23 May 2016, a total of 12 of the 32 SRF specimens transplanted in June 2015 appear dead, with the remaining 20 specimens in moderate condition (Appendix 1).

As with those specimens that perished in Year 1 of the former transplant cohort, the 'plugs' sat above the ground-layer and/or large cracks had developed near the base of the plugs increasing water runoff away from the plant. It should also be noted that many SRF plants of the 2015 transplant cohort were very small, or relatively recent germinants (< 3 years old), and as such, would have less resilience to drought stress over summer, or other forms of stress associated with salvage activities.

At several times during the year, various individual plants appeared to decline in health, only to rapidly recover following a watering event (Appendix 1.2). This indicates that drought stress was likely a major factor in plant death and growth rate on the transplanted individuals.

2.2.4.3 In-situ monitoring

The majority of the monitored *in-situ* population is located within the area subject to the ecological burn in April 2015, and little above-ground material was evident for the first portion of the Year 2 monitoring period. However, all plants have responded and recovered well from the burn, and are in excellent

condition at the end of Year 2 despite not being subject to the watering regime applied to the translocated plants.

Plate 3. New permanent wire fence delineating the railway station site and the offset site (Ecology and Heritage Partners 23/05/2016)

Plate 4. Ground disturbance caused during June 2015 translocation event (Ecology and Heritage Partners 29/09/2015)

Plate 5. Area where previous ground disturbance occurred during June 2015 translocation (Ecology and Heritage Partners 23/05/2016).

2.2.5 General Health and Growth

The health of all SRF plants was assessed at each monitoring event in accordance with the metric detailed in Table 3.

2.2.5.1 June 2014 Transplants

Of the 17 plants to survive Year 1, all are in at least very good health (i.e – a health score of 2.5 or better [Figure A1.1]), as of 23 May 2016.

All 17 plants were flowering at the date of the most recent monitoring event (23 May 2016) , with a large number of germinant observed throughout Spring 2015. However, although additional watering of these plants occurred, all germinants perished during the summer months. Monitoring also recorded an increase

in biomass over Year 2, with new several new shoots of regrowth observed sprouting from the base of these 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.

2.2.5.2 June 2015 Transplants

Of the 20 plants to survive Year 1, the majority range between poor and moderate health (i.e – a health score of between 3-4 [Figure A1.2.1]), as of 23 May 2016.

Ten of the 20 plants were flowering at the date of the most recent monitoring event (23 May 2016), with a moderate number of germinants observed in Spring. However, although additional watering of these plants occurred, all germinants perished during the summer months. Although several new shoots of regrowth were observed sprouting from the base of some plants, no overall increase in biomass was recorded over Year 1, as the regrowth often replaced existing biomass that suffered from die-back. It is likely that all 2015 translocated plants are still likely in the process of recovery and re-establishment in the recipient site

Table 3. 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 2 results indicate that the first year following a salvage and transplant event is likely a time during which plants recover from translocation shock and establish themselves within the recipient site. The surviving individuals from the 2015 cohort 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 second 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.

Summaries of the 2015/2016 recorded data are presented in Appendix 1.

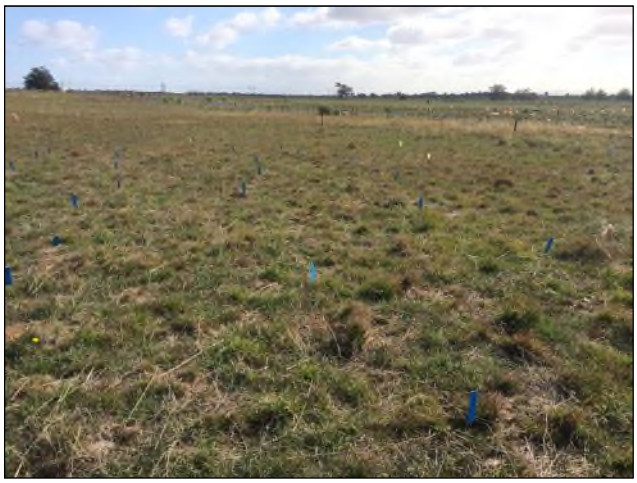


Plate 6. Recipient site (looking west)(Ecology and Heritage Partners 23/05/2016)

Plate 7. Recipient site (looking south-west)(Ecology and Heritage Partners 23/05/2016)

2.2.6 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 2.3.

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.

2.2.7 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.

On the advice of the PsRT, the recipient site was excluded from the April 2015 ecological burn (described in Section 2.4.7 of Ecology and Heritage Partners 2015) to allow for the transplanted individuals to fully establish within the recipient site. However, it will be important to reduce biomass in the recipient site via an ecological burn at some stage within the next 3 years.

As happened in 2014, due to the relatively dry conditions over late-winter/early spring, from approximately mid-October, several plants from the 2015 transplant cohort began to suffer drought stress. As per the contingency plan detailed in the CMP, a decision was made to extend the recommended watering schedule

implemented during months 0-3 (Table A1.1 from Ecology and Heritage Partners 2014a) throughout the summer to minimise the likelihood of mortality due to drought stress. In addition, during December 2015, ecologists from Ecology and Heritage Partners undertook works to back-fill the cracks surrounding the raised plugs, and attempted to level the plugs with the surrounding groundlayer. This reduced water run-off, and allowed for more water to soak into the soil immediately surrounding each plant.

Seed collection should be undertaken following the 2016 flowering season. Collected seed will be used to for propagation purposes should the performance targets specified in the CMP at the end of Year 3 not be met, and the contingency plan is enacted.

2.2.7.1 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 2, 32 plants are alive.

Although it is too early to consider the translocation a success, the survival target is still anticipated to be achieved, given no additional mortality in the 2014 transplant cohort, and the 2015 transplant cohort has had one year to establish in the recipient site.

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.

2.3 Management Actions for Year 2 (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).

2.3.1 Undertake control of woody weeds

2.3.1.1 Timing of Action and key performance target

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

Status – Year 2

Action Completed. Western Land Services mechanically removed woody weed infestations during Year 1, and during five site visits between October 2015 – April 2016, finished the removal of remaining woody weeds, and disposed of them off-site (Plate 8). In addition, as small numbers of African Box-thorn *Lycium ferocissimum* recruits were observed re-sprouting from previously removed infestations (Plate 9), follow-up herbicide treatment was undertaken.

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%. 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.

Plate 8. Site of woody weed removal (Ecology and Heritage Partners 23/05/2016)

Plate 9. Resprouting Box-thorn from a previously removed infestation (November 2015)

2.3.2 Undertake control of exotic grasses and herbaceous broadleaves

2.3.2.1 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 2

Action Completed. Western Land Services undertook several visits during the Year 2 management works to control grassy and herbaceus weeds, with a particular focus on follow-up spraying following the April 2015 ecological burn. The offset site and retained grassland contain large infestations of Serrated Tussock *Nassella trichotoma* and Patterson's Curse *Echium plantagineum* throughout, and these two species were a particular focus of weed control in Year 2 (Plate 10-11). Exotic grasses were sprayed multiple times with Glyphosate bi-active and selective herbicide was used for Broadleaf weeds, particularly Patterson's Curse, Spear Thistle and Sow Thistle (Plate 10-11).

Plate 10. Patterson's Curse subjected to herbicide treatment fence along the northern boundary of the offset site (May 2016).

Plate 11. Patterson's Curse and Serrated Tussock subjected to herbicide treatment fence along the northern boundary of the offset site (May 2016).

Although the offset site is subject to an extensive infestation of Serrated Tussock, the eastern half of the offset site is (as of the time of writing) considered to be in significantly better condition that the western half as a result of the April 2015 ecological burn. With the post-burn weed control targeted towards exotic species, the cover and abundance of perennial exotics in the eastern half appears to be lower than that in the west (Plates 12-13). In addition, Kangaroo Grass *Themeda triandra* appears to have responded well to the burn, and has recruited/resprouted in abundance.

Plate 12. Cover of biomass, predominantly Kangaroo Grass in the eastern portion of the offset site (Ecology and Heritage Partners 19/04/2016).

Plate 13. Cover of biomass (Serrated Tussock, Yorkshire Fog, Kangaroo Grass) in the western portion of the offset site (Ecology and Heritage Partners 19/04/2016).

Actions Required.

Based on the initial extent of grassy and herbaceus 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 3 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.

2.3.3 Conduct Rabbit Control

2.3.3.1 Timing of Action and key performance target

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

Status – Year 2

Action Completed. All harbour has been removed from the site during Year 1. No pest animals were observed in Year 2 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 3 is required. If pest fauna (rabbits, foxes) are observed, or signs thereof, appropriate control measures should be undertaken.

2.3.4 Maintain Perimeter Fence

2.3.4.1 Timing of Action and key performance target

Ongoing; Fence is maintained and repaired if broken.

Status – Year 2

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

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

2.3.5.1 Timing of Action and key performance target

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

Status – Year 2

Action Completed. Due to the April 2015 ecological burn, there is considered to be a high proportion of inter-tussock space in the eastern half of the offset site, and recruitment of native grasses and herbs was evident during Year 2.

Western Land Services undertook six (6) intensive spraying events during Year 2, with a focus on treating grassy weeds and herbs in the western half of the site. Although a high proportion of exotic weeds have been successfully treated with herbicide, the dead biomass is still present in the site, and inter-tussock space is low in this half.

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.

An ecological burn has been scheduled for the western half of the offset site from April 2016. However, at the time of writing, this had yet to occur due to unfavourable weather conditions.

Actions Required

Continue biomass reduction activities via weeding and/or ecological burning (when appropriate). An ecological burn is recommended to occur in the western half of the offset site during 2016 (prior to spring/summer).

2.3.6 Undertake direct seeding with native grasses in bare areas

2.3.6.1 Timing of Action and key performance target

Spring/Summer; Areas prepared in Year 1 are direct seeded.

Status – Year 2

Action Partially Completed. Due to the dry conditions experienced over spring and summer of late 2015/early 2016 in Melbourne, native seed produced *in-situ* was let fall from the parent plants to encourage natural recruitment through the bare patches of vegetation exposed by the ecological burn. Few patches of bare ground are currently present in the west of the offset site. Although the majority of the site still contains moderate to high levels of biomass, some smaller areas of bare ground have become evident following ongoing biomass and weeding activities. These areas will be targeted for direct seeding in Year 3.

An area of bare ground immediately adjacent to the railway station was direct seeded by Western Land Services in 2015 (Figure 4). As no seed was collected *in-situ* during Year 2, the seed required for the direct seeding was sourced from the local Melton area, and comprised a combination of Spear grass *Austrostipa spp*, and Wallaby grass *Rytidosperma spp*. The seed exhibited a moderate level of recruitment and this area currently exhibits a good cover of native grass cover (Plates 14-15).

Actions Required

Direct seeding should focus on areas currently comprised on high exotic grass cover (once dead biomass is removed). Although Table 12 of the OMP states direct seeding should occur in Spring/Summer, it is recommended that seeding occurs in Autumn as any new germinates are likely to perish during the drier, hotter months of Summer. It is anticipated that native seed will be collected from the offset site in during the 2016/2107 summer period for this purpose.

Plate 14. Spear grass-dominated recruits resulting from direct-seeding in January 2015 (Ecology and Heritage Partners 23/05/2016).

Plate 15. Spear grass-dominated recruits resulting from direct-seeding in January 2015 (Ecology and Heritage Partners 23/05/2016).

2.3.7 Undertake collection of seeds (herbs) for planting in Year 3

2.3.7.1 Timing of Action and key performance target

Summer; Seeds collected to allow nursery to grow plants.

Status – Year 2

Action not Completed. As summarised above in Section 2.3.6, native seed was not collected over spring and summer of late 2015/early 2016 due to the dry conditions experienced over spring and summer of late 2015/early 2016. In addition, due to the biomass currently present in the west of the offset site, few native herbs are evident in the ground layer.

Within the east of the offset site, it has become evident that a high number of herbs have successfully recruited/re-sprouted following the ecological burn. This area should be targeted for herb seed collection during 2016/2017.

Actions Required

Collection of herb seed should occur in summer of 2016/2017. If a low amount of seed is collected, or seed from few species, additional seed and/or seedlings from a wider range of herbs (see Table 11 of the OMP [Ecology and Heritage 2014b]) can be sourced from a local nursery. The planting of herbs should be undertaken in areas clear of, or with few weeds.

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

2.3.8.1 Timing of Action and key performance target

Progress report to the satisfaction of DELWP/DoE

Status – Year 2

Action Completed**.** This report satisfies this requirement.

2.3.9 Removal of all existing rubbish from site

2.3.9.1 Timing of Action and key performance target

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

Status – Year 2

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 3 of management.

REFERENCES

Ecology and Heritage Partners Pty Ltd 2015a. Spiny Rice-flower salvage and translocation from the proposed Caroline Springs Railway Station, Caroline Springs (amended). Report prepared for Public Transport Victoria.

Ecology and Heritage Partners Pty Ltd 2015b. Stockpile Relocation at the Caroline Springs Railway Station Site, Caroline Springs, Victoria. Report prepared for V/Line Pty Ltd.

Ecology and Heritage Partners Pty Ltd. 2014a. Conservation Management Plan for the proposed Caroline Springs Railway Station, Victoria. Unpublished report prepared by Ecology and Heritage Partners Pty Ltd on behalf of Public Transport Victoria.

Ecology and Heritage Partners Pty Ltd. 2014b. Offset Management Plan for the proposed Caroline Springs Railway Station, Victoria. Unpublished report prepared by Ecology and Heritage Partners Pty Ltd on behalf of Public Transport Victoria.

Ecology and Heritage Partners Pty Ltd 2015. Annual Report for the Caroline Springs Railway Station Grassland – Year 1. Report prepared for Public Transport Victoria. July 2015.

O'Shea, M. 2013. *An assessment of the Striped Legless Lizard Delma impar population at Denton Avenue Grassland Reserve, St Albans, Victoria*. Unpublished report on behalf of Brimbank Council.

Peyton Waite 2014. Plan of re-establishment survey of proposed Caroline Springs Station, Christies Road, Ravenhall. Version 3. Date of Plan: 08/09/2014.

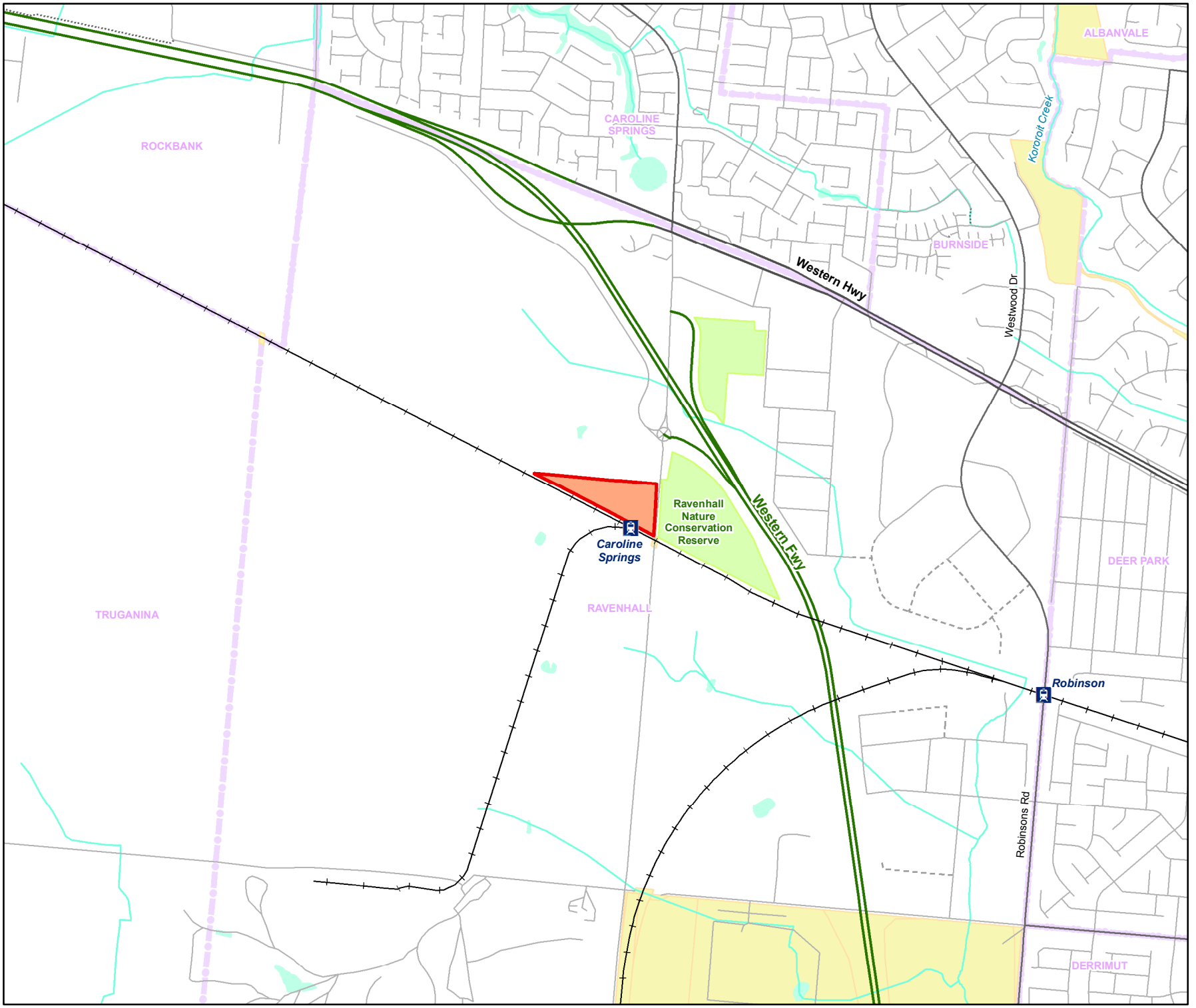
PSRT 2013. Translocation Protocol (March 2013) [Online]. Melbourne: Pimelea spinescens Recovery Team. Available: http://bird.net.au/bird/images/4/4b/Pimelea_spinescens_Translocation_Protocol_March_2013.pdf [01/04/2014].

SEWPaC 2010. Approval: Caroline Springs Railway Station Development, Ravenhall, Victoria (EPBC 2010/5463). Approval decision by the Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT.

SEWPaC 2011. Variation to Condition Attached to Approval: Caroline Springs Railway Station Development, Ravenhall, Victoria (EPBC 2010/5463). Variation of condition of approval by the Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT.

Vallee, L., Hogbin, T., Monks, L., Makinson, B., Matthes, M. & Rossetto, M. 2009. Guidelines for the translocation of threatened plants in Australia. Second edition. Australian Network for Plant Conservation, Canberra.

FIGURES



Legend

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

Figure 1

Location of the study area

Caroline Springs Year 2 Management

N

0 250 500

Metres

ecology & heritage partners

6169_Fig01_StudyArea 27/07/2016 melsley

Legend

- Offset site
- Spiny Rice-flower recipient site
- Retained areas of Grassland

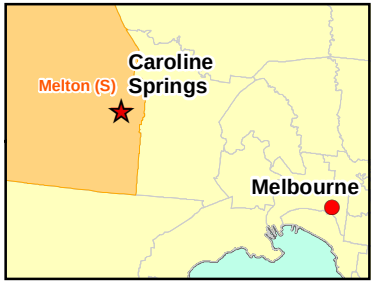


Figure 2

Location of offset site, recipient site, and areas of retained grassland

Caroline Springs Year 2 Management

N

0 25 50

Metres

ecology & heritage partners

Legend

- Study Area
- Tile grids

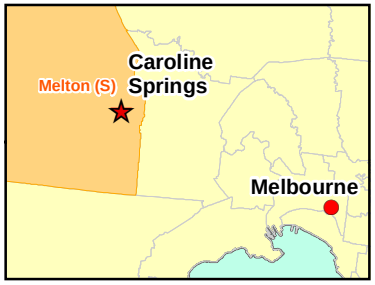


Figure 3

Striped Legless Lizard grid locations and records

Caroline Springs Year 2 Management

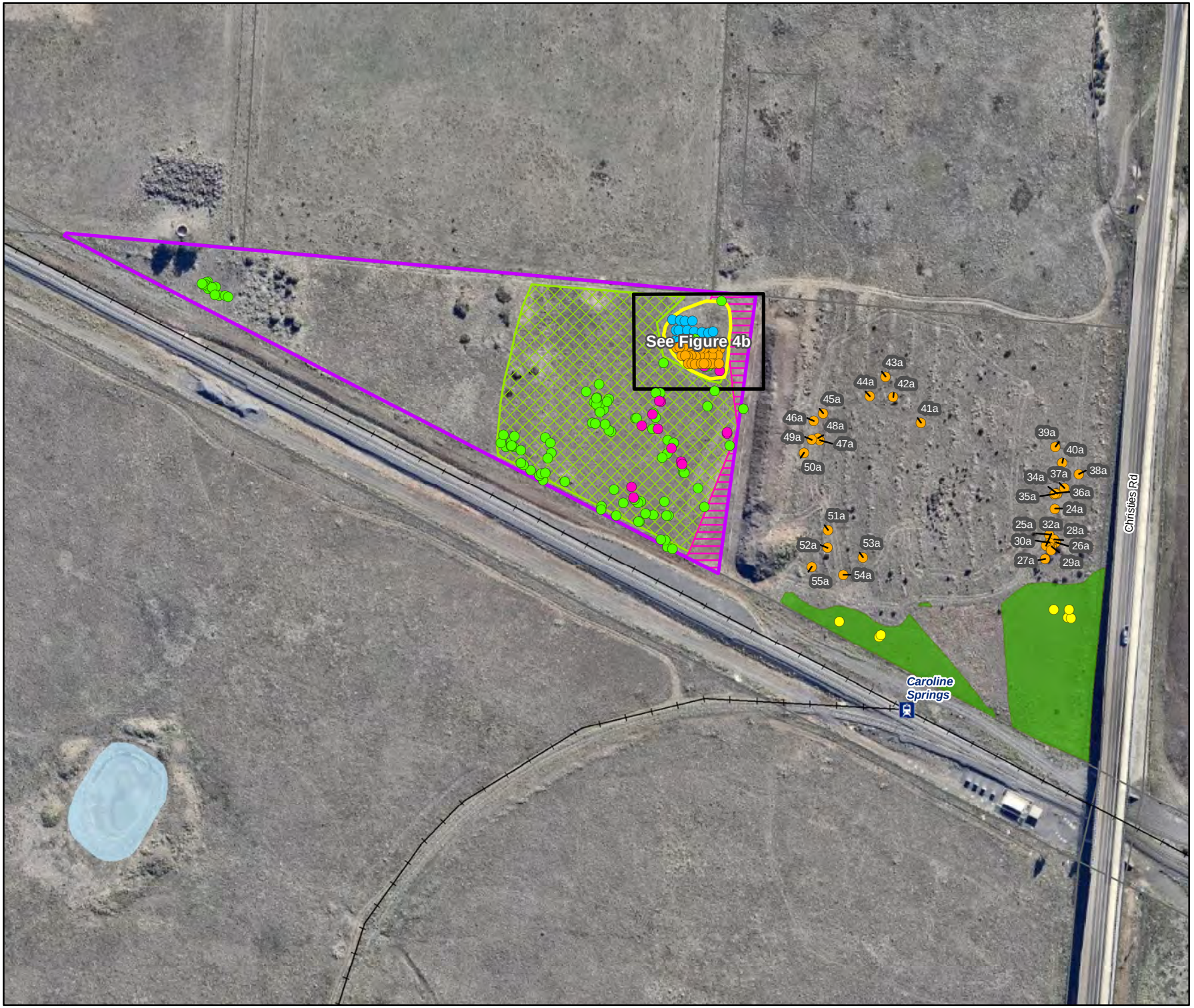
N

0 30 60

Metres

ecology & heritage partners

6169_Fig03_SLL_GridLoc 27/07/2016 melsley



Legend

- Spiny Rice-flower recipient site
- Monitored *In-situ* Spiny Rice-flower
- 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
- Ecological burn
- Direct seeding area

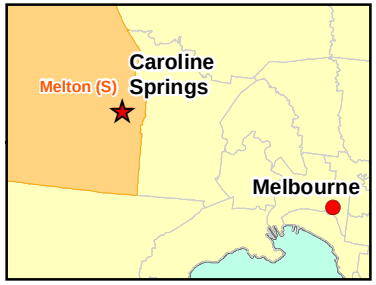


Figure 4a

Spiny Rice-flower recipient site, and monitored and translocated Spiny Rice-flowers

Caroline Springs Year 2 Management

N

0 25 50

Metres

ecology & heritage partners

6169_Fig04a_SRF 26/07/2016 melsley

Legend

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

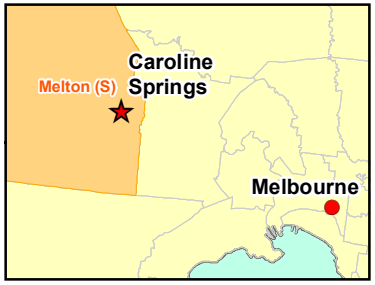


Figure 4b

Spiny Rice-flower recipient site, and monitored and translocated Spiny Rice-flowers

Caroline Springs Year 2 Management

N

0 3.75 7.5

Metres

ecology & heritage partners

6169_Fig04b_SRF_RecipientSite 27/07/2016 melsley

Legend

- Study Area
- Ecological burn

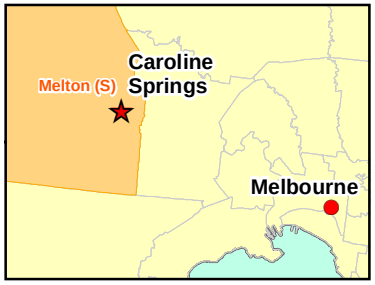


Figure 5

Ecological burn

Caroline Springs Year 2 Management

N

0 30 60

Metres

ecology & heritage partners

APPENDICES

Appendix 1. Spiny Rice-flower Monitoring Data

A1.1. 2014/2015 Transplant Cohort – Year 2 Data

Table A1.1. Sex of translocated Spiny Rice-flower.

Plant #	Sex	End of Year 2 Status
#1	Female	Alive
#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

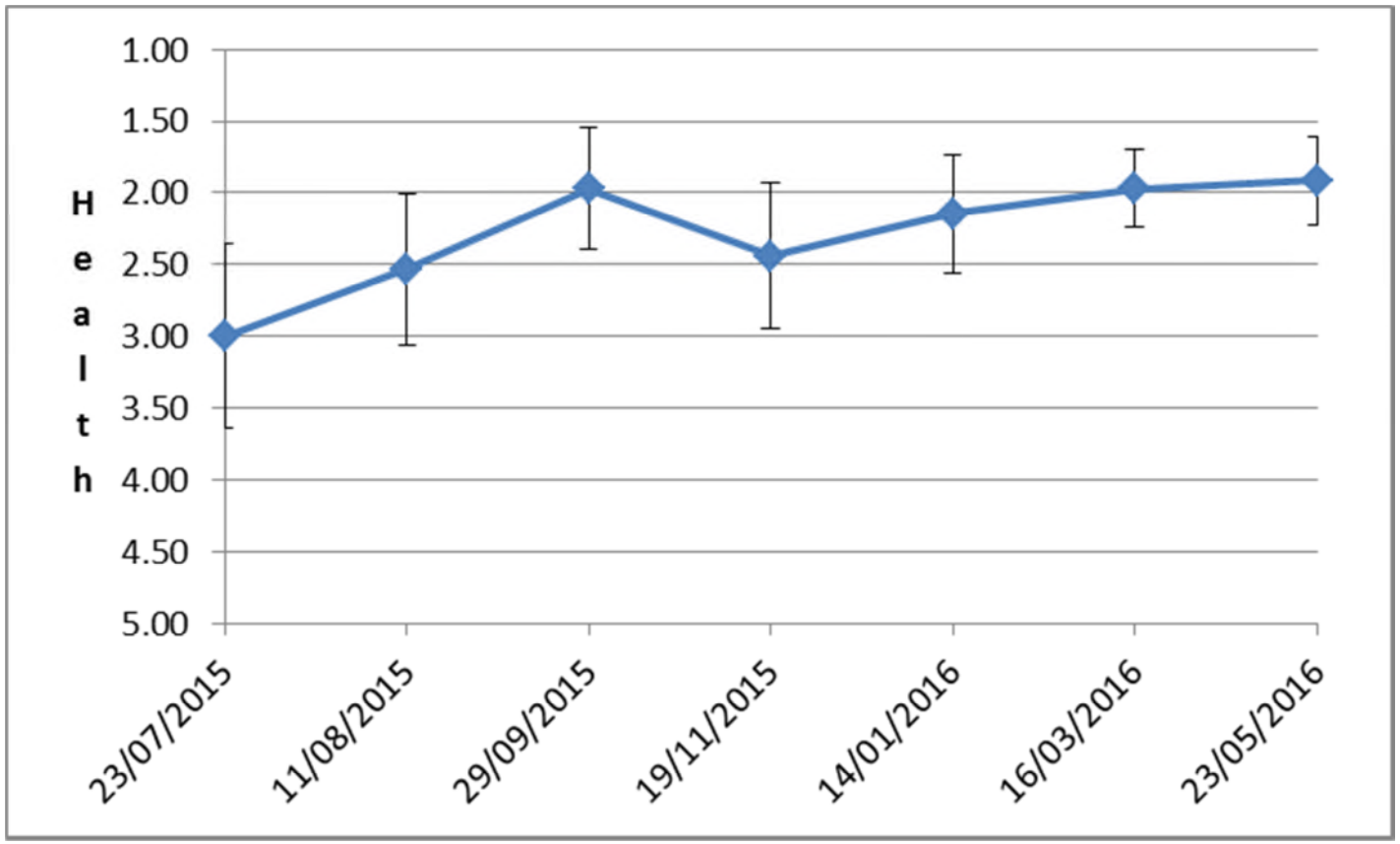


Figure A1.1.1 Average Spiny Rice-flower Health Year 2 (+/- 1 standard deviation) (refer to Table 3 for Health metric)

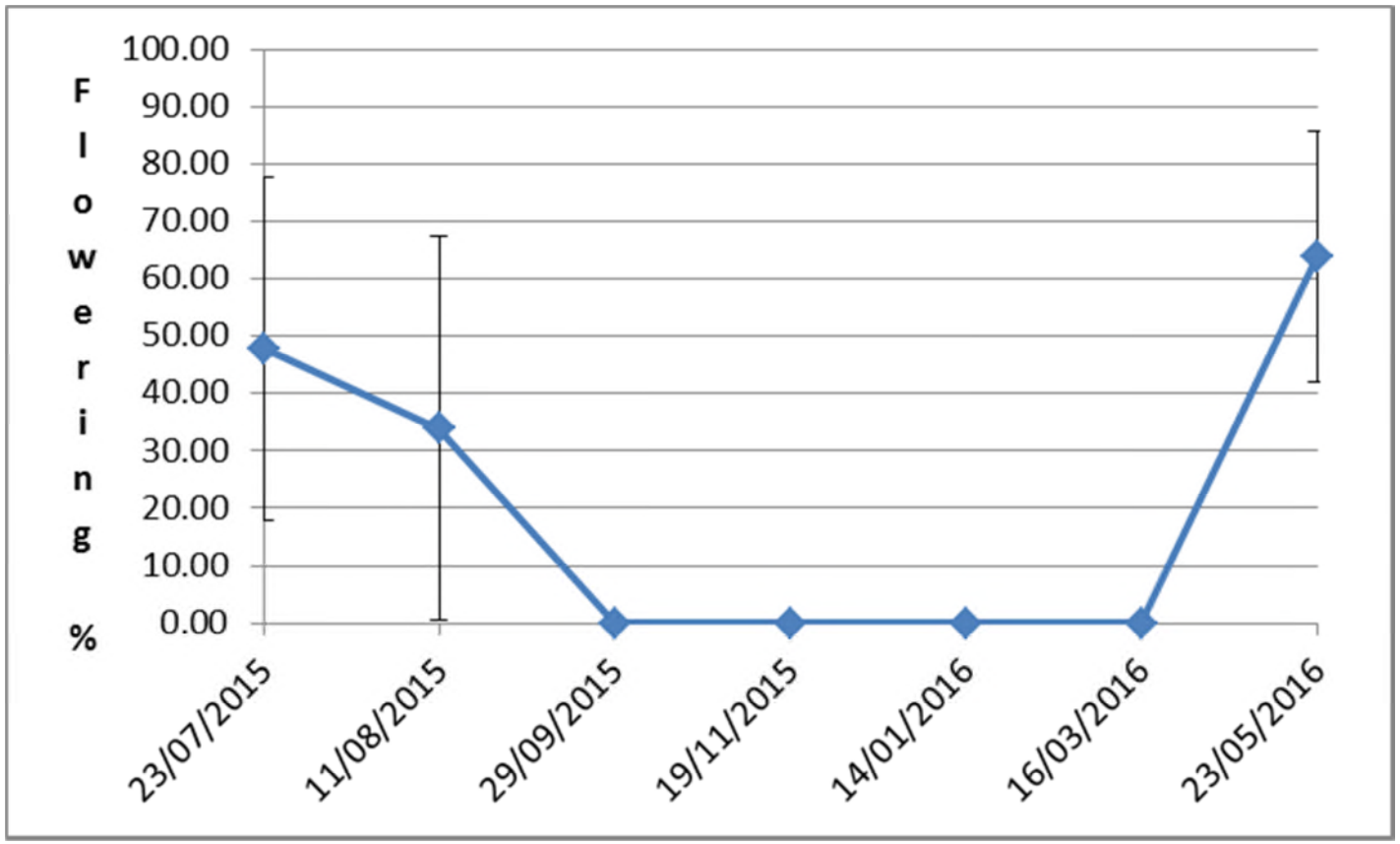


Figure A1.1.2. Average percentage of Spiny Rice-flower plant in flower (+/- 1 standard deviation).

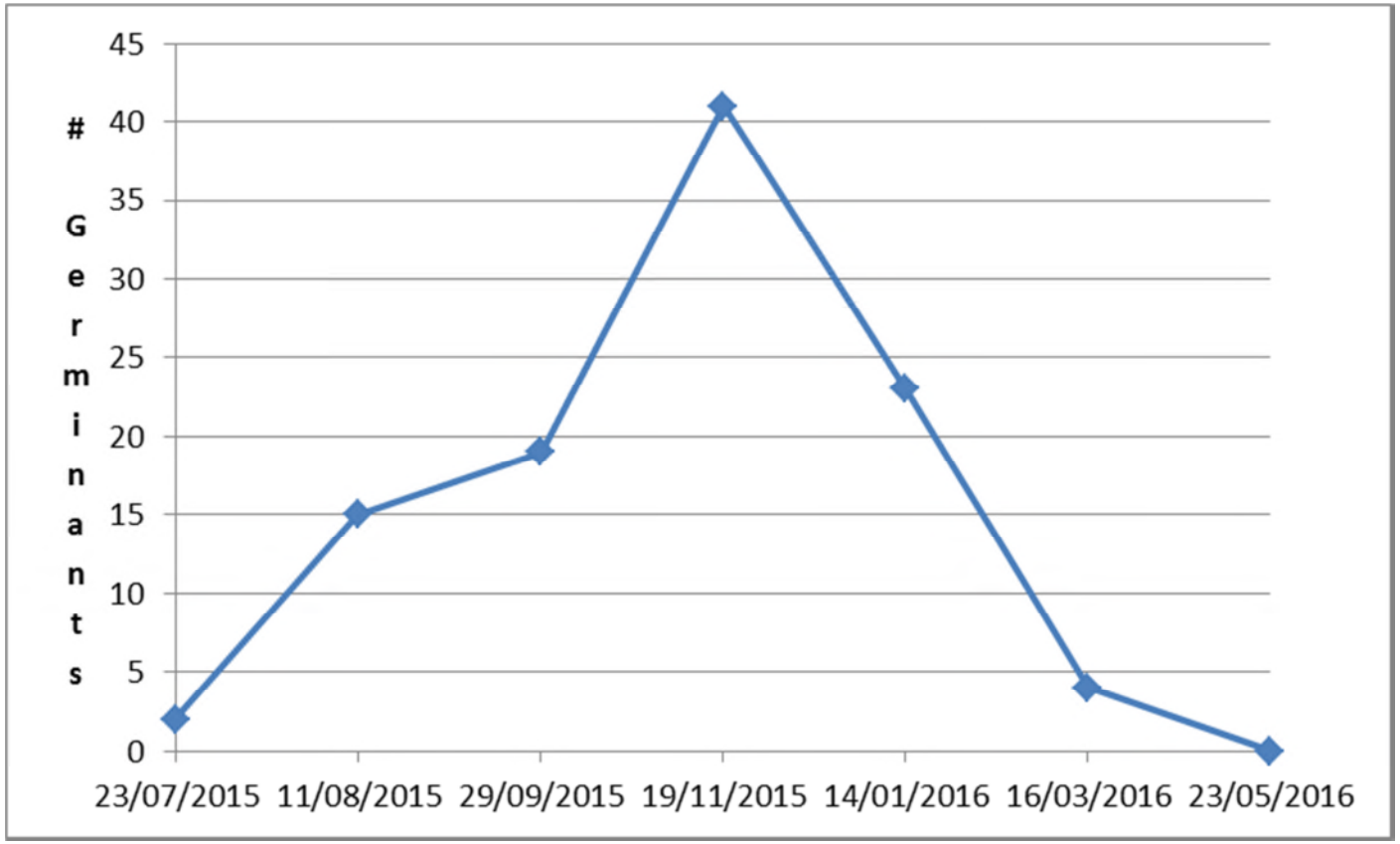


Figure A1.1.3. # Total germinants observed within the 2014/2015 transplant cohort – Year 2.

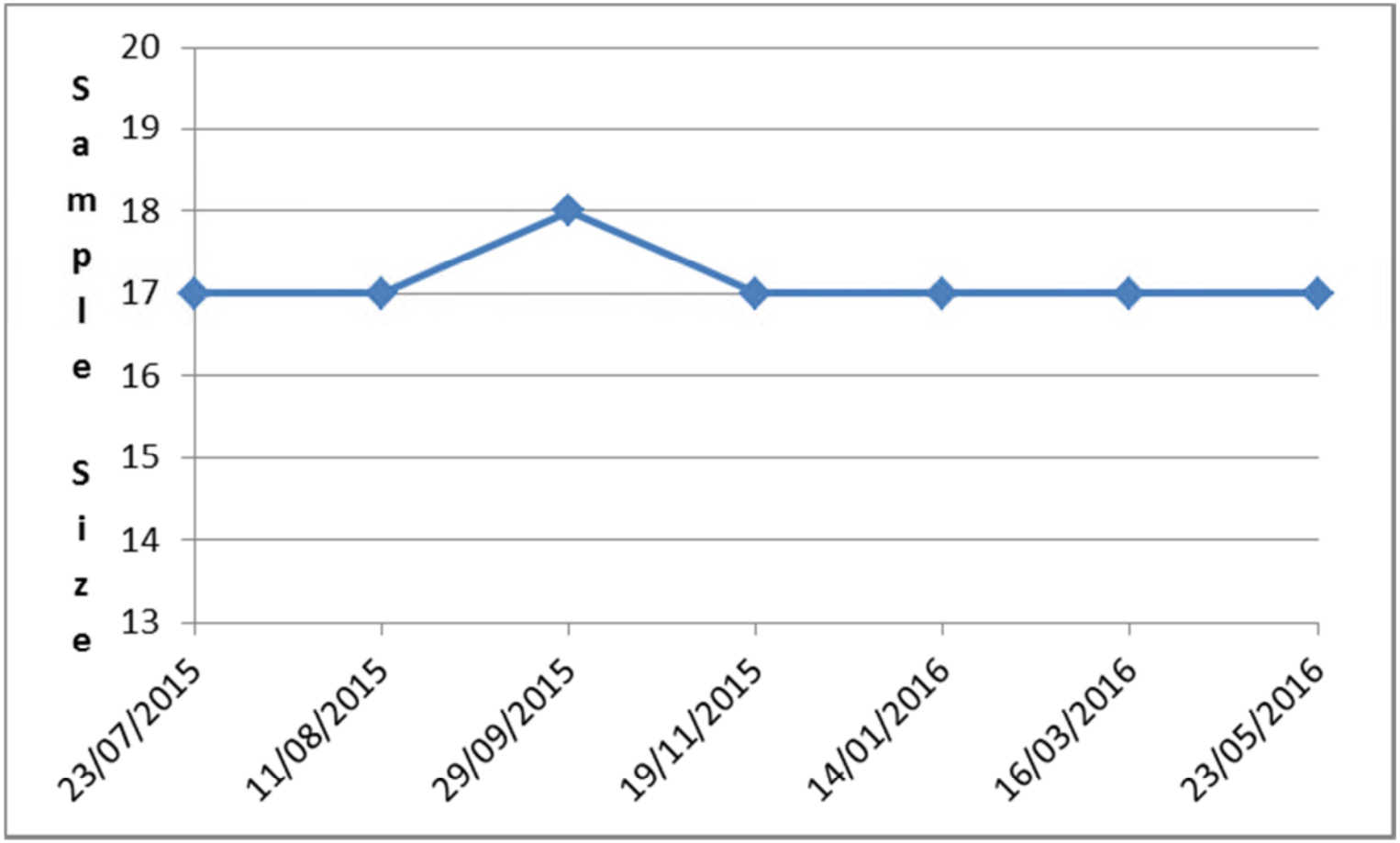


Figure A1.1.4. Sample size of (live) Spiny Rice-flower during each sampling event in Year 2 (Out of 23)

A1.2. 2015/2016 Transplant Cohort – Year 1 Data

Table A1.2. 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	Alive
#52	Female	Dead
#53	Female	Alive
#54	Female	Dead
#55	Female	Dead

2015/2016 Transplant Cohort

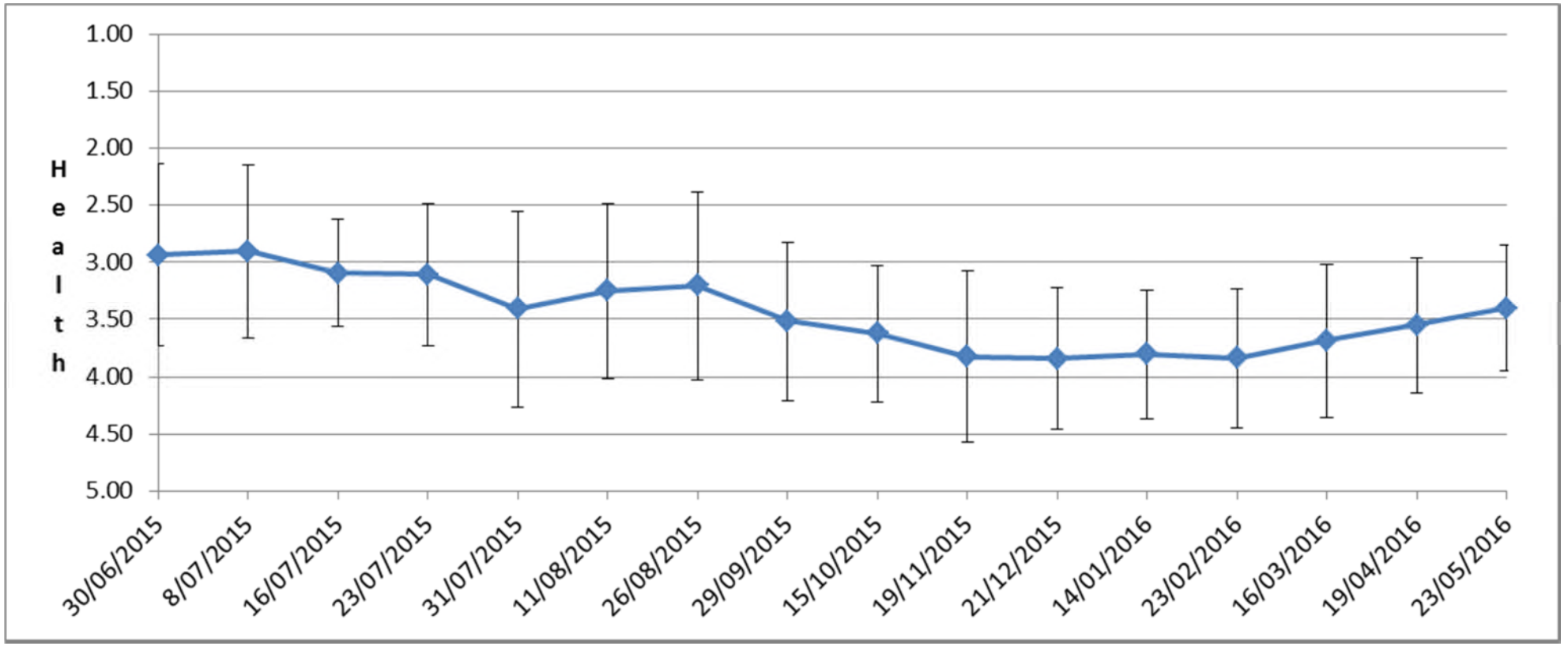


Figure A1.2.1 Average Spiny Rice-flower Health Year 1 (+/- 1 standard deviation) (refer to Table 3 for Health metric)

2015/2016 Transplant Cohort

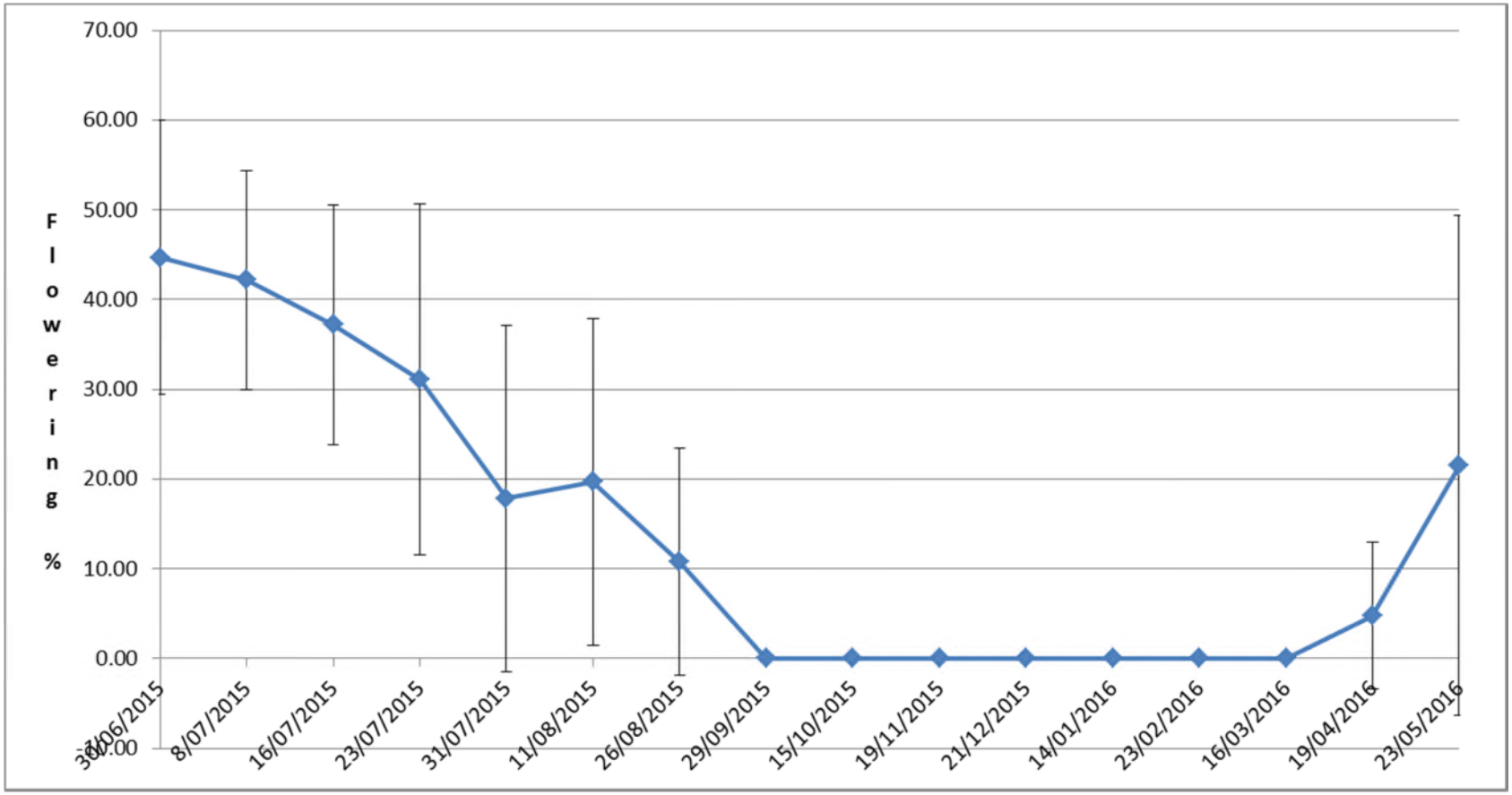


Figure A1.2.2. Average percentage of Spiny Rice-flower plant in flower (+/- 1 standard deviation).

2015/2016 Transplant Cohort

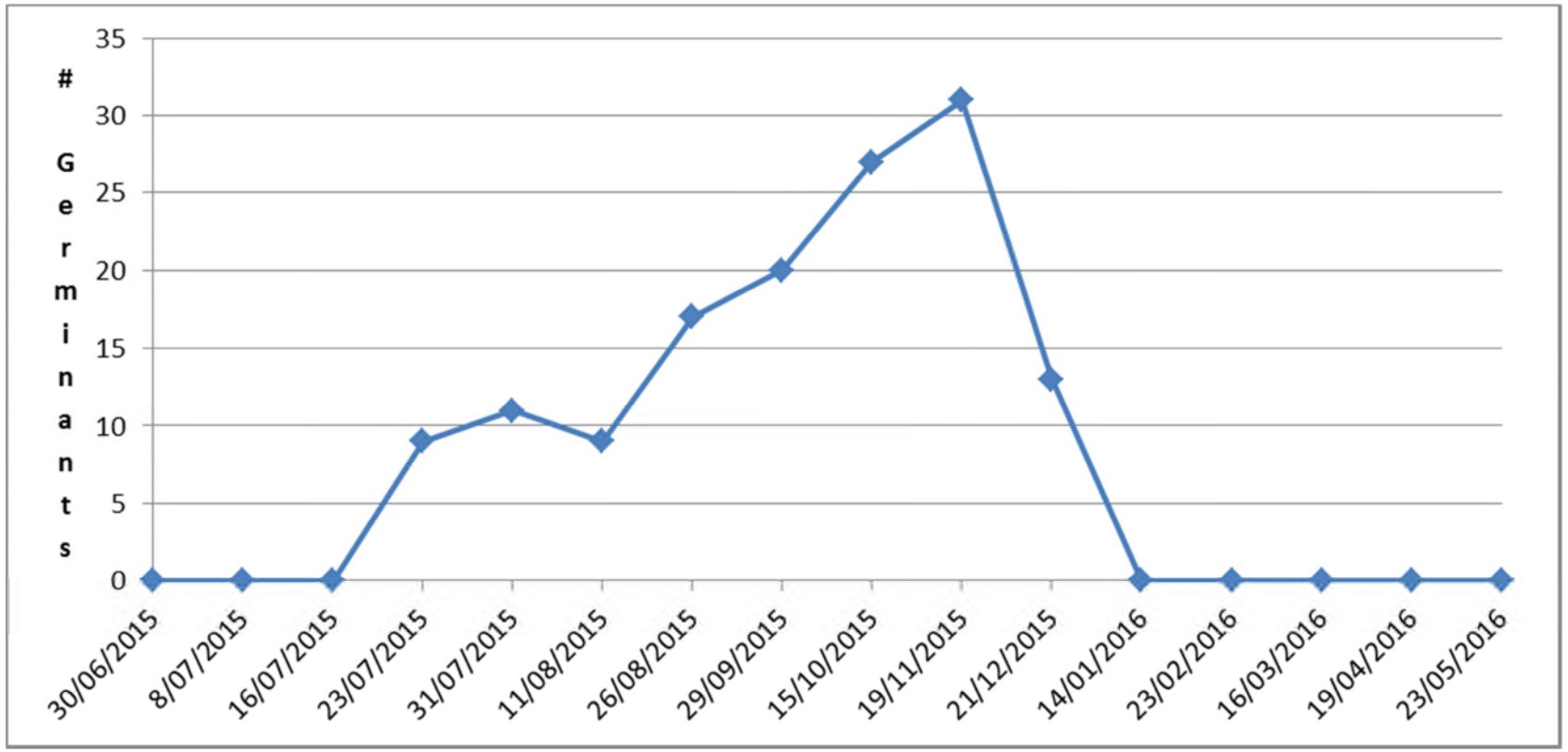


Figure A1.1.3. # Total germinants observed within the 2015/2016 transplant cohort – Year 1.

2015/2016 Transplant Cohort

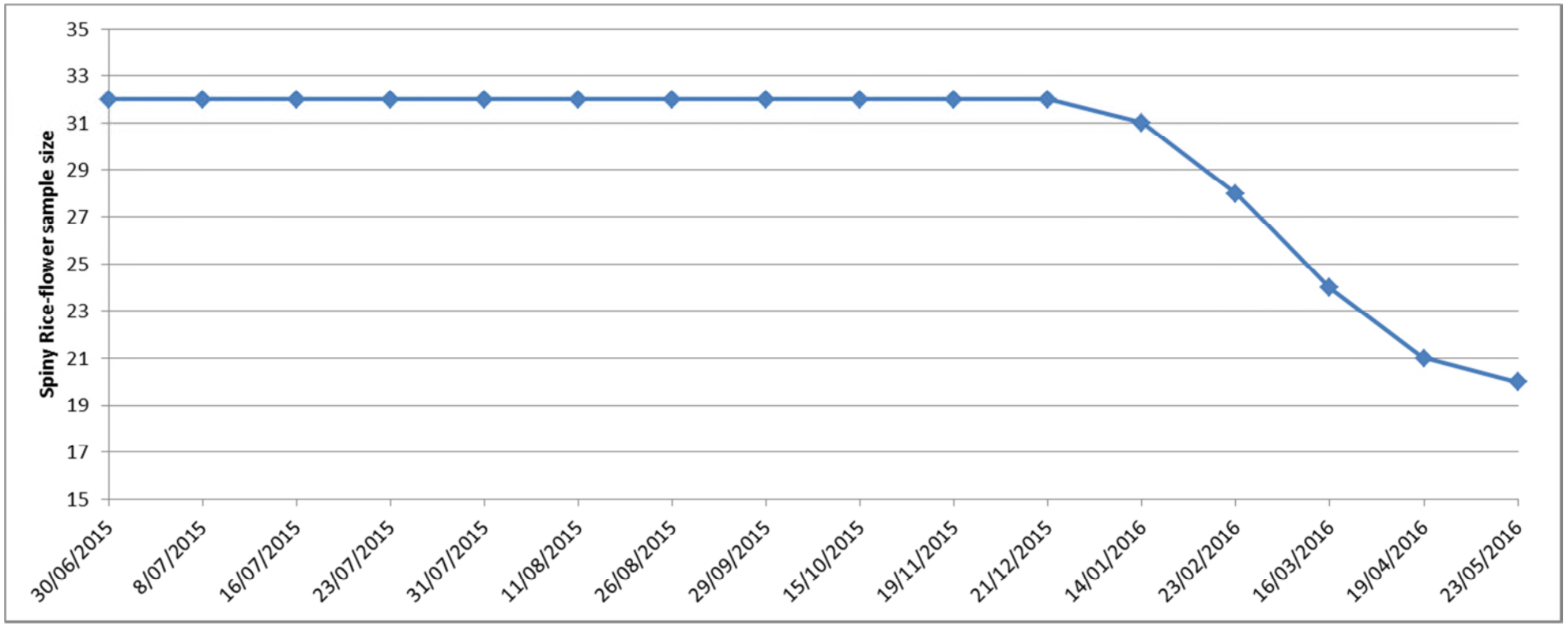


Figure A1.2.4. Sample size of (live) Spiny Rice-flower during each sampling event in Year 1 (Out of 32)

Appendix 2. Photopoints

2015/2016 Photopoints

Plate A2.1. Photopoint 1 (June 2015)

Plate A2.2. Photopoint 2 (June 2015)

Plate A2.3. Photopoint 3 (June 2015)

PlateA2.4. Photopoint 4 (June 2015)

Plate A2.5. Photopoint 5 (June 2015)

PlateA2.6. Photopoint 6 (June 2015)

PlateA2.7. Photopoint 7 (June 2015)

Plate A2.8. Photopoint 8 (June 2015)

Plate A2.9. Photopoint 9 (June 2015)

Plate A2.10. Photopoint 10 (June 2015)

2015/2016 Photopoints

Plate A2.11. Photopoint 1 (April 2016)

Plate A2.12. Photopoint 2 (April 2016)

Plate A2.13. Photopoint 3 (April 2016)

PlateA2.14. Photopoint 4 (April 2016)

Plate A2.15. Photopoint 5 (April 2016)

PlateA2.16. Photopoint 6 (April 2016)

PlateA2.17. Photopoint 7 (April 2016)

Plate A2.18. Photopoint 8 (April 2016)

Plate A2.19. Photopoint 9 (April 2016)

Plate A2.20. Photopoint 10 (April 2016)

Appendix 3. Translocated Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* photos.

All photos taken by Ecology and Heritage Partners (23/05/2016)

2014/2015 Transplant cohort

Plate A3.1. Transplant 1

Plate A3.2. Transplant 2

Plate A3.3. Transplant 3

PlateA3.4. Transplant 4

Plate A3.5. Transplant 5

PlateA3.6. Transplant 6

PlateA3.7 Transplant 7

Plate A3.8. Transplant 8

Plate A3.9. Transplant 9

Plate A3.10. Transplant 10

Plate A3.11. Transplant 11

PlateA3.12. Transplant 12

PlateA3.13. Transplant 13

Plate A3.14. Transplant 14

Plate A3.15. Transplant 15

Plate A3.16. Transplant 16

Plate A3.17. Transplant 17

PlateA3.18. Transplant 18

PlateA3.19. Transplant 19

Plate A3.20. Transplant 20

Plate A3.21. Transplant 21

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

PlateA3.27. Transplant 27

Plate A3.28. Transplant 28

PlateA3.29. Transplant 29

PlateA3.30 Transplant 30

Plate A3.31. Transplant 31

Plate A3.32. Transplant 32

Plate A3.33. Transplant 33

Plate A3.34. Transplant 34

PlateA3.35. Transplant 35

PlateA3.36. Transplant 36

Plate A3.37. Transplant 37

Plate A3.38. Transplant 38

Plate A3.39. Transplant 39

Plate A3.40. Transplant 40

PlateA3.41. Transplant 41

PlateA3.42. Transplant 42

Plate A3.43. Transplant 43

Plate A3.44. Transplant 44

Plate A3.45. Transplant 45

Plate A3.46. Transplant 46

Plate A3.47. Transplant 47

Plate A3.48. Transplant 48

PlateA3.49. Transplant 49

Plate A3.50. Transplant 50

PlateA3.51. Transplant 51

Plate A3.52 Transplant 52

Plate A3.53. Transplant 53

Plate A3.54. Transplant 54

PlateA3.55. Transplant 55