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M2G Planting Monitoring Report

Construction Corridor (Autumn 2014)

Prepared for
ACTEW Water

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ABBREVIATION	DESCRIPTION
BGGW	Box Gum Grassy Woodland
EMP	Ecological Monitoring Sub-plan
LLPS	Low Lift Pump Station
LRMP	Landscape Rehabilitation Management Plan
M2G	Murrumbidgee to Googong Water Transfer Project
ORMP	Offset Rehabilitation Management Plan
TEMP	Terrestrial Environment Management Plan

1 Introduction

1.1 Background

Eco Logical Australia (ELA) was commissioned by ACTEW Corporation (ACTEW) to deliver terrestrial ecological services as required by the environmental approval process for the Murrumbidgee to Googong Water Transfer Project (M2G). A component of that service is to provide post-construction rehabilitation monitoring in accordance with the Landscape Rehabilitation Management Plan (LRMP) for the M2G project, which has been undertaken by Blue Gum Ecological Consulting on behalf of ELA.

The following report contains the results of the autumn 2014 monitoring study for rehabilitation planting[1] within the construction corridor and structure sites. This is the fourth in a series of bi-annual reports to document the progress of tree, shrub and herbaceous plantings.

1.2 Study area

The study area extended from the Low Lift Pump Station (LLPS) at Angle Crossing on the Murrumbidgee River to the discharge facility at Burra Creek, near the intersection of Williamsdale and Burra Roads. The pipeline construction corridor has a total length of about 12 km (**Figures 1-3, Appendix 1**).

The study area falls within the Williamsdale (8726-4N) 1:25,000 Map Sheet and is part of the South-east Highlands Bioregion (Commonwealth of Australia 2012).

1.3 Study aims

The aim of the study was to monitor representative sub-sets of tree, shrub and herbaceous plantings within the M2G construction corridor and record their development and success rates.

1.4 Planting regime

Approximately 5,000 tree and shrub seedlings (Hiko Cells, 45Lt and 300SR containers) and 136,000 herbaceous tube-stock (Viro Cells) were planted within the M2G construction corridor and structure sites during spring 2011 and autumn 2012. Native plantings comprised nine tree species; eleven shrub species; eight grass species; five forb species; and six sedge/rush species, placed in approximately 280 planting arrays. In addition, five non-native tree and shrub species were also planted in the eastern sections of the construction corridor at the request of landowners. An inventory of planted species and the approximate number of individuals in each category are provided in **Table 1**.

Species selected for planting, as well as their distribution, were guided by former vegetation type, spatial characteristics of the vegetation and total vegetation loss resulting from construction activity. Additional woody plantings were included as part compensatory measure for habitat loss as well as for amenity.

[1] Concurrent plot-based sampling is being undertaken to monitor seeding rehabilitation within the construction corridor and is presented in a separate report.

Groundcover rehabilitation involved a multi-phased approach, which included: the reinstatement of top-soil; initial seeding of native species and direct drilling of a sterile non-native cover crop (the seeding component is monitored and reported separately); and a subsequent planting program (as defined above), which involved the placement of herbaceous tube-stock over approximately 30,000m^2 (3 ha) at an average rate of about 4.5 plantings per 1m^2.

Table 1: Species and number of tubestock (Viro and Hiko cells) planted within the M2G construction corridor and structure sites.

Scientific Name	Common Name	Total plantings pipeline corridor	Total plantings structures	Total
Native tree				
Eucalyptus blakelyi	Blakely's Red Gum			
Eucalyptus bridgesiana	Apple Box			
Eucalyptus mannifera	Brittle Gum			
Eucalyptus melliodora	Yellow Box			
Eucalyptus polyanthemos	Red Box			
Eucalyptus pauciflora	Snow Gum			
Eucalyptus rubida	Candlebark Gum			
Eucalyptus viminalis	Manna Gum			
Callitris endlicheri	Black Cypress Pine			
Sub-total		**624**	**148**	**772**
Native shrub				
Acacia dealbata	Silver Water			
Acacia genistifolia	Spreading Wattle			
Acacia rubida	Red Stemmed Wattle			
Acacia siculiformis	Dagger Wattle			
Banksia marginata	Silver Banksia			
Bursaria spinosa	Hairy Bursaria			
Leptospermum myrtifolium	Myrtle Tea Tree			
Leptospermum obovatum	River Tea Tree			
Kunzea ericoides	Burgan			
Cassinia longifolia	Shiny Cassinia			
Indigofera australis	Austral Indigo			
Sub-total		**3,016**	**1,055**	**4,071**
Non-native tree/shrub				
Ulmus parvifolia	Chinese Elm			
Quercus robur 'Fastigiata'	Upright English Oak			
Castanea sativa	European Chestnut			
Populus spp.	Poplar (TBC)			
Pyrus ussuriensis	Manchurian Pear			
Sub-total		**19**	**-**	**19**
Grass				
Austrodanthonia carphoides (Syn. *Rytidosperma carphoidies*)	Short Wallaby Grass			
Austrostipa scabra	Spear Grass			
Bothriochloa macra	Red Grass			
Elymus scaber	Wheat Grass			
Microlaena stipoides	Weeping Grass			

Scientific Name	Common Name	Total plantings pipeline corridor	Total plantings structures	Total
Themeda australis	Kangaroo Grass			
Chloris truncata	Windmill Grass			
Poa labillardieri	Tussock Grass			
Sub-total		**75,542**	**9,303**	**84,845**
Forb				
Chrysocephalum apiculatum	Yellow Buttons			
Convolvulus erubescens	Australia Bindweed			
Desmodium varians	Slender Tick Trefoil			
Leptorhynchos squamatus	Scaly Buttons			
Wahlenbergia stricta	Tall Bluebell			
Sub-total		**21,746**	**1,340**	**23,086**
Sedge and rush				
Carex appressa	Tall Sedge			
Eleocharis acuta	Common Spike Rush			
Isolepis fluitans	Floating Club Rush			
Phragmites australis	Common Reed			
Juncus usitatus	Common Rush			
Lomandra longifolia	Mat Rush			
Sub-total		**21,085**	**7,292**	**28,377**
Total native trees/shrub		**3,640**	**1,203**	**4,843**
Total non-native tree/shrub		**19**	**-**	**19**
Total herbaceous		**118,373**	**17,935**	**136,308**
Total		**122,032**	**19,138**	**141,170**

2 Methods

2.1 Monitoring regime

Permanent planting sites were established within the M2G construction corridor and structure sites and will be monitored on a bi-annual basis (autumn and spring/summer periods) over a period of at least two-years post-construction.

The current monitoring period was conducted on between 2 and 8 April 2014.

2.2 Selection of monitoring sites

Twenty-five monitoring (sample) sites were selected from approximately 280 planting arrays (which comprised 200 herbaceous[2] arrays and 80 tree and shrub arrays) within the M2G construction corridor and structure sites (**Figures 1 – 3, Appendix 1**). Twelve monitoring sites were established in the ACT and thirteen in NSW sections (**Table 2**).

Two planting categories are referred to in this report, they are: *woody plantings* (trees and shrubs - coded TSP); and *herbaceous plantings* (which include grasses, forbs, sedges and rushes - coded HP). Woody plantings were monitored at twelve sample sites, and herbaceous plantings at thirteen sample sites.

The spatial arrangement of sampling sites was influenced by the placement of planting arrays (which in turn were influenced by the former distribution of native vegetation) and as such fewer sampling sites appear in the eastern non-native section of the corridor than in the central and western sections. Sites were selected to include variations in landform, such as: slope and aspect, soil moisture and former vegetation type.

Each sample site was marked with a red-tipped stake, at which grid co-ordinates (using a hand-held Garmin GPS 60 set to WGS 84) and a photograph were taken.

Table 2: Planting monitoring sites within the construction corridor. Each site has a unique identifier (TSP = tree & shrub planting and HP = herbaceous planting) and are sorted in order of chainage from the LLPS.

Site sequence*	Site ID^	Approx. chainage from LLPS	Co-ordinates	Jurisdiction	Property
1	TSP1	250	691345 - 6060236	ACT	PCS (Murrumbidgee R. corridor)
2	HP1	750	691706 - 6060396	ACT	PCS (Murrumbidgee R. corridor)
3	TSP2	1,025	691964 - 6060519	ACT	PCS (Murrumbidgee R. corridor)
4	HP2	1,300	692219 - 6060594	ACT	ACTEW leasehold
5	TSP3	1,350	692256 - 6060605	ACT	ACTEW leasehold
6	HP3	1,550	692459 - 6060660	ACT	ACTEW leasehold

[2] Herbaceous monitoring sites varied in shape and size (ranging from about 40 m^2 to 400 m^2) and density of planted material.

Site sequence*	Site ID^	Approx. chainage from LLPS	Co-ordinates	Jurisdiction	Property
7	TSP4	1,900	692592 - 6060707	ACT	ACTEW leasehold
8	HP4	1,770	692797 - 6060687	ACT	ACTEW leasehold
9	TSP5	2,325	693226 - 6060578	ACT	ACTEW leasehold
10	HP5	2,550	693442 - 6060534	ACT	ACTEW leasehold
11	TSP6	2,650	693528 - 6060505	ACT	ACTEW leasehold
12	HP6	2,780	693683 - 6060542	ACT	ACT Conservation zone
13	TSP7	3,040	693927 - 6060542	NSW	Smith
14	HP7	3,200	694084 - 6060511	NSW	Smith
15	HP8	3,650	694525 - 6060591	NSW	McDonald
16	HP9	4,050	694890 - 6060767	NSW	McDonald
17	HP10	4,475	695248 - 6060569	NSW	McDonald
18	TSP8	4,975	695663 - 6060392	NSW	Lonergan
19	TSP9	5,475	696175 - 6060305	NSW	Lonergan
20	HP11	6,175	696826 - 6060127	NSW	Codd / Howarth
21	TSP10	6,425	697084 - 6060204	NSW	Johanson
22	HP12	7,550	698003 - 6060755	NSW	Devitt
23	HP13	8,250	698541 - 6061210	NSW	Bos (drainage channel)
24	TSP11	9,300	699277 - 6061925	NSW	Latimer
25	TSP12	11,900	701346 - 6063099	NSW	Discharge facility

***Sites are listed according to their sequence from the LLPS to Discharge Facility, as shown in Figures 1-3 in Appendix 1.**

2.3 Survey techniques

Sampling of planted specimens was conducted by either direct count or estimates of cover abundance. Recording was more complicated for herbaceous plantings than for tree and shrub plantings for the following reasons:

- Increases in species frequency and diversity, since the commencement of monitoring, has resulted in less confident discrimination between planted herbaceous species and 'background' recruitment - from either seeding or natural germination – of the same species.
- Limited information on exact planting frequency at each sample site.

Consequently, different monitoring strategies were adopted for each planting category, and are discussed in the following sections.

2.3.1 Tree and shrub planting

A simple quantitative sampling method was used to measure tree and shrub planting success. Specimens were counted, identified to at least genus level and their health determined according to the following criteria:

- *Good Health* - indicated by vigorous growth, fully leaved with expected colouration for that species;
- *Poor Health* - stems or leaves discoloured, foliage limited or easily dislodged, specimen may appear stunted or heavily browsed;

- *Dead* - absence of leaves, stem or leaves entirely discoloured or desiccated with no visible living vegetative material.

2.3.2 Herbaceous (grasses and forbs) planting

As indicated in Section 2.3, above, isolating planted herbaceous specimens from non-planted specimens of the same species proved difficult and time consuming, and it was not possible to account for herbaceous plantings in the same manner as for trees and shrubs. Consequently, a semi-quantitative approach, based on cover abundance estimates of target herbaceous species (accepting unavoidable mixing of planted and non-planted forms of the same species) was adopted to gauge planting performance.

All native herbaceous species (both planted and non-planted) were recorded and their cover abundances estimated according to a modified Braun-Blanquet scale, although the size and shape of sample sites were neither uniform nor standardised and ranged from about 40 m^2 to 400 m^2 in size (sample sites conformed to the original size and configuration of planting arrays). While this limited the capacity to compare results between sample sites (as in the manner of a standardised plot-based study) the sampling method is considered representative of both planted tube stock and planting sites.

3 Results

3.1 Overview

Monitoring results for tree and shrub planting are summarised in **Section 3.2** and for herbaceous planting in **Section 3.3**.

Monitoring surveys accounted for approximately 14% of all woody plantings and between 3.6% and 7.2%[3] of all herbaceous plantings, or, measured as a proportion of planting area, about 6.5% (1,950 m^2) of the total planting area (30,000 m^2). As explained, in **Section 2.3** above, accounting for each herbaceous planting cell proved problematic and a modified sampling approach, based on cover abundance measures, was adopted.

Main findings from the current monitoring study are:

- **significant decline** in tree and shrub planting success with a corresponding **increase** in dead or missing plantings;
- **a small decline** in the total number of native herbaceous species (attributed in part to seasonal growth patterns); and,
- **a small increase** in the estimated cover abundance of 'planted' native herbaceous species.

3.2 Tree and shrub monitoring

A total of 700[4] tree and shrub plantings were monitored at twelve sample sites during the current monitoring period (see **Table 7 in Appendix 2** for full data sets). Of these, 343 (49%) were in good health, 82 (11.7%) in poor health and 275 (39.3%) either dead or unaccounted (**Table 3**). This represented a 15% decline of specimens in good health compared to the previous spring 2013 sampling period (**Table 4**). Furthermore, declines in specimen health were observed at nine of the twelve sample sites.

The best performing sample sites (TSP8 and TSP11) had 88.9% and 90.9% of specimens in good health, respectively, however, these sites had the lowest sample sizes. Five sites had less than 75% specimens in good health and five sites below 50% (**Table 3**). Slightly more than half of the total sample was classified as poor, dead or missing (**Chart 1**). **Table 3** provides a summary of the current tree and shrub survey results, and **Table 4** compares the results from previous sampling sessions.

The current tree and shrub planting results were the least successful of any period (**Chart 2)**.

Extrapolating the proportional sample results (**Table 3)** to the total planted tree and shrub population of 4,843 (see **Table 1** in **Section 1**) would yield approximately 2,375 plantings in good health, 565 in poor health and 1,900 dead or unaccounted. Assuming a sample error of +/- 5%, the number of plantings in good health would range from 2,257 to 2,493.

[3] This is based on an estimated planting regime of between 2.5 to 5 plantings per m^2

[4] The initial TSP sample size was 661 in spring 2012, increasing to 700 in spring 2013.

Table 3: Summary of tree and shrub monitoring results for the autumn 2014 monitoring period.

Site ID	Seedling Health			Combined	Total	%	
	Good	Poor	Dead*	Poor/Dead*	Plantings	Good	Poor/Dead*
TSP1	43	21	28	49	92	***46.7***	***53.3***
TSP2	80	12	35	47	127	***63.0***	***37***
TSP3	18	11	66	77	95	***18.9***	***81.1***
TSP4	7	2	67	69	76	***9.2***	***90.8***
TSP5	4	3	12	15	19	***21.1***	***78.9***
TSP6	7	6	8	14	21	***33.3***	***66.7***
TSP7	16	1	5	6	22	***72.7***	***27.3***
TSP8	8	0	1	1	9	***88.9***	***11.1***
TSP9	14	9	1	10	24	***58.3***	***41.7***
TSP10	94	12	33	45	139	***67.6***	***32.4***
TSP11	10	0	1	1	11	***90.9***	***9.1***
TSP12	42	5	18	23	65	***64.6***	***35.4***
Total plantings	**343**	**82**	**275**	**357**	**700**	**-**	**-**
Av. per site	**28.6**	**6.8**	**22.9**	**29.7**	**58.3**	**-**	**-**
%	***49.0***	***11.7***	***39.3***	***51.0***	***100***	***49.0***	***51.0***

*** Includes unaccounted specimens**

Table 4: Summary of previous tree and shrub monitoring results.

Monitoring period	Seedling Health			Poor/Dead Combined*	Total Plantings
	Good	Poor	Dead*		
Spring 2012					
Total	364	188	109	297	661
Av. per site	30.3	15.7	9.1	24.8	
%	*55.1*	*28.5*	*16.5*	*45.0*	
Autumn 2013					
Total	458	81	150	231	689
Av. per site	38.2	6.7	12.5	19.2	
%	*66.5*	*11.7*	*21.8*	*33.5*	
Spring 2013					
Total	451	76	173	249	700
Av. per site	37.6	6.3	14.4	20.7	
%	*64.4*	*10.9*	*24.7*	*35.6*	

*** Includes unaccounted specimens**

Chart 1: Tree & shrub plantings grouped as either 'good health' (orange) or 'poor health/dead and missing' (blue) for the autumn 2014 monitoring period.

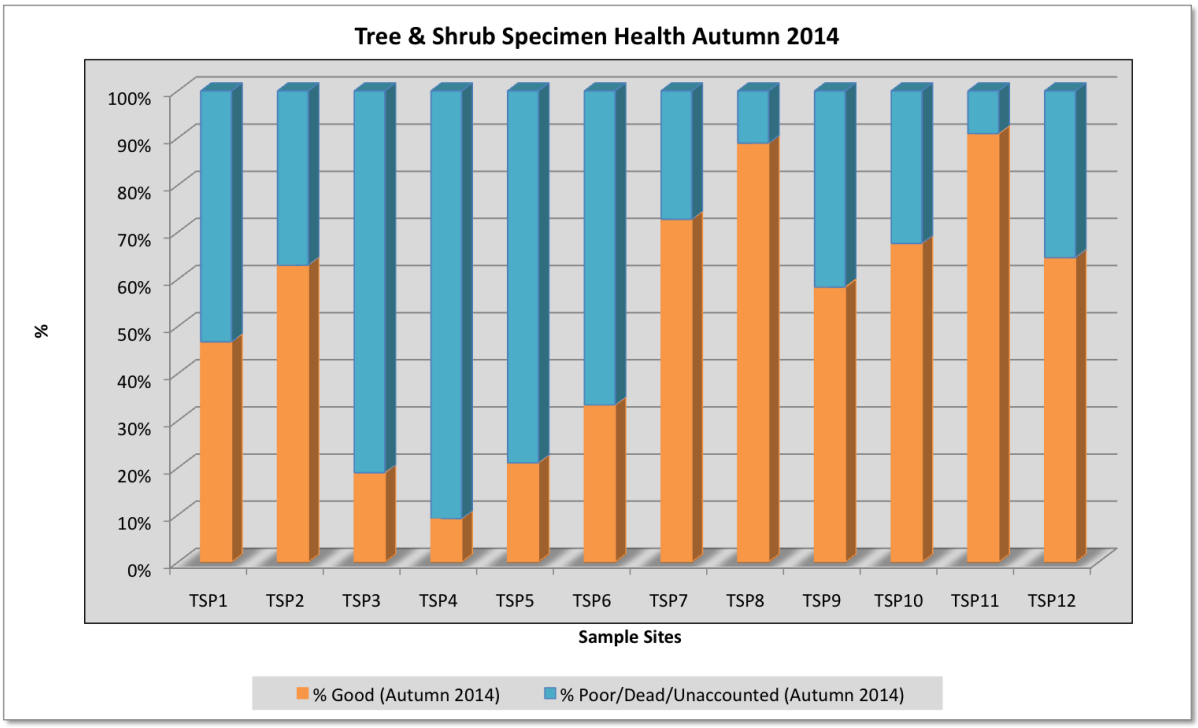
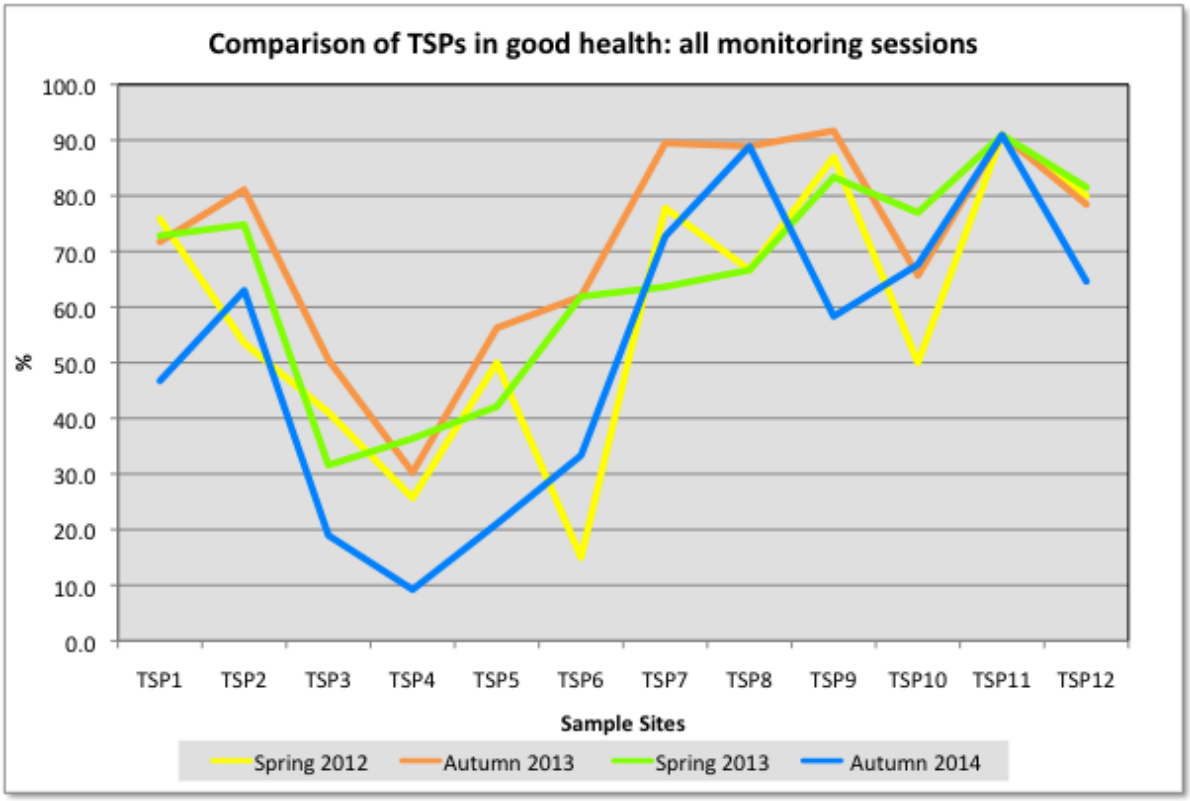


Chart 2: A comparison of tree and shrub plantings in good health for all monitoring periods.



Summaries and images of each TSP monitoring site are provided in the following sections. Bracketed numbers in the central column show results from the previous spring 2013 monitoring period.

3.2.1 Monitoring site TSP1 (sequence 1)

Jurisdiction	**ACT**	**TSP1** Situated within the Murrumbidgee River Corridor immediately W and NW of the HLPS, about 250 m from the LLPS. *Note*: Decline of specimens in good health and significant increase in the number of poor, dead or missing specimens. Groundcover mostly retained native *Themeda* grassland in good condition. *Swainsona sericea* present. Mulch area along northern boundary of the HLPS remains sparsely vegetated.
Co-ordinates	691345 – 6060236	
No. of tree & shrub species	**8**	
Seedling health		
Good	**43** (67)	
Poor	**21** (9)	
Dead / Missing	**28** (11)	
Total plantings	**92** (92)	

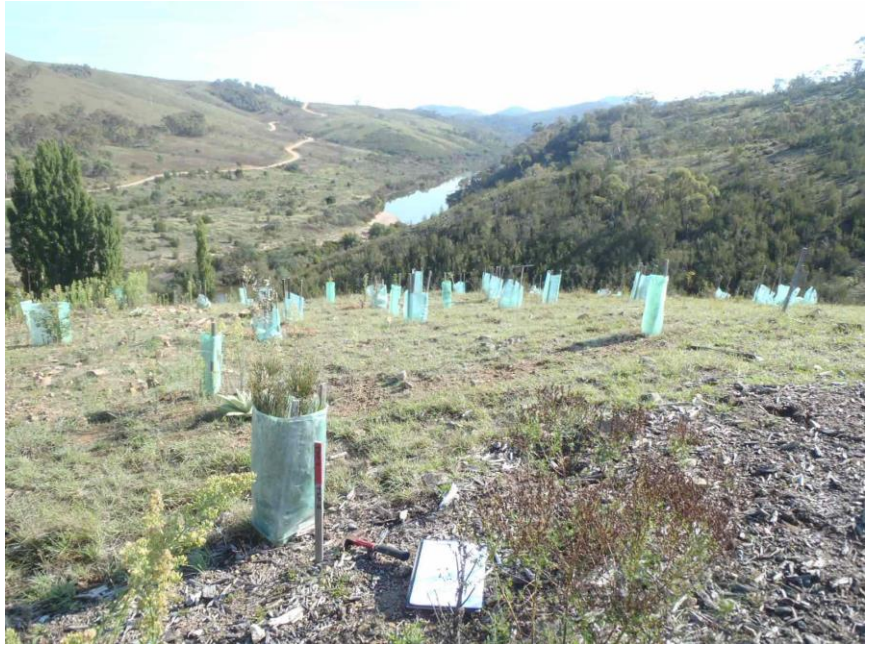


Plate 1: Monitoring Site TSP1. Image on left spring 2013 and right autumn 2014.

3.2.2 Monitoring site TSP2 (3)

Jurisdiction	**ACT**
Co-ordinates	691964 – 6060519
No. of tree & shrub species	**5**
Seedling health	
Good	**80** (95)
Poor	**12** (14)
Dead / Missing	**35** (15)
Total plantings	**127** (127)

TSP2 is located within the Murrumbidgee River Corridor, about 1,025 m from the LLPS.

Note: Decline of specimens in good health and significant increase in the number of dead or missing specimens.

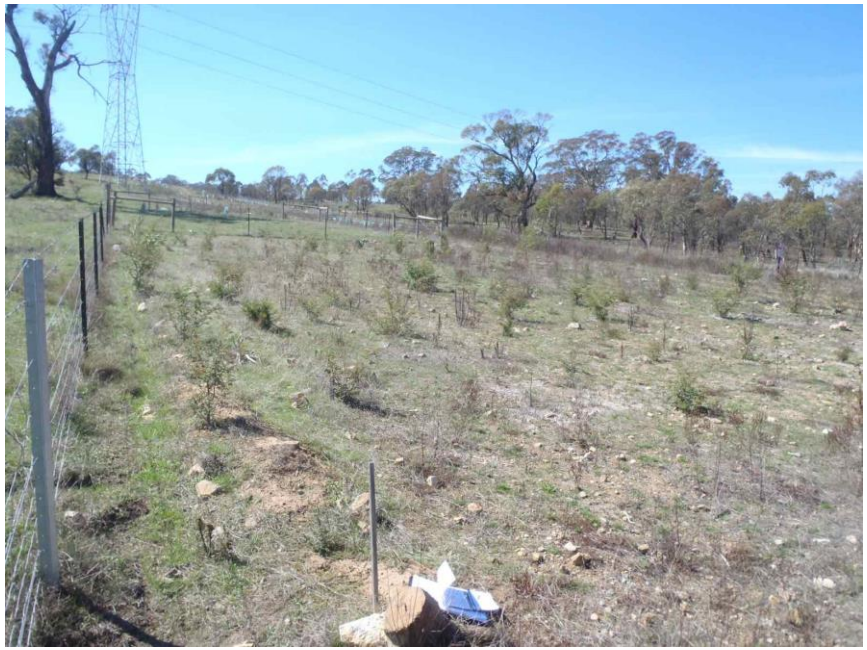


Plate 2: Monitoring Site TSP2. Image on left spring 2013 and right autumn 2014.

3.2.3 Monitoring site TSP3 (5)

Jurisdiction	**ACT**
Co-ordinates	691964 – 6060519
No. of tree & shrub species	**3** (4)
Seedling health	
Good	**18** (30)
Poor	**11** (11)
Dead / Missing	**66** (54)
Total plantings	**95** (95)

TSP3 is located within the Murrumbidgee River Corridor, about 1,350 m from the LLPS.

Note: Significant decline of specimens in good health and increase in the number of dead or missing specimens.

Plate 3: Monitoring Site TSP3. Image on left spring 2013 and right autumn 2014.

3.2.4 Monitoring site TSP4 (7)

Jurisdiction	**ACT**	**TSP4** is located about 1,900 m from the LLPS within the ACT. *Note*: Significant decline of specimens in good health and significant increase in the number of dead or missing specimens.
Co-ordinates	692592 – 6060707	
No. of tree & shrub species	**2** (3)	
Seedling health		
Good	**7** (28)	
Poor	**2** (8)	
Dead / Missing	**67** (40)	
Total plantings	**76** (76)	

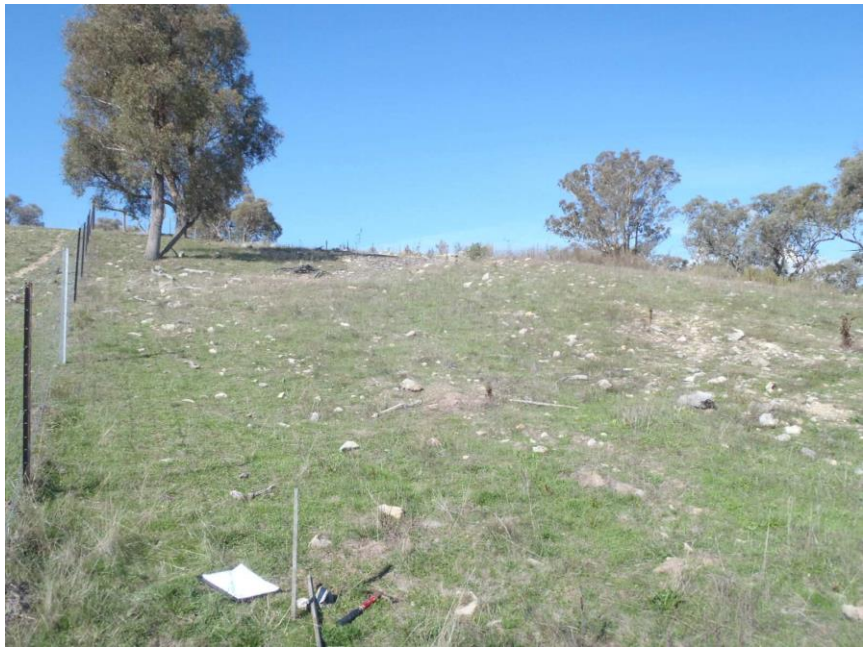


Plate 4: Monitoring Site TSP4. Image on left spring 2013 and right autumn 2014.

3.2.5 Monitoring site TSP5 (9)

Jurisdiction	**ACT**	**TSP5** is located about 2,325 m from the LLPS within the ACT. *Note*: Conyza sp. widespread and abundant. Decline of specimens in good health and increase in the number of specimens in poor health.
Co-ordinates	693226 – 6060578	
No. of tree & shrub species	**3**	
Seedling health		
Good	**4** (8)	
Poor	**3** (1)	
Dead / Missing	**11** (10)	
Total plantings	**19** (19)	

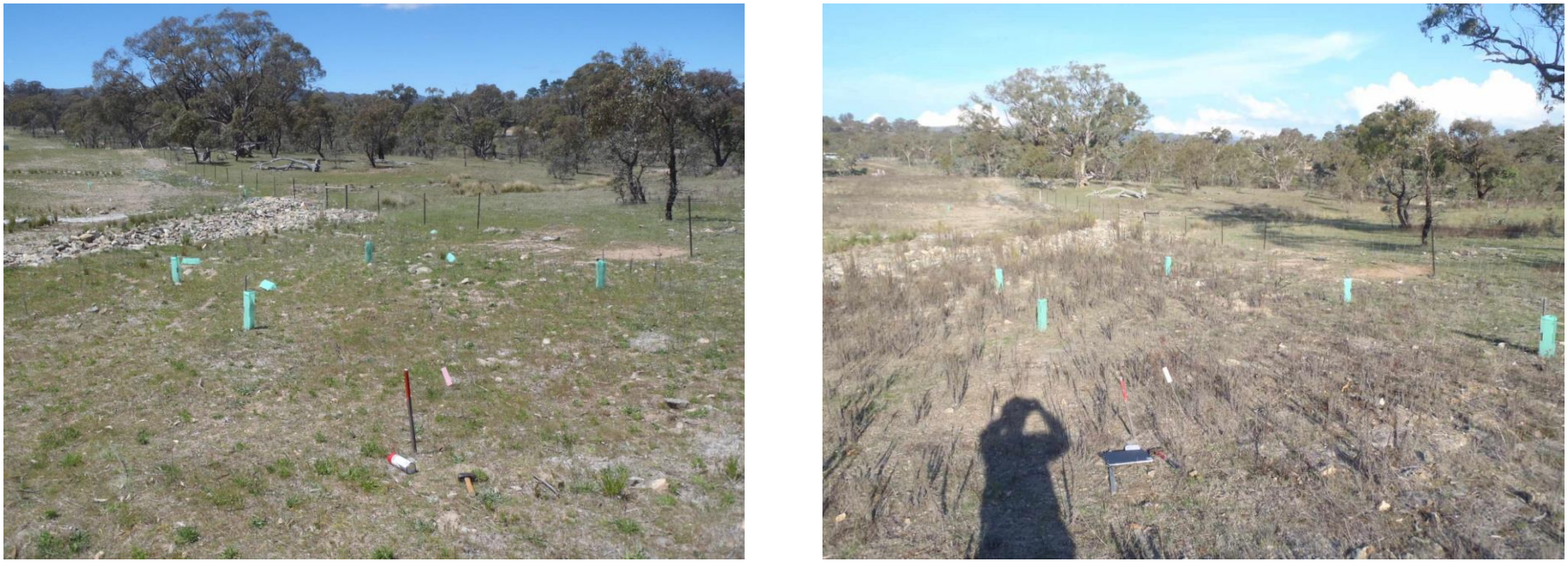


Plate 5: Monitoring Site TSP5. Image on left spring 2013 and right autumn 2014.

3.2.6 Monitoring site TSP6 (11)

Jurisdiction	**ACT**
Co-ordinates	693528 – 6060505
No. of tree & shrub species	**3**
Seedling health	
Good	**7** (13)
Poor	**6** (4)
Dead / Missing	**8** (4)
Total plantings	**21** (21)

TSP6 is located about 2,650 m from the LLPS - west of and adjacent to the Monaro Hwy within the ACT.

Note: Decline of specimens in good health and increase in the number of specimens in poor health, dead or missing.

Natural recruitment of native Eucalypts – Yellow Box *Eucalyptus melliodora* and Blakely's Red Gum *E. blakelyi.* These were not included in the sample.

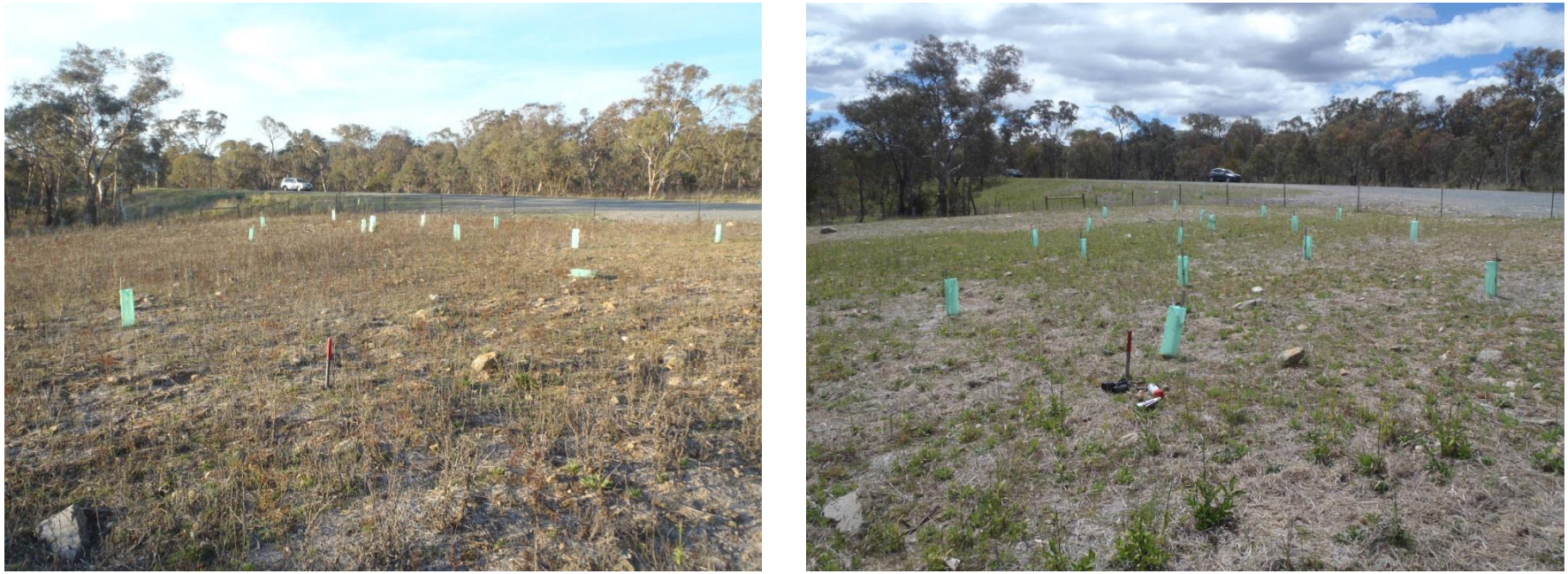


Plate 6: Monitoring Site TSP6. Image on left spring 2013 and right autumn 2014.

3.2.7 Monitoring site TSP7 (13)

Jurisdiction	**NSW**
Co-ordinates	693927 – 6060542
No. of tree & shrub species	**3** (2)
Seedling health	
Good	**16** (14)
Poor	**1** (3)
Dead / Missing	**5** (5)
Total plantings	**22** (22)

TSP7 is located about 3,040 m from the LLPS within the Smith property, NSW.

Note: Sample site is separated in to two planting areas - northern and southern sides of the construction corridor. Additional plantings have maintained the success rate at this sample site. Also, natural recruitment of native eucalypts (Apple Box *Eucalyptus bridgesiana* and Broad-leaved Peppermint *E. dives*).

A pair of Brown Treecreeper observed within scattered woodland in the south-western corner of the McDonald property.

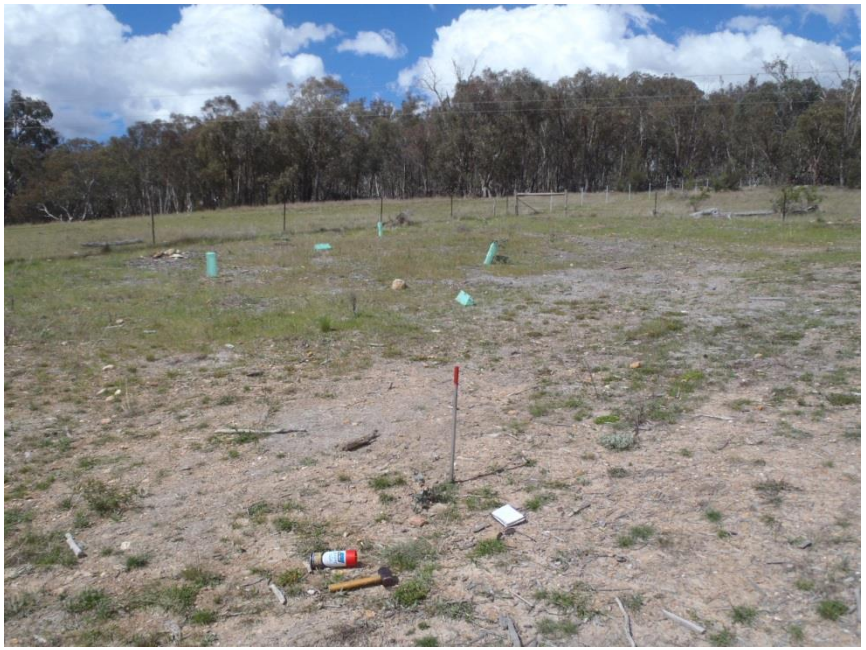


Plate 7: Monitoring Site TSP7. Image on left spring 2013 and right autumn 2014.

3.2.8 Monitoring site TSP8 (18)

Jurisdiction	**NSW**	**TSP8** is located about 4,975 m from the LLPS within the Lonergan property, NSW. *Note:* Site contains well developed *Themeda* tussocks.
Co-ordinates	695663 – 6060392	
No. of tree & shrub species	**2 (3)**	
Seedling health		
Good	**8** (6)	
Poor	**0** (1)	
Dead / Missing	**1** (0)	
Total plantings	**9** (9)	

Plate 8: Monitoring Site TSP8. Image on left spring 2013 and right autumn 2014.

3.2.9 Monitoring site TSP9 (19)

Jurisdiction	**NSW**
Co-ordinates	696175 – 6060305
No. of tree & shrub species	**3**
Seedling health	
Good	**14** (20)
Poor	**9** (3)
Dead / Missing	**1** (1)
Total plantings	**24** (24)

TSP9 is located about 5,475 m from the LLPS within the Lonergan property, NSW.

Note: Decline of specimens in good health and increase in the number of specimens in poor health.

Plate 9: Monitoring Site TSP9. Image on left spring 2013 and right autumn 2014.

3.2.10 Monitoring site TSP10 (21)

Jurisdiction	**NSW**	**TSP10** is located about 6,425 m from the LLPS within the Johanson property, NSW. *Note:* Slight decline of specimens in good health and significant increase in the number of specimens either dead or missing.
Co-ordinates	697084 – 6060204	
No. of tree & shrub species	**6** (8)	
Seedling health		
Good	**94** (107)	
Poor	**12** (19)	
Dead / Missing	**33** (13)	
Total plantings	**139** (139)	

Plate 10: Monitoring Site TSP10. Image on left spring 2013 and right autumn 2014.

3.2.11 Monitoring site TSP11 (24)

Jurisdiction	**NSW**	**TSP11** is located about 9,300 m from the LLPS within the Latimer property, NSW. *Note*: Planting success maintained
Co-ordinates	699277 – 6061925	
No. of tree & shrub species	**2** (3)	
Seedling health		
Good	**10** (10)	
Poor	**0** (0)	
Dead / Missing	**1** (1)	
Total plantings	**11** (11)	

Plate 11: Monitoring Site TSP11. Image on left spring 2013 and right autumn 2014.

3.2.12 Monitoring site TSP12 (25)

Jurisdiction	**NSW**
Co-ordinates	701346 – 6063099
No. of tree & shrub species	**3** (4)
Seedling health	
Good	**42** (53)
Poor	**5** (3)
Dead / Missing	**18** (9)
Total plantings	**65** (65)

TSP12 is located about 11,900 m from the LLPS near the discharge facility, NSW.

Note: Decline of specimens in good health and significant increase in the number of specimens either dead or missing.

Plate 12: Monitoring Site TSP12. Image on left spring 2013 and right autumn 2014.

3.3 Herbaceous species monitoring

A total of 46 native herbaceous species[5] (compared to 57 sp. in spring 2013) were recorded at thirteen sample sites during the current monitoring period. This comprised 12[6] of the 19 *planted* species (see **Table 1**) and 34 *non-planted* species.

Four planted species were recorded at all thirteen sample sites (100% frequency), they are: (Kangaroo Grass *Themeda australis*, Common Wheatgrass *Elymus scaber*, Windmill Grass *Chloris truncata* and Wallaby Grass *Austrodanthonia*. One species (Weeping Grass *Microlaena stipoides*) was recorded at twelve sites (93%), two (Red Grass *Bothriochloa macra* and Speargrass *Austrostipa scabra*) at eleven sites (85%), one (*Wahlenbergia* sp.) at ten sites (76%), and one (Common Everlasting *Chrysocephalum apiculatum*) at seven sites (54%). The remaining three species (Slender Tick-trefoil *Desmodium varians*, *Juncus usitatus* and Poa *Poa labillardierei*) were recorded at fewer than three sites (<23%). For full data set see **Table 8** in **Appendix 3**.

Planted species not recorded at sample sites during the current monitoring period were: Scaly Buttons *Leptorhynchos squamatus*, Blushing Bindweed *Convolvulus erubescens* (though both species were recorded elsewhere within the construction corridor), Spiny-headed Mat-rush *Lomandra longifolia,* Floating Club Rush *Isolepis fluitans*, *Eleocharis acuta*, Tall Sedge *Carex appressa* and Common Reed *Phragmites australis*. The latter four species are associated with damp areas and may be present in other drainage channels that were not sampled.

Species diversity

Native species diversity ranged from 6 to 10 for planted species and 2 to 14 for non-planted species, at an average of 8.2 sp. and 8.5 sp., respectively, per site (**Table 5**). The combined planted/non-planted average was 16.7 sp. per site, which was slightly lower than in spring 2013 (16.9), but higher than the preceding autumn 2013 (13.2) and spring 2012 (9.8) (**Table 6**).

Despite the variability in the proportions of planted and non-planted at the site level there was general uniformity between the groups across the entire sample (**Chart 3).**

A number of previously recorded warm-season native annual and perennial species were either not observed or occurred at low frequencies, these included: Common Woodruff *Asperula conferta*, Grass Cushion *Isoetopsis graminifolia*, Slender Tick-trefoil *Desmodium varians*, Bulbine Lily *Bulbine bulbosa*, Austral Sunray *Triptilodiscus pygmaeus*, Adder's Tongue O*phioglossum lusitanicum,* Blue Storksbill *Erodium crinitum*, Spoon Cudweed *Stuartina muelleri* and Early Nancy *Wurmbea diocia*.

[5] Exotic species were not included in the sample data.

[6] *Themeda australis, Bothriochloa macra, Microlaena stipoides, Austrodanthonia carphoides, Elymus scaber, Chloris truncata* and *Austrostipa scabra* comprise planted, seeded and naturally germinated cohorts and it was not possible to differentiate between these forms, in which case, their incidences have been recorded as planted. Similarly, *Wahlenbergia stricta*, *Convolvulus erubescens* and *Desmodium varians* are likely to comprise planted and naturally germinated forms.

Table 5: Summary of herbaceous monitoring results for the autumn 2014 monitoring period.

Site ID	Planted native sp.	Non-planted native sp.	Total native sp.	Est. TFC* planted	Est. TFC* non-planted
HP1	9	8	17	5-25%	<5%
HP2	9	13	22	5-25%	5-25%
HP3	7	8	15	<5% v	5-25%^
HP4	6	6	12	5-25%^	<5%
HP5	7	9	16	5-25%^	<5%
HP6	9	4	13	5-25%	<5%
HP7	10	5	15	5-25%	<5%
HP8	8	14	22	5-25%	5-25%
HP9	9	7	16	5-25%	<5%
HP10	10	14	24	5-25%	5-25%^
HP11	8	8	16	5-25%	<5%
HP12	7	13	20	5-25%	<5%
HP13	8	2	10	<5%	<5%
Mean sp./site	**8.23**	**8.54**	**16.77**	**-**	**-**
Est. TFC*	**-**	**-**	**-**	**<25%**	**5-10%**

*** TFC =Total foliage cover;**

^ = Increase in TFC from spring 2013;

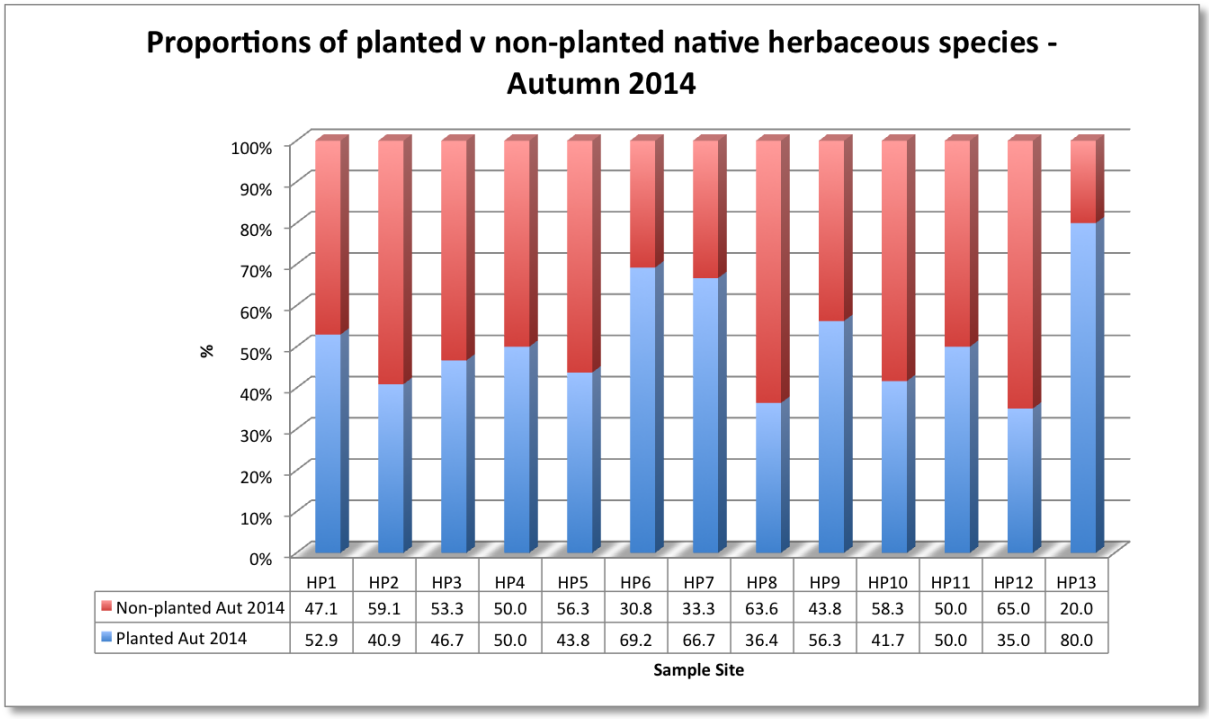
v = Decrease in TFC from spring 2013.

Table 6: Summary of previous herbaceous monitoring results.

Monitoring Period	Categories	Planted	Non-planted	Total native sp.
Spring 2012				
	Mean sp./site	**6.4**	**3.4**	**9.8**
	Est. TFC*	**5-10%**	**<5%**	**10-15%**
Autumn 2013				
	Mean sp./site	**7.5**	**5.8**	**13.2**
	Est. TFC*	**<25%**	**<5%**	**25-30%**
Spring 2013				
	Mean sp./site	**8.4**	**8.5**	**16.9**
	Est. TFC*	**<25%**	**>5%**	**20-30%**

***TFC = Total foliage cover**

Chart 3: Proportions of planted (blue) and non-planted (red) native herbaceous species at each monitoring site.



	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8	HP9	HP10	HP11	HP12	HP13
Non-planted Aut 2014	47.1	59.1	53.3	50.0	56.3	30.8	33.3	63.6	43.8	58.3	50.0	65.0	20.0
Planted Aut 2014	52.9	40.9	46.7	50.0	43.8	69.2	66.7	36.4	56.3	41.7	50.0	35.0	80.0

Cover abundance estimates

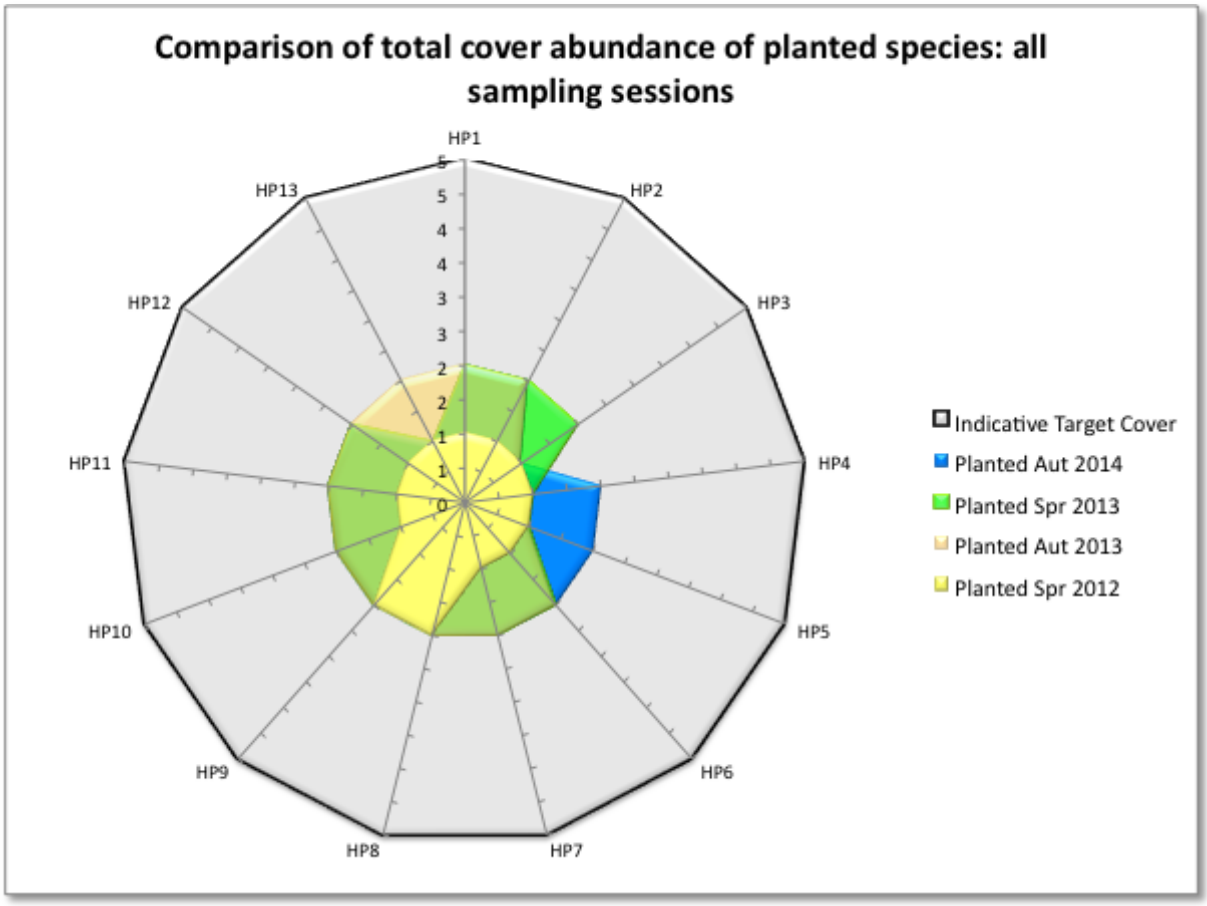
Two planted species obtained individual cover scores of 2 (5-25% cover range): *Chloris truncata* (HP8 and HP12) and *Chrysocephalum apiculatum* (HP2). All other planted herbaceous species had cover scores of 1 (<5% cover and >15 individuals) or less. Importantly, there was an increase in the frequency of individual species with cover scores of 1 at twelve of the thirteen sample sites (**Table 8 in Appendix 3**).

The estimated cover abundance of planted native species increased at HP4 and HP5, declined at HP3 and remained stable at all other sites. Despite a small decline in number of recorded species (see preceding section) there was a slight increase in total cover abundance of planted species (**Tables 5** and **6, above**), due in part to a wider representation and increased frequency of species with cover scores of 1.

Overall, the total cover abundance of planted species remained at the higher end of the 5-25% range. This equated to a predicted maximum foliar cover of planted species of about 7,500m^2 across the 30,000m^2 planted area (see **Chart 4**). Cover abundance estimates for non-planted native species fell in the 5-10% range (**Table 5**).

Chart 4: Estimated total cover abundance of planted herbaceous species across the sample area, which remains at the higher end of the 5-25% cover range. Cover range is indicated by the vertical column, where: 1 = <5% cover; 2 = 5-25%; 3 = 25-50%; 4 = 50-75% and 5 = >75%.

Note: there was a slight re-adjustment to the estimated total cover abundance for autumn 2013.



Summaries and photographs of each herbaceous planting site are provided in the following sections. Bracketed numbers in the centre column provide results from the previous (spring 2013) monitoring period.

3.3.1 Monitoring Site HP1 (Sequence 2)

Jurisdiction	**ACT**	**HP1** is located about 750 m from the LLPS within the Murrumbidgee River corridor. *Note:* Problem poor soil condition. Broad-leaf weeds: *Conyza* sp., *Hypericum perforatum*, *Plantago lanceolata*, *Verbscum thapsis* and *Verbena bonariensis*.
Co-ordinates	691706 – 6060396	
No. of native herbaceous species	**16** (10)	
Planted	**9** (7)	
Non-planted	**8** (3)	
Estimated cumulative cover score		
Planted	**5-25%** (5-25%)	
Non-planted	**<5%** (<5%)	

Plate 13: Monitoring Site HP1. Image on left spring 2013 and right autumn 2014.

3.3.2 Monitoring Site HP2 (4)

Jurisdiction	**ACT**	**HP2** is located about 1,300 m from the LLPS within the ACT. *Note:* The NSW threatened Silky Swainson-pea *Swainsona sericea* was recorded within monitoring site. Mid-autumn growth of *Eryngium ovinum*, which typically exhibits early spring emergence, possibly due to above average minimum temperatures for April and no reported frosts. Problem weeds: Fleabane *Conyza* sp., perennial and annual exotic grasses.
Co-ordinates	692219 – 6060594	
No. of native herbaceous species	**22** (22)	
Planted	**9** (8)	
Non-planted	**13** (14)	
Estimated cumulative cover score		
Planted	**5-25%** (5-25%)	
Non-planted	**5-25%** (5-25%)	

Plate 14: Monitoring Site HP2. Image on left spring 2013 and right autumn 2014.

3.3.3 Monitoring Site HP3 (6)

Jurisdiction	**ACT**
Co-ordinates	692459 – 6060660
No. of native herbaceous species	**15** (18)
Planted	**7** (7)
Non-planted	**8** (11)
Estimated cumulative cover score	
Planted	**<5%** (5-25%)
Non-planted	**5-25%** (<5%)

HP3 is located about 1,550 m from the LLPS within the ACT.
Exotic grasses *Bromus* sp*., Lolium, Vulpia* and broadleaf weeds i.e. C*onyza* sp*.* have combined to dominate the site to the near elimination of some native grasses i.e. *Microlaena.*

NOTE: the overall recovery in the ACT section is poor. Dominant exotic grasses and a variety of broadleaf weeds are persistent. Poor top soil is part of the problem.

Plate 15: Monitoring Site HP3. Image on left spring 2013 and right autumn 2014.

3.3.4 Monitoring Site HP4 (8)

Jurisdiction	**ACT**	**HP4** is located about 1,770 m from the LLPS within the ACT. *Note:* Exotic perennial and annual grasses: *Lolium* sp., *Vulpia* sp., *Bromus* sp., and broadleaf weeds: *Conyza* sp., *Verbena bonariensis* and *Hypericum perforatum.*
Co-ordinates	692797 – 6060687	
No. of native herbaceous species	**12** (22)	
Planted	**6** (9)	
Non-planted	**6** (13)	
Estimated cumulative cover score		
Planted	**5-25%** (<5%)	
Non-planted	**<5%** (<5%)	

Plate 16: Monitoring Site HP4. Image on left spring 2013 and right autumn 2014.

3.3.5 Monitoring Site HP5 (10)

Jurisdiction	**ACT**
Co-ordinates	693442 – 6060534
No. of native herbaceous species	**16** (14)
Planted	**7** (8)
Non-planted	**9** (6)
Estimated cumulative cover score	
Planted	**5-25%** (<5%)
Non-planted	**<5%** (<5%)

HP5 is located about 2,550 m from the LLPS within the ACT, W of the Monaro Hwy.

Problem weeds, *Plantago lanceolata, Conyza sp.* and *Cirsium vulgare.*

Note: Chrysocephalum apiculatum has progressively declined over consecutive monitoring periods and is now absent from the sample site.

Plate 17: Monitoring Site HP5. Image on left spring 2013 and right autumn 2014.

3.3.6 Monitoring Site HP6 (12)

Jurisdiction	**ACT**
Co-ordinates	693683 – 6060542
No. of native herbaceous species	**13** (11)
Planted	**9** (8)
Non-planted	**4** (3)
Estimated cumulative cover score	
Planted	**5-25%** (5-25%)
Non-planted	**<5%** (<5%)

HP6 is located about 2,780 m from the LLPS within the ACT, between the Monaro Hwy and Cooma-Goulburn Railway corridor.

Note: Pasture grasses eg. *Lolium sp., Paspalum dilatatum, Phalaris* and occasional *Eragrostis curvula* and broadleaf weeds *Plantago lanceolata Conyza sp., Hypericum perforatum* and *Eragrostis curvula*.

Plate 18: Monitoring Site HP6. Image on left spring 2013 and right autumn 2014.

3.3.7 Monitoring Site HP7 (14)

Jurisdiction	**NSW**	
Co-ordinates	694084 – 6060511	**HP7** is located about 3,200 m from the LLPS within the Smith property, NSW. *Note:* Problem weeds: include *Hypochaeris radicata*. *Conyza* sp., Bare ground 40-50%.
No. of native herbaceous species	**15** (14)	
Planted	**10** (8)	
Non-planted	**5** (6)	
Estimated cumulative cover score		
Planted	**5-25%** (5-25%)	
Non-planted	**<5%** (<5%)	

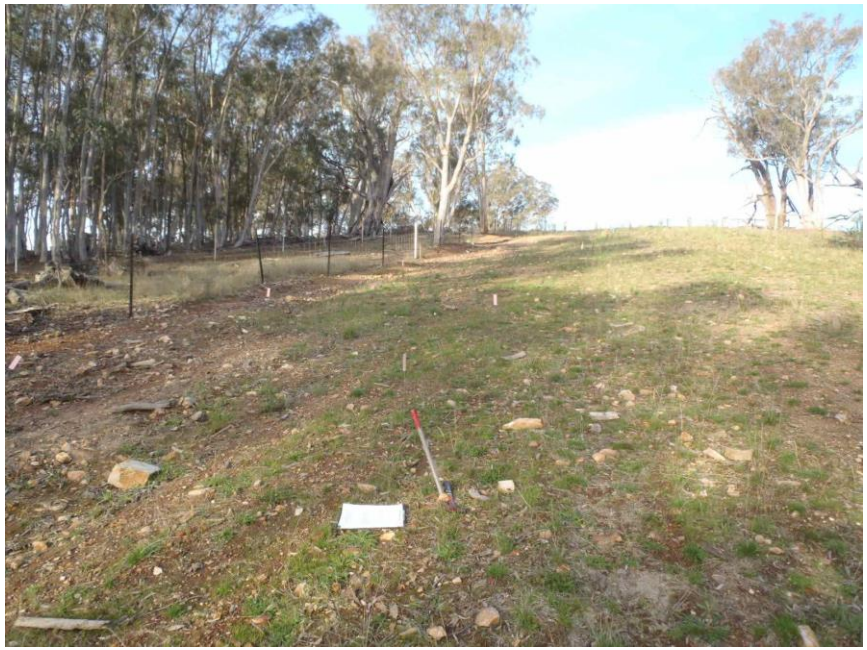


Plate 19: Monitoring Site HP7. Image on left spring 2013 and right autumn 2014.

3.3.8 Monitoring Site HP8 (15)

Jurisdiction	**NSW**
Co-ordinates	694525 – 6060591
No. of native herbaceous species	**22** (31)
Planted	**8** (10)
Non-planted	**14** (21)
Estimated cumulative cover score	
Planted	**5-25%** (5-25%)
Non-planted	**5-25%** (5-25%)

HP8 is located about 3,650 m from the LLPS within the McDonald property, NSW.

Note: Northern half of sample site was dominated by annual exotic grasses *Bromus* sp. *and Vulpia* sp. and broadleaf weeds *Conyza* sp. and *Cirsium vulgare*. Southern half retains components of the original groundcover and fewer weeds.

Plate 20: Monitoring Site HP8. Image on left spring 2013 and right autumn 2014.

3.3.9 Monitoring Site HP9 (16)

Jurisdiction	**NSW**
Co-ordinates	694890 – 6060767
No. of native herbaceous species	**16** (19)
Planted	**9** (10)
Non-planted	**7** (9)
Estimated cumulative cover score	
Planted	**5-25%** (5-25%)
Non-planted	**<5%** (<5%)

HP9 is located about 4,050 m from the LLPS within the McDonald property, NSW.

Note: Problem weeds include *Conyza* sp., *Hypochaeris radicata* and *Cirsium vulgare*. *Bromus* sp. and *Vulpia* sp. are the dominant exotic grasses with low incidence of *Eragrostis curvula*.

Plate 21: Monitoring Site HP9. Image on left spring 2013 and right autumn 2014.

3.3.10 Monitoring Site HP10 (17)

Jurisdiction	**NSW**
Co-ordinates	695248 – 6060569
No. of native herbaceous species	**24** (16)
Planted	**10** (9)
Non-planted	**14** (7)
Estimated cumulative cover score	
Planted	**5-25%** (5-25%)
Non-planted	**5-25%** (<5%)

HP10 is located about 4,475 m from the LLPS within the McDonald property, NSW.

Note: Problem weeds include *Bromus* sp. and *Vulpia* sp., which are the dominant grasses and lesser amounts of *Phalaris aquatica* and *Paspalum dilataum*.

Plate 22: Monitoring Site HP10. Image on left spring 2013 and right autumn 2014.

3.3.11 Monitoring Site HP11 (20)

Jurisdiction	**NSW**	**HP11** is located about 6,175 m from the LLPS within the Codd/Howarth property, NSW. *Note:* Problem weeds *Phalaris aquatica, Conyza sp.* and *Plantago lanceolata.*
Co-ordinates	696826 – 6060127	
No. of native herbaceous species	**16 (13)**	
Planted	**8** (8)	
Non-planted	**8** (5)	
Estimated cumulative cover score		
Planted	**5-25%** (5-25%)	
Non-planted	**<5%** (<5%)	

Plate 23: Monitoring Site HP11. Image on left spring 2013 and right autumn 2014.

3.3.12 Monitoring Site HP12 (22)

Jurisdiction	**NSW**
Co-ordinates	698003 – 6060755
No. of native herbaceous species	**20** (20)
Planted	**7** (8)
Non-planted	**13** (12)
Estimated cumulative cover score	
Planted	**5-25%** (5-25%)
Non-planted	**<5%** (<5%)

HP12 is located about 7,550 m from the LLPS within the Devitt property, NSW.

Note: Problem weeds *Phalaris aquatica*, *Bromus* sp., *Paspalum dilatatum*, *Dactylis glomerata*, *Plantago lanceolata* and *Hypochaeris radicata.*

Plate 24: Monitoring Site HP12. Image on left spring 2013 and right autumn 2014.

3.3.13 Monitoring Site HP13 (23)

Jurisdiction	**NSW**
Co-ordinates	698541 – 6061210
No. of native herbaceous species	**10** (10)
Planted	**8** (9)
Non-planted	**2** (1)
Estimated cumulative cover score	
Planted	**<5%** (<5%)
Non-planted	**<5%** (<5%)

HP13 is located about 8,250 m from the LLPS within the Boss property, NSW.

Note: Native groundcover has declined and revegetation is poor. Most of the planted tubestock appears no longer viable. Pasture grasses, *Dactylis glomerata*, *Paspalum dilataum*, *Lolium perenne* are dominant along edges of drainage line.

Requires replanting.

Plate 25: Monitoring Site HP13. Image on left spring 2013 and right autumn 2014.

3.4 Weeds

Broad-leaf weeds (i.e. Fleabane *Conyza* sp., St John's Wort *Hypericum perforatum*, Viper's Bugloss *Echium vulgare* and Purple-top *Verbena bonariensis*) and a variety of annual and perennial exotic grasses (i.e. *Bromus* sp., *Lolium s*p., *Vulpia* sp., and *Paspalum dilatatum*) were widely encountered within former Box Gum Grassy Woodland components of the construction corridor, with heavy infestations observed in the ACT, central and eastern portions of the McDonald property and western portion of the Lonergan property.

Substantial infestations of African Lovegrass (ALG) *Eragrostis curvula* occur either side of the Monaro Highway and continue to be a source of reinfestation into surrounding areas, including the construction corridor. Smaller infestations occur at HP6 and near TSP5 within the ACT and HP9 within the McDonald property and within HP13 on the Bos property.

St John's Wort *Hypericum perforatum* was widespread within the construction corridor and was most abundant at HP1, HP4, HP6 in the ACT and HP7 in NSW.

Minor outbreaks of Spear Thistle *Cirsium vulgare*, Blackberry *Rubus* sp. and Briar Rose *Rosa rubiginosa* persisted in low densities at HP1, HP3, HP5 in the ACT and HP8, HP9, HP10, HP11, HP12 and HP13 in NSW.

3.5 Threatened plants

Silky Swainson-pea *Swainsona sericea* occurred at HP2 (ACT section) and in the central portion of the McDonald property west and east of the gate complex.

3.6 Threatened fauna

Previous observations of Diamond Firetail *Stagonopleura guttata* Brown Treecreeper *Climacteris picumnus* and White-winged Triller *Lalage sueurii* were noted in earlier reports.

An additional sighting of a pair of Brown Treecreeper was made within remnant BGGW at the south-western corner of the McDonald property (co-ordinates E693808 - N6060633) on 8 April 2014.

3.7 Main Observations

Tree and shrub planting

- There was a significant decline in the proportion of specimens that were in good health (down from 64% in Spring 2013 to 49% in autumn 2014).
- There was a significant increase in the number of dead or missing tree and shrub plantings, which was most pronounced in the ACT section of the construction corridor.
- The proportion of specimens that were in poor health, dead or missing rose by 15.5% from 35% in spring 2013 to 51% in autumn 2014.

Herbaceous planting

- Twelve of nineteen planted species were recorded.
- Planted species averaged 8.2 sp. per sample site (7.6 sp. in spring 2013), about half the number planted.
- There was a small increase in the estimated total cover abundance of planted species compared with the previous spring 2013 monitoring period.

3.8 Key Performance Targets

The *planting* monitoring procedure was implemented after the *plot* (seeding) monitoring, when the KPTs were established, and thus, the KPTs do not provide an effective tool with which to measure herbaceous planting success (see **Section 2.3**, above). The performance target stipulates (see extracts below) a minimum 70% cover abundance threshold for sown (seeded) vegetation, however, the targets are inconsistent and not well articulated with respect to planting targets.

The following extracts from LRMP and EMP, exemplify this lack of coherence.

> *'* ***Ground Cover*** *- >70% of vegetation cover of the native species sown and survival of native ground and tree species*.' and '***Native species*** *(planting success) - all species listed for seeding and planting are present*.' (from Table 8.1 in the LRMP, Jan 2012); and further,
>
> *'****Ground Cover*** *- >70% of vegetation sown or planted within the construction project.'* ….and....'***Native species*** *(vegetation composition and abundance) – all species listed for seeding and planting are evident and other native species are migrating into woodland areas*…..' which is followed by comments for the **'Operation easement'**……***'Ground Cover*** *- >70% of vegetation cover of the native species sown*. (from Table 6.4 in the EMP, Sept 2010).

Furthermore, attempts to measure the success of planted herbaceous tube stock were confounded by increasing groundcover heterogeneity and mixing of congeners from other sources, such as seeding rehabilitation and soil-seed stock, thus, reducing the value of the assessment.

On this basis, there is little purpose continuing with monitoring herbaceous plantings and it should be discontinued. The performance of groundcover rehabilitation could be based solely on the outcomes of plot monitoring, which evaluate all species regardless of origin. Tree and shrub monitoring, on the other hand, should continue albeit under clear performance guidelines.

3.9 Suggested Actions

- Continue with routine weed control measures, however, care should be taken to minimise non-target species impacts, i.e. no broad spraying applications unless absolutely necessary.
- Engage with ACT Government Territory and Municipal Services to reduce significant African Lovegrass *Eragrostis curvula* infestations within the Monaro Hwy and railway corridors.
- Crash grazing was undertaken in the central and eastern paddocks of the McDonald property during late summer/early autumn 2014 to reduce bio-mass and control invading broad-leaf weeds such as Fleabane *Conyza* sp. Recurrent seasonal 'crash' grazing may be required to maintain broad-leaf weeds levels.
- Given the low survival rate for tree and shrub planting (only 49% success) supplementary planting in areas of native vegetation and high conservation woodland will be required (see '*Actions (if KPTs not met)*' in Table 6.4 of the Ecological Monitoring Sub-plan, Sept 2010).
- The KPTs for the planting component should be reviewed. The KPT for trees and shrubs needs clarification. We would recommend a target of 70% success rate.
- Monitoring of herbaceous plantings should be discontinued.

4 Conclusion

Monitoring surveys were conducted between 2 and 8 April 2014 to measure the performance of rehabilitation plantings within the M2G construction corridor and structure sites.

Quantitative sampling methods were applied to woody plantings and a modified quantitative approach, based on species presence and cover abundance, was used for herbaceous plantings.

Tree and Shrub Monitoring

About 14% (700 specimens) of the all tree and shrub plantings were monitored at twelve sample sites. Of these, 343 (49%) were in good health, 82 (11.7%) were in poor health and 275 (39.3%) were dead or missing. This represented a 15% decline in the number of specimens in good health compared to the previous monitoring period.

Extensive supplementary tree and shrub planting will be required to meet an adequate level of success, and particularly in the ACT section of the construction corridor.

Herbaceous Monitoring

A total of 46 native herbaceous species were recorded, which comprised 12 planted species (from a total of 19 sp.) and 34 non-planted native species. Although there was a small decline in the number of planted species compared to previous sampling there was a greater number of species with cover scores of 1 (<5% cover) and a small increase in total cover abundance, which remained near but below 25%.

It has been recommended that herbaceous planting monitoring be discontinued and that groundcover rehabilitation be determined through the plot monitoring procedure.

References

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Blue Gum Ecological Consultng (July 2012) *Rehabilitation Planting Monitoring Report (Spring 2012)*: M2G Construction Corridor. Prepared for EcoLogical Australia Pty Ltd.

Commonwealth of Australia (2012). Interim Biogeographic Regionalisation for Australia, Version 7. Map produced by ERIN for the National Reserved System Section, Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Appendix 1: Maps

Figures 1 – 3 display the locations of the monitoring sites within the M2G construction corridor:

- **Figure 1**: Western section
- **Figure 2**: Central section
- **Figure 3**: Eastern section

Note: Numbers on maps show site sequence. Refer to Table 7 (tree and shrub) and Table 8 (herbaceous) in subsequent Appendices for corresponding site ID.

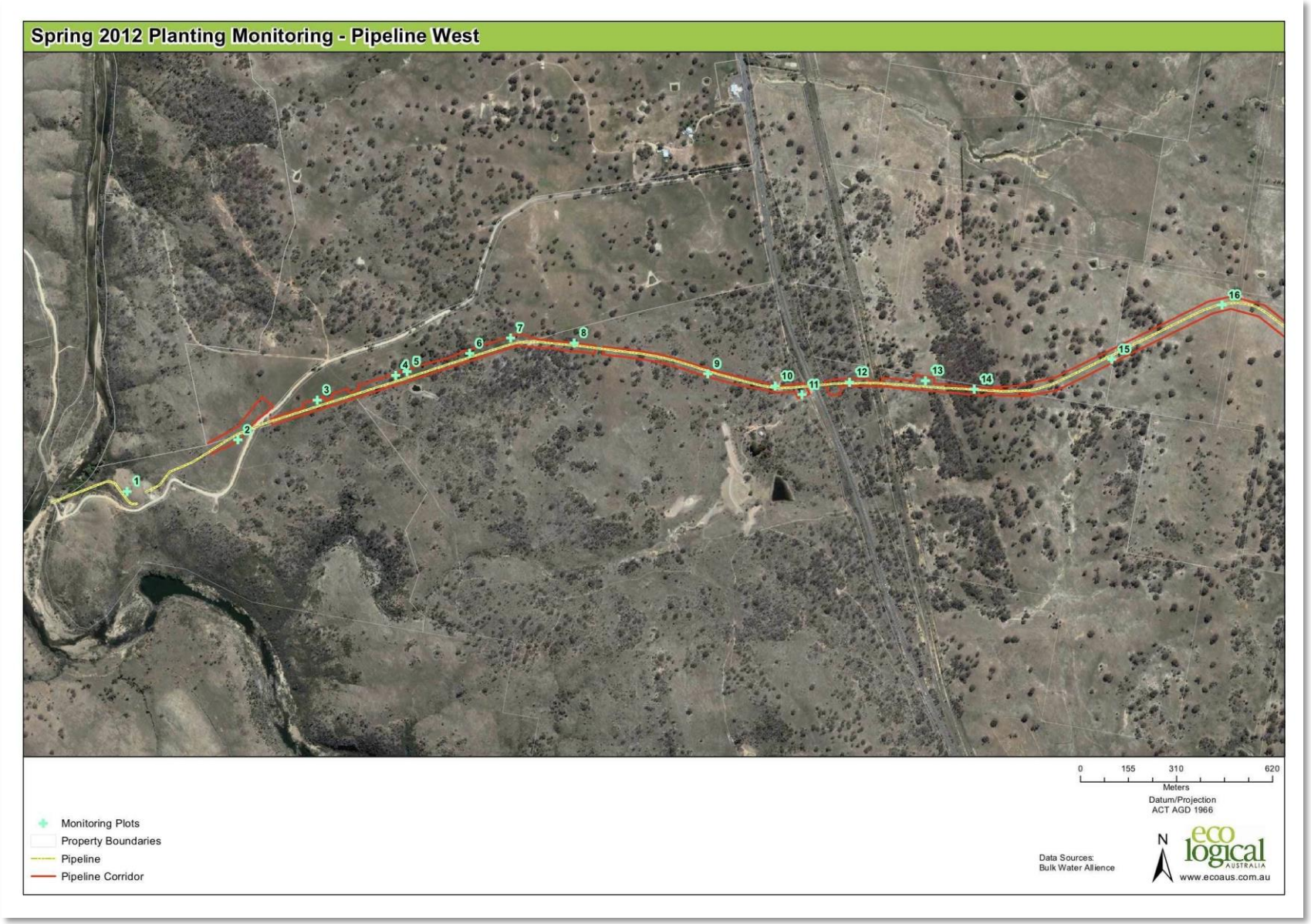

Figure 1: Location of planting monitoring sites within the western section of the M2G construction corridor.

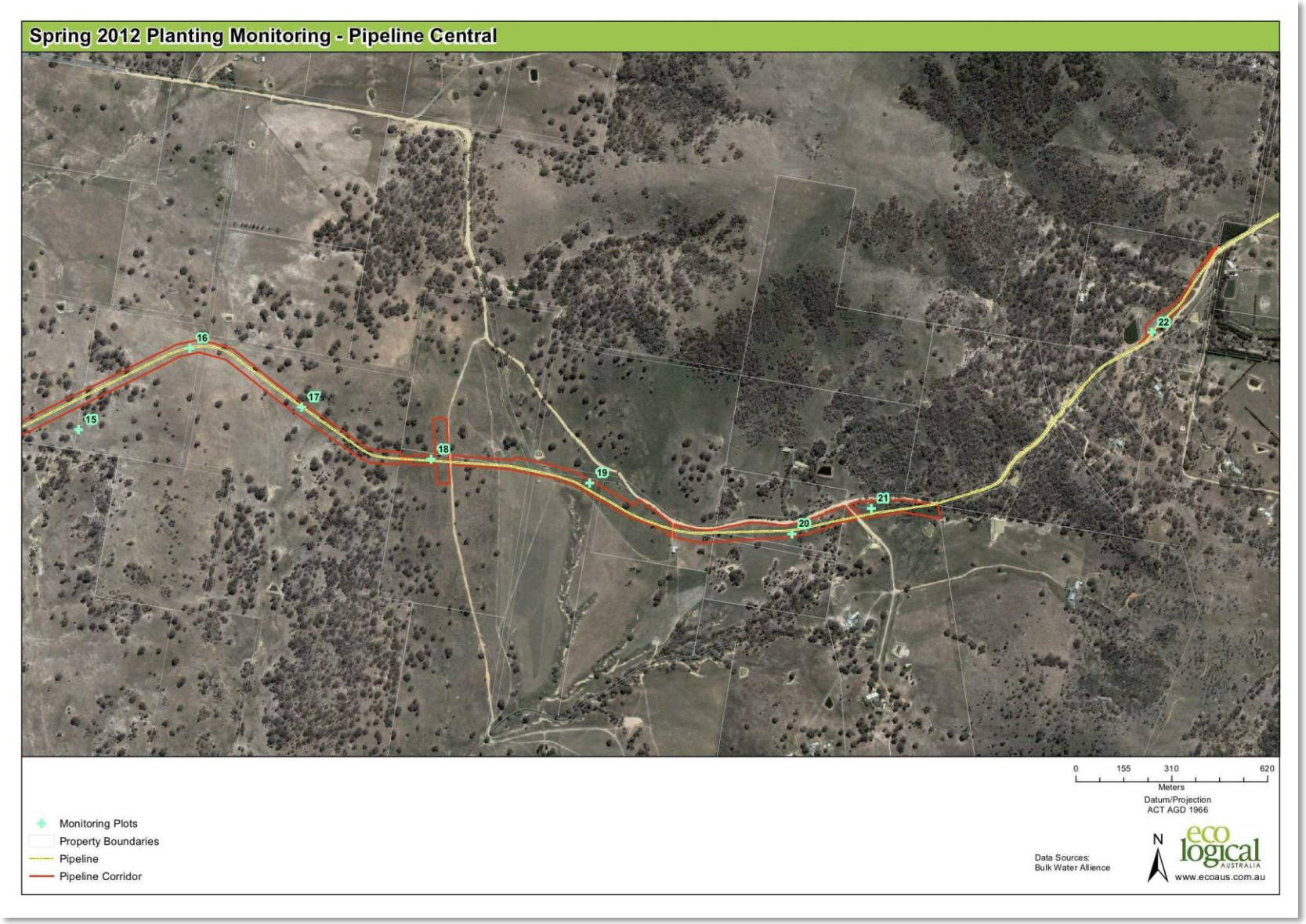

Figure 2: The location of planting monitoring sites within the central section of the M2G construction corridor

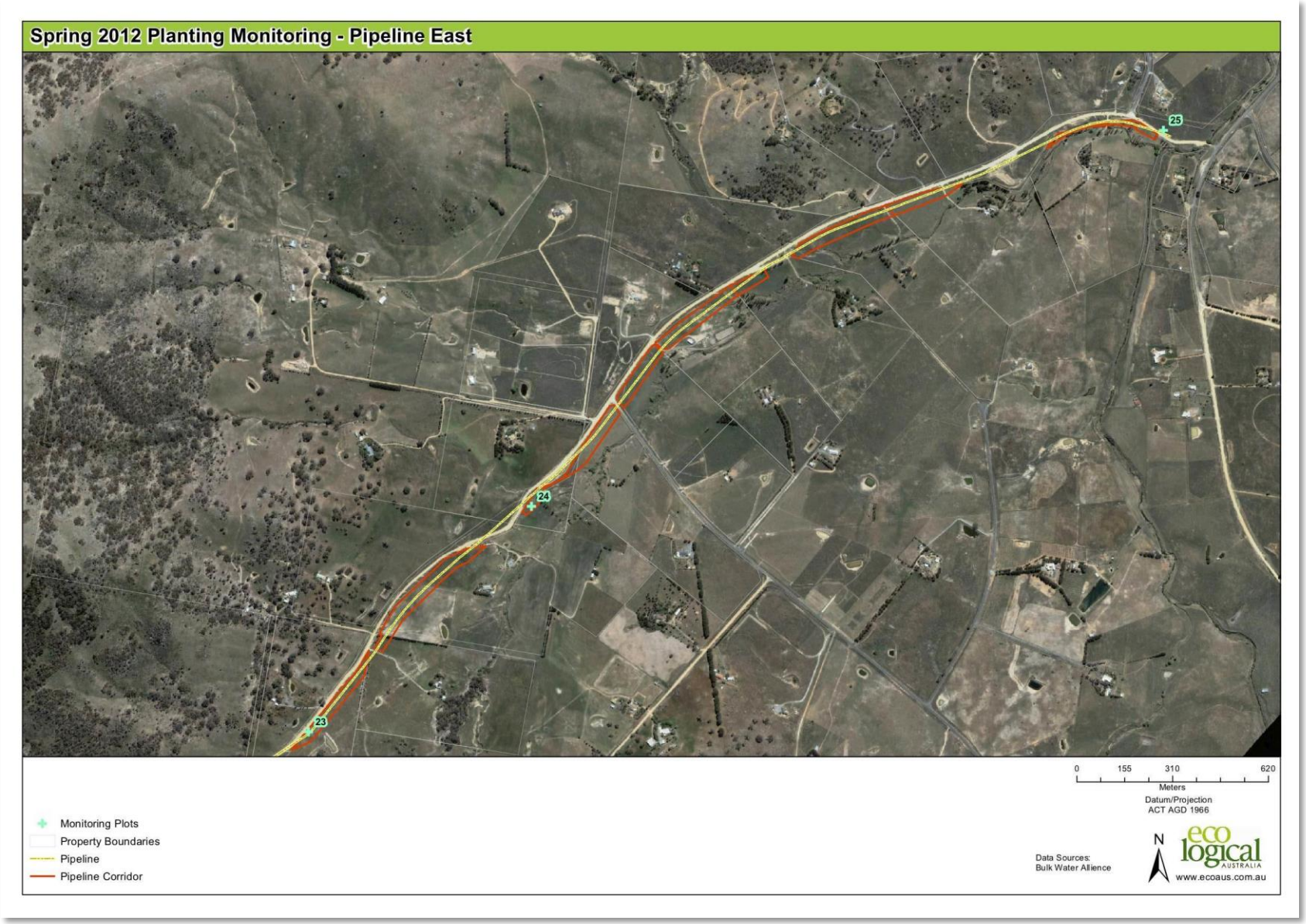

Figure 3: The location of planting monitoring sites within the eastern section of the M2G construction corridor

Appendix 2: Floristic data – tree & shrub plantings

Table 7: Tree and shrub planting data from twelve sampling sites (TSP1 - TSP 12) during the autumn 2014 monitoring session.

*** figures not species specific.**

Site Sequence	Site ID	Species	Seedling success	Poor Health	Dead	Unaccounted	Total
1	TSP1	*Acacia sp.*	21	3	4		
1	TSP1	*Bursaria spinosa*	5	1			
1	TSP1	*Cassinia sp.*	7	5	1		
1	TSP1	*Leptospermum sp.*	2				
1	TSP1	*(Hakea sp.) Grevillea sp.*	0				
1	TSP1	*E. mannifera*	4	5			
1	TSP1	*E. melliodora*	3	7	1		
1	TSP1	*Grevillea sp.*	1				
1	TSP1	Unknown			8*	14*	
Total			**43**	**21**	**14**	**14**	**92**
% good health							**47.0%**
% poor, dead or missing							**53%**
3	TSP2	*Acacia sp.*	54	5			
3	TSP2	*Bursaria spinosa*	7	5			
3	TSP2	*Cassinia sp.*	0	1			
3	TSP2	*Leptospermum/Kunzea*	14	1			
3	TSP2	*(Hakea sp.) Grevillea sp.*	5				
3	TSP2	Unknown			3*	32*	
Total			**80**	**12**	**3**	**32**	**127**
% good health							**63.0%**
% poor, dead or missing							**37%**
5	TSP3	*Acacia sp.*	1	6			
5	TSP3	*Bursaria spinosa*	6	2	1		
5	TSP3	*Leptospermum sp.*	11	3	3		
5	TSP3	*Kunzea*	0				
5	TSP3	Unknown			15*	47*	
Total			**18**	**11**	**19**	**47**	**95**
% good health							**19.0%**
% poor, dead or missing							**81.0%**
7	TSP4	*Acacia sp.*	6	2			
7	TSP4	*Bursaria spinosa*	0				
7	TSP4	*Leptospermum/Kunzea*	1				
7	TSP4	Unknown				67*	
Total			**7**	**2**	**-**	**67**	**76**
% good health							**9.0%**

Site Sequence	Site ID	Species	Seedling success	Poor Health	Dead	Unaccounted	Total
% poor, dead or missing							**91%**
9	TSP5	*E. bridgesiana*	2	2			
9	TSP5	*E. melliodora*	2	1			
9	TSP5	*E. dives*	0				
9	TSP5	Unknown			1*	11*	
Total			**4**	**3**	**1**	**11**	**19**
% good health							**21%**
% poor, dead or missing							**79%**
11	TSP6	*E. bridgesiana*	2		1		
11	TSP6	*E. melliodora*	4	5	1		
11	TSP6	*E. blakelyi*		1			
11	TSP6	Unknown	**1***		1*	5*	
Total			**7**	**6**	**3**	**5**	**21**
% good health							**33%**
% poor, dead or missing							**67%**
13	TSP7	*E. melliodora*	5	1			
13	TSP7	*E. bridgesiana*	7				
13	TSP7	*E. blakelyi*	3				
13	TSP7	*E. dives*	1				
13	TSP7	*Dodonaea* sp.			2		
13	TSP7	Unknown				3*	
Total			**16**	**1**	**2**	**3**	**22**
% good health							**73.0%**
% poor, dead or missing							**27%**
18	TSP8	*E. melliodora*	5				
18	TSP8	*E. mannifera*	3				
18	TSP8	*Leptospermum sp.*	0				
18	TSP8	Unknown				**1***	
Total			**8**	**0**	**0**	**1**	**9**
% good health							**89%**
% poor, dead or missing							**11%**
19	TSP9	*E. melliodora*	9	7			
19	TSP9	*E.mannifera*	0				
19	TSP9	*E. blakelyi*	3	2			
19	TSP9	*E. polyanthemos*	2				
19	TSP9	Unknown				**1***	
Total			**14**	**9**	**0**	**1**	**24**
% good health							**58.0%**
% poor, dead or missing							**42%**
21	TSP10	*E. melliodora*	4		1		
21	TSP10	*E. mannifera*	9	3			
21	TSP10	*E. blakelyi*	0				
21	TSP10	*E. polyanthemos*	42	7	3		

Site Sequence	Site ID	Species	Seedling success	Poor Health	Dead	Unaccounted	Total
21	TSP10	*Dodonaea sp.*	4	2			
21	TSP10	*Callistemon sp.*	9				
21	TSP10	*Acacia sp.*	26				
21	TSP10	*Leptospermum sp.*	0				
21	TSP10	Unknown			**26***	**3***	
Total			**94**	**12**	**30**	**3**	**139**
% good health							**68.0%**
% poor, dead or missing							**32.0%**
24	TSP11	*E. melliodora*	5				
24	TSP11	*E. bridgesiana*	5				
24	TSP11	Unknown eucalypt			1*		
Total			**10**	**0**	**1**	**0**	**11**
% good health							**91%**
% poor, dead or missing							**9%**
25	TSP12	*Leptospermum sp.*	10	3	4		
25	TSP12	*Bursaria spinosa*	10	2	1		
25	TSP12	*Acacia sp.*	22				
25	TSP12	*Kunzea sp.*					
25	TSP12	*Grevillea sp.*					
25	TSP12	Unknown			5*	8*	
Total			**42**	**5**	**10**	**8**	**65**
% good health							**65.0%**
% poor, dead or missing							**35.0%**
TOTAL			**343**	**82**	**150**	**125**	**700**
%			**49.0%**	**11.7%**	**21.4%**	**17.9%**	**100%**

Appendix 3: Floristic data – herbaceous plantings

Table 8: Herbaceous planting data from thirteen sample sites (HP1 - HP13) from spring 2102 to autumn 2014. Planted species are shown in bold type.

Cover abundance scores for recorded native species based on a modified Braun Blanquet scale, as follows:

r = < 5% cover and solitary (< 4 individuals)
+ = < 5% cover and few (4-15 individuals)
1 = < 5% cover and numerous/scattered (>15 individuals)
2 = 5% - 25% cover
3 = 25% - 50% cover
4 = 50% - 75% cover
5 = > 75% cover

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
2	HP 1	***Themeda australis***	+	1	+	1	1	-
2	HP 1	*Austrostipa sp.*	r	+	-	+	-	1
2	HP 1	*Hypericum gramineum*	r	-	-	r	-	1
2	HP 1	***Austrodanthonia sp.***	+	+	1	1	1	-
2	HP 1	***Chrysocephalum apiculatum***	1	1	+	+	1	-
2	HP 1	***Convolvulus erubescens***	r	-	-	-	0	-
2	HP 1	*Crassula sieberiana*	+	-	-	-	-	0
2	HP 1	***Microlaena stipoides***	1	1	1	1	1	-
2	HP 1	*Geranium solanderi*	r	-	r	+	-	1
2	HP 1	***Wahlenbergia sp.***	+	r	+	1	1	-
2	HP 1	*Euchiton sp.*	r	-	-	r	-	1
2	HP 1	***Chloris truncata***		1	1	1	1	-
2	HP 1	***Bothriochloa macra***		+	r	+	1	-
2	HP 1	*Eragrostis brownii*		+	-	r	-	1
2	HP 1	*Epilobium billardierianum*		r	-	r	-	1
2	HP 1	***Austrostipa scabra***			1	+	1	-
2	HP 1	*Erodium crinitum*			r	-	-	0
2	HP 1	***Elymus scaber***				1	1	-
2	HP 1	*Panicum effusum*				1	-	1
2	HP 1	*Oxalis perennans*				r	-	1
Total sp.			**11**	**10**	**10**	**17**	**9**	**8**
Sp. with cover score of 1 or more			**2**	**4**	**4**	**7**	**6**	**1**
Est. total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**5%**
4	HP 2	*Swainsona sericea*	+	1	1	r	-	1
4	HP 2	***Chrysocephalum apiculatum***	1	1	1	2 (low)	1	-
4	HP 2	*Crassula sieberiana*	1	-	+	-	-	0

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
4	HP 2	*Plantago varia*	1	1	1	+	-	1
4	HP 2	*Wurmbea dioica*	+	-	1	-	-	0
4	HP 2	***Microlaena stipoides***	+	+	-	+	1	-
4	HP 2	*Cymbonotus lawsonianus*	r	+	+	r	-	1
4	HP 2	***Convolvulus erubescens***	r	-	-	-	0	-
4	HP 2	***Wahlenbergia sp.***	+	1	+	1	1	-
4	HP 2	*Eryngium ovinum*	1	+	+	1	-	1
4	HP 2	*Geranium solanderi*	+	1	+	1	-	1
4	HP 2	***Austrodanthonia sp.***	+	1	1	1	1	-
4	HP 2	*Bulbine bulbosa*	r	-	r	-	-	0
4	HP 2	*Euchiton sp.*	+	r	+	+	-	1
4	HP 2	*Einadia sp.*	r	r	r	-	-	0
4	HP 2	*Austrostipa sp.*	r	+	-	+	-	1
4	HP 2	*Lomandra sp.*		+	-	+	-	1
4	HP 2	*Eragrostis ? brownii*		+	-	+	-	1
4	HP 2	*Panicum effusum*		+	-	1	-	1
4	HP 2	***Themeda australis***		+	-	+	1	-
4	HP 2	***Chloris truncata***		+	+	1	1	-
4	HP 2	*Erodium crinitum*		r	-	+	-	1
4	HP 2	*Asperula conferta*			1	-	-	0
4	HP 2	***Elymus scaber***			+	1	1	-
4	HP 2	*Lomandra bracteata*			r	-	-	0
4	HP 2	*Senecio quadridentatus*			r	-	-	0
4	HP 2	*Hydrocotyle laxiflora*			r	-	-	0
4	HP 2	***Austrostipa scabra***			1	+	1	-
4	HP 2	***Bothriochloa macra***			+	r	1	-
4	HP 2	*Epilobium billardierianum*			r	-	-	0
4	HP 2	*Eragrostis sp. 1*				r	-	1
4	HP 2	*Oxalis perennans*				r	-	1
Total sp.			**16**	**17**	**22**	**22**	**9**	**13**
Sp. with cover score of 1 or more			**4**	**6**	**7**	**8**	**5**	**3**
Est. total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**5-25%**
6	HP 3	***Chrysocephalum apiculatum***	1	1	1	+	1	-
6	HP 3	*Hydrocotyle laxiflora*	+	+	r	-	-	0
6	HP 3	*Geranium solanderi*	+	+	+	+	-	1
6	HP 3	***Austrodanthonia sp.***	+	+	+	1	1	-
6	HP 3	***Microlaena stipoides***	+	+	r	+	1	-
6	HP 3	*Austrostipa sp.*	r	r	1	r	-	1
6	HP 3	*Haloragis heterophylla*		r	1	+	-	1
6	HP 3	*Eragrostis ? brownii*		+	r	-	-	0
6	HP 3	*Carex breviculmis*		r	+	-	-	0
6	HP 3	***Chloris truncata***		1	r	1	1	-
6	HP 3	*Panicum effusum*		1	-	1	-	1
6	HP 3	*Eucalyptus melliodora*		[1]	[1]	[1]	-	[1]

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
6	HP 3	*Lomandra sp.*		+	-	-	-	0
6	HP 3	***Themeda australis***		+	-	r	1	-
6	HP 3	***Wahlenbergia sp.***		+	+	+	1	-
6	HP 3	*Euchiton sp.*		r	+	-	-	0
6	HP 3	*Wurmbea diocia*			+	-	-	0
6	HP 3	*Juncus filicaulis*			+	-	-	0
6	HP 3	***Elymus scaber***			1	+	1	-
6	HP 3	*Hypericum gramineum*			+	-	-	0
6	HP 3	*Rumex brownii*			r	r	-	1
6	HP 3	*Erodium crinitum*			r	-	-	0
6	HP 3	*Eragrostis sp. 1*				1	-	1
6	HP 3	*Juncus sp.*				1	-	1
6	HP 3	*Oxalis perennans*				r	-	1
Total sp.			**6**	**15**	**18**	**15**	**7**	**8**
Sp. with cover score of 1 or more			**1**	**3**	**4**	**5**	**2**	**3**
Est. total foliage cover			**-**	**-**	**-**	**-**	**<5% v**	**5-25% ^**
8	HP 4	*Wurmbea dioica*	+	-	r	-	-	0
8	HP 4	*Hydrocotyle laxiflora*	+	-	+	-	-	0
8	HP 4	***Chrysocephalum apiculatum***	+	+	+	-	0	-
8	HP 4	***Austrodanthonia sp.***	r	+	1	1	1	-
8	HP 4	*Austrostipa sp.*	r	r	r	-	0	-
8	HP 4	*Geranium solanderi*	+	r	r	r	-	1
8	HP 4	***Microlaena stipoides***	r	1	1	+	1	-
8	HP 4	***Chloris truncata***		+	r	1	1	-
8	HP 4	*Eragrostis ? brownii*		+	r	1	-	1
8	HP 4	***Themeda australis***		+	r	+	1	-
8	HP 4	*Euchiton sp.*		+	+	-	-	0
8	HP 4	*Carex ? inversa*		+	+	-	-	0
8	HP 4	*Haloragis heterophylla*		r	+	+	-	1
8	HP 4	***Wahlenbergia sp.***			+	r	1	-
8	HP 4	*Rumex brownii*			r	-	-	0
8	HP 4	*Carex appressa*			r	-	-	0
8	HP 4	*Epilobium billardierianum*			r	-	-	0
8	HP 4	*Hypericum gramineum*			r	r	-	1
8	HP 4	***Elymus scaber***			+	1	1	-
8	HP 4	*Schoenus apogon*			1	-	-	0
8	HP 4	*Erodium crinitum*			+	-	-	0
8	HP 4	*Juncus filicaulis*			+	-	-	0
8	HP 4	*Carex ? breviculmis*				+	-	1
8	HP 4	*Eragrostis sp. 1*				1	-	1
Total sp.			**7**	**11**	**22**	**12**	**6**	**6**
Sp. with cover score of 1 or more			**0**	**1**	**3**	**5**	**3**	**2**
Total foliage cover			**-**	**-**	**-**	**-**	**5-25%^**	**<5%**
10	HP 5	***Austrodanthonia sp.***	1	+	1	1	1	-

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
10	HP 5	***Themeda australis***	r	+	+	+	1	-
10	HP 5	***Elymus scaber***	r	-	r	+	1	-
10	HP 5	***Chrysocephalum apiculatum***	1	+	r	-	0	-
10	HP 5	***Microlaena stipoides***	1	1	1	1	1	-
10	HP 5	***Convolvulus erubescens***	r	-	-	-	0	-
10	HP 5	***Wahlenbergia sp.***	r	r	r	-	0	-
10	HP 5	*Austrostipa sp.*	+	r	-	+	-	1
10	HP 5	***Chloris truncata***	+	r	-	1	1	-
10	HP 5	*Eragrostis ? brownii*		r	r	-	-	0
10	HP 5	***Bothriochloa macra***		+	+	1	1	-
10	HP 5	*Lachnagrostis sp.*		r	-	-	-	0
10	HP 5	*Panicum effusum*		r	-	+	-	1
10	HP 5	***Austrostipa scabra***			+	+	1	-
10	HP 5	*Geranium solanderi*			r	r	-	1
10	HP 5	*Vittadinia muelleri*			+	r	-	1
10	HP 5	*Haloragis heterophylla*			1	+	-	1
10	HP 5	*Austrostipa bigeniculata*			r	r	-	1
10	HP 5	*Cymbonotus lawsonianus*			r	-	-	0
10	HP 5	*Eragrostis sp. 1*				+	-	1
10	HP 5	*Hypericum gramineum*				r	-	1
10	HP 5	*Oxalis perennans*				r	-	1
Total sp.			**9**	**11**	**14**	**16**	**7**	**9**
Sp. with cover score of 1 or more			**3**	**1**	**3**	**4**	**4**	**0**
Est. total foliage cover			**-**	**-**	**-**	**-**	**5-25%^**	**<5%**
12	HP 6	***Microlaena stipoides***	1	1	1	1	1	-
12	HP 6	***Chrysocephalum apiculatum***	1	+	+	r	1	-
12	HP 6	***Themeda australis***	+	1	1	1	1	-
12	HP 6	***Austrodanthonia sp.***	+	1	1	1	1	-
12	HP 6	***Elymus scaber***	+	+	+	1	1	-
12	HP 6	***Wahlenbergia sp.***	+	-	-	r	1	-
12	HP 6	***Bothriochloa macra***		1	r	1	1	-
12	HP 6	*Austrostipa sp.*		r	+	-	-	0
12	HP 6	*Geranium solanderi*		r	+	+	-	1
12	HP 6	*Euchiton sp.*		r	+	-	-	0
12	HP 6	***Austrostipa scabra***			+	1	1	-
12	HP 6	*Senecio quadridentatus*			+	-	-	0
12	HP 6	*Chloris truncata*				1	1	-
12	HP 6	*Eragrostis sp. 1*				+	-	1
12	HP 6	*Panicum effusum*				+	-	1
12	HP 6	*Pseudognathalium luteoalbum*				+	-	1
Total sp.			**6**	**9**	**11**	**13**	**9**	**4**
Sp. with cover score of 1 or more			**2**	**4**	**3**	**7**	**7**	**0**
Est. total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**<5%**
14	HP 7	***Microlaena stipoides***	1	1	1	1	1	-

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
14	HP 7	***Chrysocephalum apiculatum***	1	1	+	1	1	-
14	HP 7	*Austrostipa sp.*	+	r	-	1	-	1
14	HP 7	***Austrodanthonia sp.***	1	1	1	1	1	-
14	HP 7	***Wahlenbergia stricta***	+	+	r	-	0	-
14	HP 7	***Themeda australis***		+	+	+	1	-
14	HP 7	***Chloris truncata***		r	-	+	1	-
14	HP 7	***Bothriochloa macra***		+	+	+	1	-
14	HP 7	*Euchiton sp.*		r	r	r	-	1
14	HP 7	***Austrostipa scabra***			1	+	1	-
14	HP 7	*Stuartina muelleri*			r	-	-	0
14	HP 7	*Dichondra repens*			r	-	-	0
14	HP 7	***Elymus scaber***			+	+	1	-
14	HP 7	*Oxalis perennans*			r	+	-	1
14	HP 7	*Carex sp.*			r	-	-	0
14	HP 7	*Triptilodiscus pygmaeus*			+	-	-	0
14	HP 7	***Desmodium varians***				r	1	-
14	HP 7	*Eragrostis sp.1*				+	-	1
14	HP 7	*Panicum effusum*				+	-	1
14	HP 7	***Wahlenbergia sp.***				r	1	-
Total sp.			**5**	**9**	**14**	**15**	**10**	**5**
Sp. with cover score of 1 or more			**3**	**3**	**3**	**4**	**3**	**1**
Est. total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**<5%**
15	HP 8	*Bulbine bulbosa*	1	-	+	-	-	0
15	HP 8	***Themeda australis***	+	1	1	1	1	-
15	HP 8	***Austrodanthonia sp.***	1	1	1	1	1	-
15	HP 8	***Austrostipa scabra***	1	1	1	+	1	-
15	HP 8	*Lomandra sp. (filiformis)*	+	+	r	+	-	1
15	HP 8	*Triptilodiscus pygmaeus*	1	-	1	-	-	0
15	HP 8	***Wahlenbergia sp.***	1	1	1	1	1	-
15	HP 8	*Cymbonotus lawsonianus*	+	-	r	r	-	1
15	HP 8	*Hypericum gramineum*	+	-	-	-	-	0
15	HP 8	*Geranium solanderi*	+	+	r	+	-	1
15	HP 8	*Euchiton sp.*	r	+	+	r	-	1
15	HP 8	***Chloris truncata***	+	1	+	2 (low)	1	-
15	HP 8	*Eragrostis ? benthamii*	1	1	r	-	-	0
15	HP 8	*Panicum effusum*	+	+	+	1	-	1
15	HP 8	*Schoenus apogon*	+	-	r	-	-	0
15	HP 8	***Microlaena stipoides***	+	1	1	+	1	-
15	HP 8	*Hydrocotyle laxiflora*	+	-	+	-	-	0
15	HP 8	***Bothriochloa macra***	+	2	1	1	1	-
15	HP 8	***Elymus scaber***	+	-	+	1	1	-
15	HP 8	*Aristida ? ramosa*		+	r	+	-	1
15	HP 8	*Haloragis heterophylla*		+	+	+	-	1
15	HP 8	*Solenogyne dominii*		+	r	1	-	1

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
15	HP 8	***Desmodium varians***		+	r	-	0	-
15	HP 8	*Oxalis perennans*			+	+	-	1
15	HP 8	*Austrostipa bigeniculata*			+	1	-	1
15	HP 8	*Wurmbea dioica*			+	-	-	0
15	HP 8	*Pseudognathalium luteoalbum*			+	+	-	1
15	HP 8	*Senecio quadridentatus*			r	-	-	0
15	HP 8	*Crassula sieberiana*			+	-	-	0
15	HP 8	*Ophioglossum lusitanicum*			+	-	-	0
15	HP 8	***Convolvulus erubescens***			r	-	-	0
15	HP 8	*Isoetopsis graminifolia*			+	-	-	0
15	HP 8	*Eragrostis ? brownii*				+	-	1
15	HP 8	*Eragrostis sp. 1*				1	-	1
15	HP 8	*Poa sp.*				r	-	1
Total sp.			**19**	**16**	**31**	**22**	**8**	**14**
Sp. with cover score of 1 or more			**6**	**8**	**7**	**10**	**6**	**4**
Est. total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**5-25%**
16	HP 9	***Chrysocephalum apiculatum***	r	r	r	r	1	-
16	HP 9	***Microlaena stipoides***	1	1	1	1	1	-
16	HP 9	***Themeda australis***	1	+	+	+	1	-
16	HP 9	***Chloris truncata***	1	2	1	1	1	-
16	HP 9	***Austrodanthonia sp.***	1	1	1	1	1	-
16	HP 9	*Panicum effusum*	1	r	+	-	-	0
16	HP 9	*Triptilodiscus pygmaeus*	+	-	1	-	-	0
16	HP 9	*Austrostipa sp.*	+	1	+	1	-	1
16	HP 9	*Vittadinia sp.*	+	-	+	-	-	0
16	HP 9	*Crassula sieberiana*	1	-	1	-	-	0
16	HP 9	***Bothriochloa macra***		1	+	1	1	-
16	HP 9	*Lachnagrostis sp.*		r	+	r	-	1
16	HP 9	***Elymus scaber***		r	+	1	1	-
16	HP 9	*Oxalis perennans*			+	+	-	1
16	HP 9	*Poa sp.*			r	r	-	1
16	HP 9	*Rumex brownii*			r	r	-	1
16	HP 9	***Wahlenbergia sp.***			+	+	1	-
16	HP 9	*Carex inversa*			r	-	-	0
16	HP 9	*Pseudognathalium luteoalbum*			r	r	-	1
16	HP 9	*Austrostipa bigeniculata*				+	-	1
16	HP 9	***Austrostipa scabra***				+	1	-
Total sp.			**10**	**10**	**19**	**16**	**9**	**7**
Sp. with cover score of 1 or more			**6**	**5**	**5**	**6**	**5**	**1**
Est total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**<5%**
17	HP 10	*Solenogyne dominii*	r	-	-	-	-	0
17	HP 10	*Austrodanthonia sp.*	1	1	1	1	1	-
17	HP 10	***Microlaena stipoides***	1	1	1	1	1	-
17	HP 10	***Bothriochloa macra***	+	1	1	1	1	-

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
17	HP 10	*Carex ? breviculmis/inversa*	1	+	-	-	-	0
17	HP 10	*Austrostipa sp.*	r	1	+	1	-	-
17	HP 10	***Themeda australis***	r	+	+	1	1	-
17	HP 10	***Chloris truncata***	r	1	1	1	1	-
17	HP 10	*Cymbonotus lawsonianus*	r	r	-	r	-	1
17	HP 10	***Chrysocephalum apiculatum***	+	+	r	r	1	-
17	HP 10	***Wahlenbergia sp.***	+	+	-	+	1	-
17	HP 10	*Geranium solanderi*	r	r	r	+	-	1
17	HP 10	*Euchiton sp.*	+	+	1	-	-	0
17	HP 10	*Tryptilodiscus pygmaeus*	r	-	-	-	-	0
17	HP 10	*Eragrostis ? benthamii*	r	1	-	-	-	0
17	HP 10	*Panicum effusum*		+	-	-	-	0
17	HP 10	*Juncus sp.*		+	-	+	-	1
17	HP 10	***Elymus scaber***		r	1	1	1	-
17	HP 10	*Eragrostis sp.*		1	+	-	0	-
17	HP 10	*Hydrocotyle laxiflora*		r	-	-	0	-
17	HP 10	*Hypericum gramineum*		r	-	r	-	1
17	HP 10	*Haloragis heterophylla*		r	-	1	-	1
17	HP 10	*Lachnagrostis sp.*		+	+	+	-	1
17	HP 10	*Oxalis perennans*			+	1	-	1
17	HP 10	*Carex inversa*			+	1	-	1
17	HP 10	*Poa sp.*			r	r	-	1
17	HP 10	*Juncus filicaulis*			r	-	-	0
17	HP 10	*Austrostipa bigeniculata*				+	-	1
17	HP 10	***Austrostipa scabra***				+	1	-
17	HP 10	*Eragrostis ? brownii*				+	-	1
17	HP 10	*Eragrostis sp. 1*				+	-	1
17	HP 10	***Poa sp. (labillardieri)***				r	1	-
17	HP 10	*Rumex brownii*				r	-	1
17	HP 10	*Pseudognathalium luteoalbum*				+	-	1
Total sp.			**15**	**21**	**16**	**24**	**10**	**14**
Sp. with cover score of 1 or more			**3**	**7**	**6**	**10**	**6**	**4**
Est. total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**5-25% ^**
20	HP 11	***Austrodanthonia sp.***	1	1	1	1	1	-
20	HP 11	***Austrostipa scabra***	1	1	1	1	1	-
20	HP 11	***Microlaena stipoides***	1	1	1	1	1	-
20	HP 11	*Carex ? breviculmis*	+	r	-	-	-	0
20	HP 11	*Lomandra sp.*	+	-	-	-	-	0
20	HP 11	***Poa sp. (labillardieri)***	+	r	-	r	1	-
20	HP 11	*Epilobium billardierianum*	r	-	-	-	-	0
20	HP 11	*Eleocharis sp.*	r	-	-	-	0	-
20	HP 11	***Elymus scaber***	+	-	+	+	1	-
20	HP 11	***Chloris truncata***		1	+	1	1	-
20	HP 11	*Eragrostis sp. 1*		1	1	+	-	1

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
20	HP 11	*Eragrostis sp. ? brownii*		+	-	-	-	0
20	HP 11	*Euchiton sp.*		+	-	r	-	1
20	HP 11	***Bothriochloa macra***		1	+	1	1	-
20	HP 11	*Cynodon dactylon*		+	-	+	-	1
20	HP 11	*Juncus sp.*		+	r	-	-	0
20	HP 11	*Panicum effusum*		+	r	r	-	1
20	HP 11	***Themeda australis***			+	+	1	-
20	HP 11	*Oxalis perennans*			+	r	-	1
20	HP 11	*Haloragis heterophylla*			r	r	-	1
20	HP 11	***Carex appressa***			r	-	0	-
20	HP 11	*Eragrostis sp. 2*				+	-	1
20	HP 11	*Senecio quadridentatus*				r	-	1
Total sp.			**9**	**13**	**13**	**16**	**8**	**8**
Sp. with cover score of 1 or more			**3**	**6**	**4**	**5**	**5**	**0**
Est. total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**<5%**
22	HP 12	***Microlaena stipoides***	1	1	1	-	0	-
22	HP 12	***Chloris truncata***	1	1	1	2 (low)	1	-
22	HP 12	***Austrostipa scabra***	1	1	1	1	1	-
22	HP 12	*Euchiton sp.*	+	+	-	r	-	1
22	HP 12	***Austrodanthonia sp.***	1	1	1	1	1	-
22	HP 12	***Themeda australis***	+	+	1	1	1	-
22	HP 12	*Rumex brownii*		r	r	-	-	0
22	HP 12	***Elymus scaber***		r	+	+	1	-
22	HP 12	*Panicum effusum*		1	+	+	-	1
22	HP 12	***Bothriochloa macra***		1	1	1	1	-
22	HP 12	*Eragrostis sp.*		+	r	-	-	0
22	HP 12	*Lachnagrostis sp.*		+	r	r	-	1
22	HP 12	*Haloragis heterophylla*		+	r	+	-	1
22	HP 12	*Juncus sp.*		+	r	r	-	1
22	HP 12	*Cyperus sp.*		+	r	-	-	0
22	HP 12	*Cynodon dactylon*		+	-	+	-	1
22	HP 12	***Wahlenbergia sp.***			+	r	1	-
22	HP 12	*Geranium solanderi*			r	r	-	1
22	HP 12	*Schoenus apogon*			r	r	-	1
22	HP 12	*Hydrocotyle laxiflora*			r	-	-	0
22	HP 12	*Oxalis perennans*			r	-	-	0
22	HP 12	*Triptilodiscus pygmaeus*			r	-	-	0
22	HP 12	*Eragrostis sp. 1*				r	-	1
22	HP 12	*Poa sp.*				r	-	1
22	HP 12	*Senecio quadridentatus*				r	-	1
22	HP 12	*Vittadinia sp.*				r	-	1
22	HP 12	*Glycine tabacina*				r	-	1

Site	Site ID	Species	Total Sp. Cover Spring 2012	Total Sp. Cover Autumn 2013	Total Sp. Cover Spring 2013	Total Sp. Cover Autumn 2014	Planted Sp. Autumn 2014	Non-planted Sp. Autumn 2014
Total sp.			**6**	**16**	**20**	**20**	**7**	**13**
Sp. with cover score of 1 or more			**4**	**6**	**6**	**5**	**5**	**0**
Total foliage cover			**-**	**-**	**-**	**-**	**5-25%**	**<5%**
23	HP 13	***Microlaena stipoides***	1	1	+	+	1	-
23	HP 13	***Austrostipa scabra***	+	1	r	+	1	-
23	HP 13	***Chloris truncata***	+	1	+	1	1	-
23	HP 13	***Austrodanthonia sp.***	1	1	+	+	1	-
23	HP 13	***Elymus scaber***	r	+	+	r	1	-
23	HP 13	***Themeda australis***	+	+	r	+	1	-
23	HP 13	*Carex ? appressa*	r	-	r	-	-	0
23	HP 13	*Juncus ? usitatus*	+	+	+	+	1	-
23	HP 13	*Lachnagrostis sp.*		+	-	-	-	0
23	HP 13	***Bothriochloa macra***		+	r	1	1	-
23	HP 13	*Epilobium billardierianum*		+	-	r	-	1
23	HP 13	*Haloragis heterophylla*		1	-	-	-	0
23	HP 13	*Eragrostis sp. 1*		+	+	1	-	1
23	HP 13	*Panicum effusum*		+	-	-	-	0
23	HP 13	*Eragrostis sp. 2*		+	-	-	-	0
23	HP 13	*Lomandra sp.*			+	-	-	0
Total sp.			**8**	**14**	**10**	**10**	**8**	**2**
Sp. with cover score of 1 or more			**2**	**5**	**0**	**3**	**2**	**1**
Est. total foliage cover			**-**	**-**	**-**	**-**	**<5%**	**<5%**

Changes in the total foliage cover (TFC) are indicated by ^ = increase; v = decrease.

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