

M2G Planting (Tree & Shrub) Monitoring Report

Construction Corridor (Spring 2014)

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Abbreviations

ABBREVIATION	DESCRIPTION
BGGW	Box Gum Grassy Woodland
BWA	Bulk Water Alliance
EMP	Ecological Monitoring Sub-plan
HLPS	High Lift Pump Station
LLPS	Low Lift Pump Station
LRTEMP	Landscape Rehabilitation and Terrestrial Ecology Management Plan
M2G	Murrumbidgee to Googong Water Transfer Project
ORMP	Offset Rehabilitation 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 examines the results of the spring 2014 monitoring session for rehabilitation planting¹ within the M2G construction corridor and structure sites. This is the fifth in a series of bi-annual monitoring studies documenting the progress of tree and shrub plantings.

1.2 Study area

The study area extends from the Low Lift Pump Station (LLPS) at Angle Crossing on the Murrumbidgee River to the discharge facility at Burra Creek, situated near the intersection of Williamsdale and Burra Roads. The pipeline construction corridor is approximately 12 km in length (**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 is to monitor representative sub-sets of tree and shrub plantings within the M2G construction corridor and record planting success.

As was explained in the previous report (autumn 2014), there was significant difficulty in discriminating between planted and non-planted herbaceous specimens and the herbaceous component of the planting monitoring was discontinued.

1.4 Planting regime

Almost 5,000 tree and shrub seedlings (Hiko Cells, 45Lt and 300SR containers) were planted within the M2G construction corridor and structure sites during spring 2011 and autumn 2012. Native plantings comprised eleven shrub and nine tree species. In addition, five non-native tree and shrub species were planted in the eastern sections of the construction corridor at the request of landowners.

An inventory of planted species is provided in **Table 1**.

Species selection and planting distribution were guided by former vegetation type, spatial characteristics and vegetation lost as a result of construction. Additional woody plantings were included as part of compensatory measures for habitat loss as well as for amenity.

¹ Concurrent plot-based monitoring for seeding rehabilitation within the construction corridor is presented in a separate report.

Table 1: Tree and shrub species and the total number of tube-stock planted within the M2G construction corridor and structure sites.

Scientific Name	Common Name	Total plantings pipeline corridor	Total plantings structures	Total
Native tree				
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum			
<i>Eucalyptus bridgesiana</i>	Apple Box			
<i>Eucalyptus mannifera</i>	Brittle Gum			
<i>Eucalyptus melliodora</i>	Yellow Box			
<i>Eucalyptus polyanthemus</i>	Red Box			
<i>Eucalyptus pauciflora</i>	Snow Gum			
<i>Eucalyptus rubida</i>	Candlebark Gum			
<i>Eucalyptus viminalis</i>	Manna Gum			
<i>Callitris endlicheri</i>	Black Cypress Pine			
Sub-total		624	148	772
Native shrub				
<i>Acacia dealbata</i>	Silver Water			
<i>Acacia genistifolia</i>	Spreading Wattle			
<i>Acacia rubida</i>	Red Stemmed Wattle			
<i>Acacia siculiformis</i>	Dagger Wattle			
<i>Banksia marginata</i>	Silver Banksia			
<i>Bursaria spinosa</i>	Hairy Bursaria			
<i>Leptospermum myrtifolium</i>	Myrtle Tea Tree			
<i>Leptospermum obovatum</i>	River Tea Tree			
<i>Kunzea ericoides</i>	Burgan			
<i>Cassinia longifolia</i>	Shiny Cassinia			
<i>Indigofera australis</i>	Austral Indigo			
Sub-total		3,016	1,055	4,071
Non-native tree/shrub				
<i>Ulmus parvifolia</i>	Chinese Elm			
<i>Quercus robur</i> 'Fastigiata'	Upright English Oak			
<i>Castanea sativa</i>	European Chestnut			
<i>Populus spp.</i>	Poplar (TBC)			
<i>Pyrus ussuriensis</i>	Manchurian Pear			
Sub-total		19	-	19
Total native trees/shrub		3,640	1,203	4,843
Total non-native tree/shrub		19	-	19

2 Methods

2.1 Monitoring regime

Permanent monitoring sites were established and are sampled on a bi-annual basis (autumn and spring/summer periods) over a period of at least two-years post-construction.

The current monitoring period occurred during October 2014.

2.2 Selection of monitoring sites

Twelve tree and shrub monitoring sites were selected from approximately 80 planting arrays within the M2G construction corridor and structure sites (**Figures 1 – 3, Appendix 1**). Six sites (TSP1-6) are situated in the ACT and six (TSP7-12) in NSW (**Table 2**).

The spatial arrangement of sampling sites was influenced by the original placement of planting arrays (most of which were located in areas of former native vegetation), which resulted in fewer sampling sites in the eastern non-native section of the construction corridor than in the central and western sections. Sample sites were also selected to include variations in landform, such as: slope and aspect, soil moisture and vegetation types.

Sample sites were marked with a red-tipped stake, at which grid co-ordinates and photographs were taken.

Table 2: Tree and shrub (TSP) monitoring sites within the construction corridor and structure sites.

Site ID [^]	Approx. chainage from LLPS	Co-ordinates	Jurisdiction	Property
TSP1	250	691345 - 6060236	ACT	PCS (Murrumbidgee R. corridor)
TSP2	1025	691964 - 6060519	ACT	PCS (Murrumbidgee R. corridor)
TSP3	1350	692256 - 6060605	ACT	ACTEW leasehold
TSP4	1900	692592 - 6060707	ACT	ACTEW leasehold
TSP5	2325	693226 - 6060578	ACT	ACTEW leasehold
TSP6	2650	693528 - 6060505	ACT	ACTEW leasehold
TSP7	3040	693927 - 6060542	NSW	Smith
TSP8	4975	695663 - 6060392	NSW	Loneragan
TSP9	5475	696175 - 6060305	NSW	Loneragan
TSP10	6425	697084 - 6060204	NSW	Johanson
TSP11	9300	699277 - 6061925	NSW	Latimer
TSP12	11900	701346 - 6063099	NSW	Discharge facility

2.3 Survey techniques

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.

2.4 Key Performance Target

The current Key Performance Target (KPT) for tree and shrub plantings is 90% survival rate, which was set between the BWA and the planting contractor in early 2012. Unfortunately, the KPTs for planting success provided in the M2G Landscape Rehabilitation and Terrestrial Ecology Management Plan (LRTEMP) do not provide an explicit target figure.

In light of this inconsistency and considering the survey results to date it is recommended that the KPT for plantings be reduced to 70%. If accepted by the Environmental Auditor and M2G Environment Reference Group the LRTEMP will be amended and provided to the ACT and NSW regulators for their respective approval.

3 Results

3.1 Overview

Of the 700 tree and shrub specimens² that were monitored 295 (**42.1%**) were in good health, 100 (**14.3%**) in poor health and 305 (**43.6%**) either dead or missing. Almost **58%** of the total sample was categorised as poor, dead or missing (**Table 3**). Planting success was also differentiated by jurisdiction, with **61%** of plantings in NSW in good health compared to just **30%** in the ACT.

The proportion of specimens in good health declined by **7%** in October 2014 (49% in autumn 2014) and the proportion of dead and missing specimens now exceeds those in good health. A summary of the spring 2014 monitoring results is provided in **Table 3** (see **Table 7 in Appendix 2** for full data sets) and a summarised comparison of all session results in **Table 4**.

With the exception of TSP7, which remained stable, all sample sites exhibited declines in planting health compared to the previous reporting period - autumn 2014. Furthermore, all sites within the ACT (TSP1-6) have had significant declines in planting health with just two sites (TSP1 and 2) above **40%** success and the remaining four sites all below **15%**. In comparison all NSW sites had success rates above **50%**, though all have experienced discernible declines since the start of monitoring (**Chart 1**).

The best performing sites were TSP11, TSP7 and TSP8 - with **81.8%**, **72.7%** and **66.7%** planting success, respectively – however, these sites were also among the least populated and represented just 6% of the total sample. Of the twelve sites, seven had greater than 50% of specimens in good health; one site above 40%, and four sites scored below 20% (**Table 3**).

Extrapolating the current results to the total planted population of 4,843 (see **Table 1 in Section 1**) would yield approximately **2,038** plantings in good health, **693** in poor health and **2,112** dead or missing. Assuming a sample error of +/- 5%, the number of plantings in good health would range from **2,281** to **1,797**. This was the least successful result of any monitoring period.

Summaries and images of each monitoring site are provided in the following sections. Note: bracketed numbers in the central column provide results from the previous autumn 2014 monitoring period.

² Initial tree & shrub sample size comprised 661 specimens (spring 2012) additional plantings increased the total to 700 in spring 2013.

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

Site ID	Seedling Health			Combined Poor/Dead*	Total Plantings	%	
	Good	Poor	Dead*			Good	Poor/Dead*
TSP1	38	15	39	54	92	41.3	58.7
TSP2	68	18	41	59	127	53.5	46.5
TSP3	14	12	69	81	95	14.7	85.3
TSP4	6	7	63	70	76	7.9	92.1
TSP5	2	3	14	17	19	10.5	89.5
TSP6	2	5	14	19	21	9.5	90.5
TSP7	16	0	6	6	22	72.7	27.3
TSP8	6	2	1	3	9	66.7	33.3
TSP9	13	10	1	11	24	54.2	45.8
TSP10	85	19	35	54	139	61.2	38.8
TSP11	9	1	1	2	11	81.8	18.2
TSP12	36	8	21	29	65	55.4	44.6
Total plantings	295	100	305	405	700		
Av. per site	24.6	8.3	25.4	33.7	58.3		
%	42.1	14.3	43.6	57.9	100		

* Includes missing specimens

Table 4: Comparison of tree and shrub monitoring results from all sessions.

Monitoring period	Seedling Health			Poor/Dead Combined*	Total Plantings
	Good	Poor	Dead*		
Spring 2012					
Total number	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 number	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 number	451	76	173	249	700
Av. per site	37.6	6.3	14.4	20.7	
%	64.4	10.9	24.7	35.6	
Autumn 2014					
Total number	343	82	275	357	700
Av. per site	28.6	6.8	22.9	20.7	
%	49.0	11.7	39.3	35.6	
Spring 2014					
Total number	295	100	305	405	700
Av. per site	24.6	8.3	25.4	33.7	
%	42.1	14.3	43.6	57.9	

* Includes missing specimens

Chart 1: Plantings in good health at each site during each monitoring period.

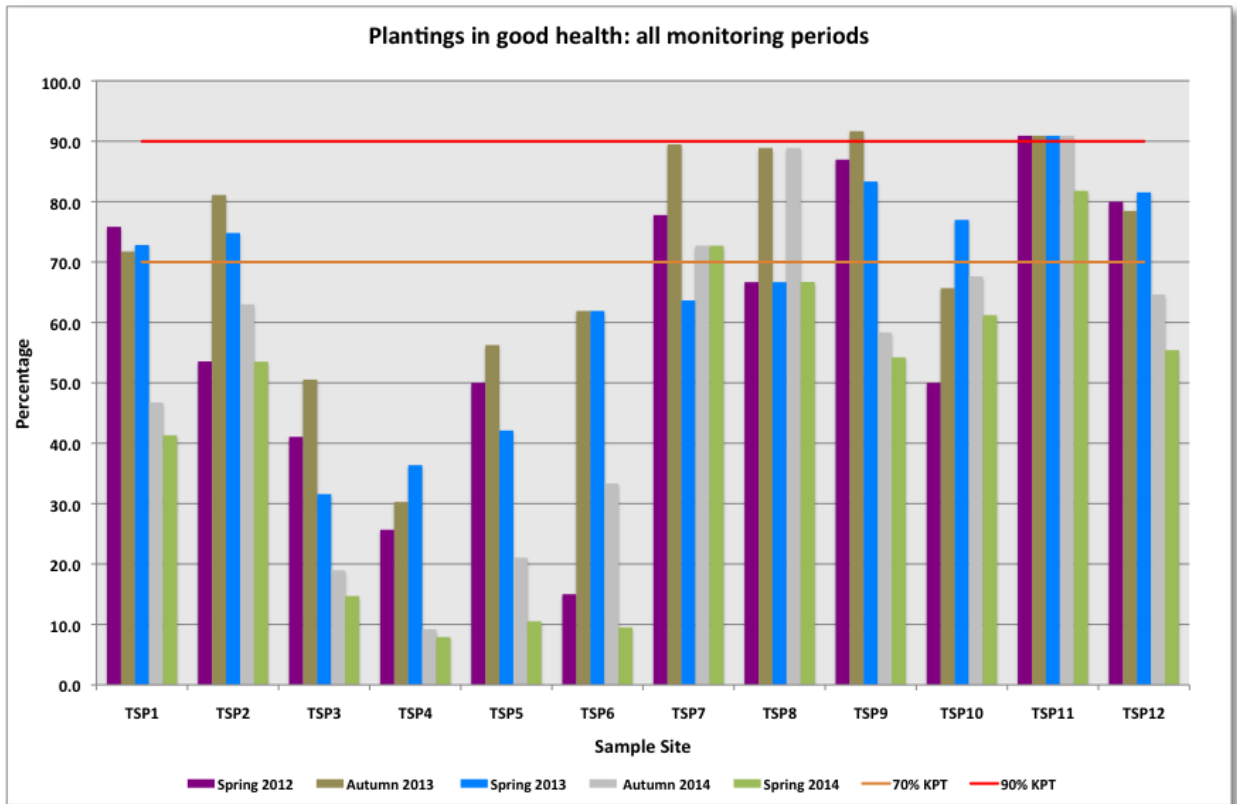
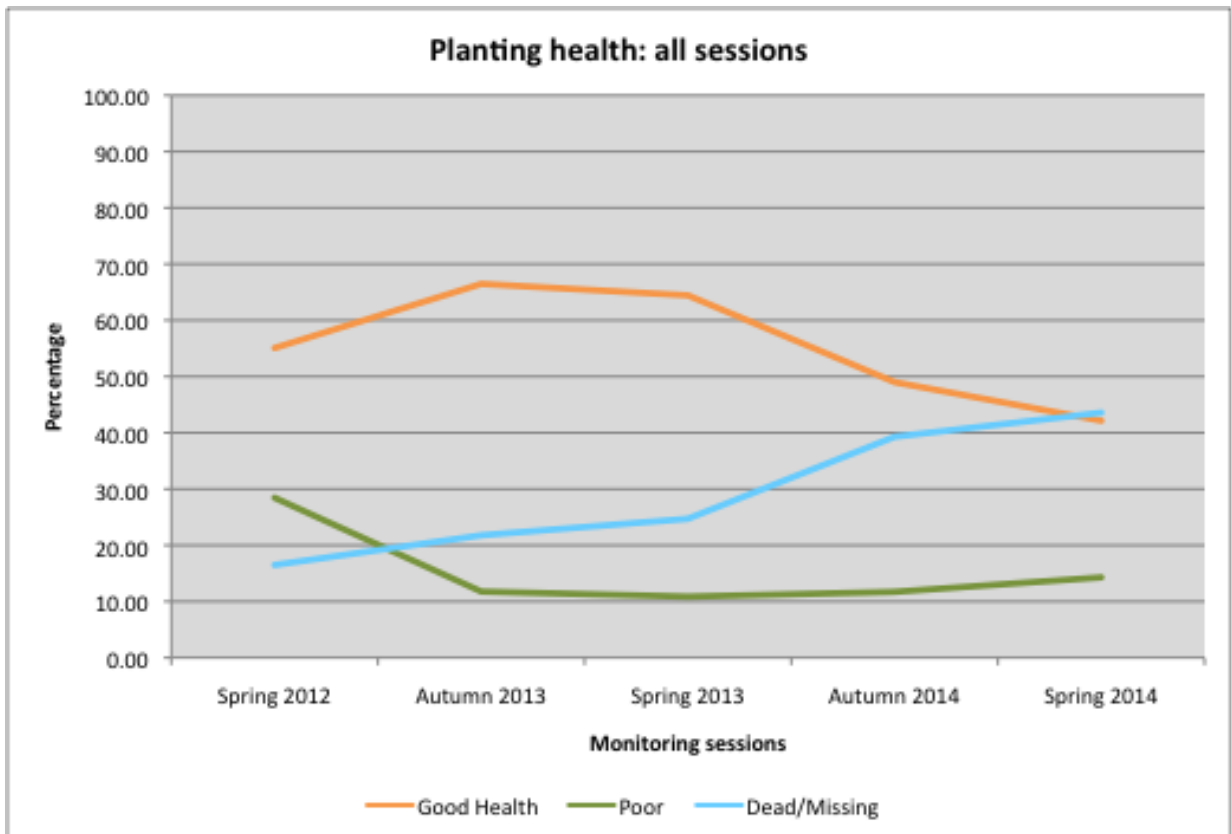


Chart 2: Cumulative planting health across all monitoring periods.



3.1.1 Monitoring site TSP1

Jurisdiction	ACT	TSP1 Situated within the Murrumbidgee River Corridor immediately W and NW of the HLPS, about 250 m from the LLPS.
Co-ordinates	691345 – 6060236	
No. of tree & shrub species planted	8	There has been a gradual decline in specimen health, which is now at 41.3%. Approximately one-third of plantings are either dead or missing. The original groundcover was retained at this site and comprised <i>Themeda</i> dominated grassland in moderate to good condition.
Seedling health		
Good	38 (43)	
Poor	15 (21)	
Dead / Missing	32 (28)	Recommendation: Replace dead and missing specimens
Total plantings	92	



Plate 1: Monitoring Site TSP1. The image on the left is from autumn 2014 and the right spring 2014.

3.1.2 Monitoring site TSP2

Jurisdiction	ACT	TSP2 is located within the Murrumbidgee River Corridor, about 1,025 m from the LLPS.
Co-ordinates	691964 – 6060519	
No. of tree & shrub species planted	5	Although 68 plantings were in good health there has been a consistent decline in the success rate with almost one-third of specimens either dead or missing. <i>Inset: TSP2 in spring 2012, within 12 months of planting.</i>
Seedling health		
Good	68 (80)	Recommendation: Replace dead and missing specimens
Poor	18 (12)	
Dead / Missing	41 (35)	
Total plantings	127	



Plate 2: Monitoring Site TSP2. The image on the left is from autumn 2014 and the right spring 2014.

3.1.3 Monitoring site TSP3

Jurisdiction	ACT	TSP3 is located within the Murrumbidgee River Corridor, about 1,350 m from the LLPS.
Co-ordinates	691964 – 6060519	
No. of tree & shrub species planted	3 (4)	Planting success at this site peaked at 48 in autumn 2013 but has steadily declined since that time. The majority of specimens are now either dead or missing <i>Inset: TSP3 in spring 2012, within 12 months of planting.</i>
Seedling health		
Good	14 (18)	Recommendation: Replace dead and missing specimens
Poor	12 (11)	
Dead / Missing	69 (66)	
Total plantings	95	



Plate 3: Monitoring Site TSP3. The image on the left is from autumn 2014 and the right spring 2014.

3.1.4 Monitoring site TSP4

Jurisdiction	ACT	<p>TSP4 is located about 1,900 m from the LLPS within the ACT. Plantings success at this site has never been high, but the last two results have seen a significant decline with the majority of specimens either dead or missing. <i>Inset: TSP4 in within 12 months of planting</i></p> <p>Recommendation: Replace dead and missing specimens</p>
Co-ordinates	692592 – 6060707	
No. of tree & shrub species planted	2 (3)	
Seedling health		
Good	6 (7)	
Poor	7 (2)	
Dead / Missing	63 (67)	
Total plantings	76	



Plate 4: Monitoring Site TSP4. The image on the left is from autumn 2014 and the right spring 2014.

3.1.5 Monitoring site TSP5

Jurisdiction	ACT	TSP5 is located about 2,325 m from the LLPS within the ACT.
Co-ordinates	693226 – 6060578	
No. of tree & shrub species planted	3	Only 2 of 19 plantings remain in good health with most either dead or missing.
Seedling health		
Good	2 (4)	Recommendation: Replace dead and missing specimens
Poor	3 (3)	
Dead / Missing	14 (11)	
Total plantings	19	

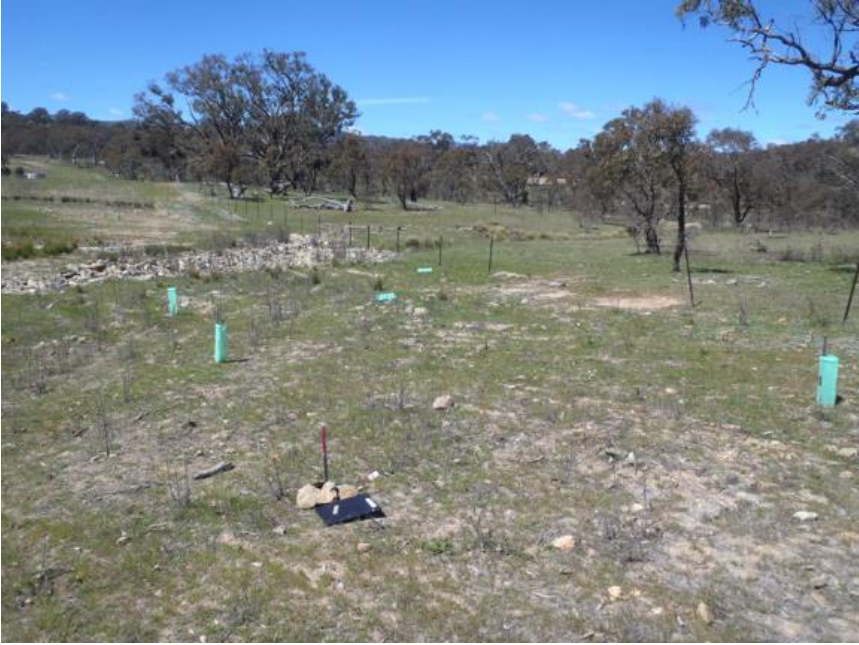


Plate 5: Monitoring Site TSP5. The image on the left is from autumn 2014 and the right spring 2014.

3.1.6 Monitoring site TSP6

Jurisdiction	ACT	<p>TSP6 is located about 2,650 m from the LLPS - west of and adjacent to the Monaro Hwy within the ACT.</p> <p>Only 2 of 21 plantings remain in good health with most either dead or missing.</p> <p>Natural recruitment of Yellow Box <i>Eucalyptus melliodora</i> and Blakely's Red Gum <i>E. blakelyi</i> was recorded nearby, and these have not been included in the sample count.</p> <p>Recommendation: Replace dead and missing specimens and improved maintenance (see Section 3.5 of the LRTEMP).</p>
Co-ordinates	693528 – 6060505	
No. of tree & shrub species planted	3	
Seedling health		
Good	2 (7)	
Poor	5 (6)	
Dead / Missing	14 (8)	
Total plantings	21	



Plate 6: Monitoring Site TSP6. The image on the left is from autumn 2014 and the right spring 2014.

3.1.7 Monitoring site TSP7

Jurisdiction	NSW	<p>TSP7 is located about 3,040 m from the LLPS within the Smith property, NSW. Additional plantings have maintained the number of specimens in good health. <i>Note:</i> Sample site is separated in to two planting areas - northern and southern sides of the construction corridor. Natural recruitment of Yellow Box <i>Eucalyptus melliodora</i>, Apple Box <i>E. bridgesiana</i> and Broad-leaved Peppermint <i>E. dives</i> was observed either side of this site within the construction corridor.</p> <p>Recommendation: Replace dead and missing specimens (see Section 3.5 of the LRTEMP).</p>
Co-ordinates	693927 – 6060542	
No. of tree & shrub species planted	3	
Seedling health		
Good	16 (16)	
Poor	0 (1)	
Dead / Missing	6 (5)	
Total plantings	22	



Plate 7: Monitoring Site TSP7. The image on the left is from autumn 2014 and the right spring 2014.

3.1.8 Monitoring site TSP8

Jurisdiction	NSW	TSP8 is located about 4,975 m from the LLPS within the Lonergan property, NSW.
Co-ordinates	695663 – 6060392	
No. of tree & shrub species planted	2	Recommendation: Improve planting maintenance (see Section 3.5 of the LRTEMP).
Seedling health		
Good	6 (8)	
Poor	2 (0)	
Dead / Missing	1 (1)	
Total plantings	9	



Plate 8: Monitoring Site TSP8. The image on the left is from autumn 2014 and the right spring 2014.

3.1.9 Monitoring site TSP9

Jurisdiction	NSW	TSP9 is located about 5,475 m from the LLPS within the Lonergan property, NSW.
Co-ordinates	696175 – 6060305	
No. of tree & shrub species planted	3	Planting success exceeded 80% during the first three monitoring sessions, but has since declined to 54%. A high proportion of specimens are in poor health mainly due to competition from pasture grasses. Recommendation: Improve planting maintenance (see Section 3.5 of the LRTEMP).
Seedling health		
Good	13 (14)	
Poor	10 (9)	
Dead / Missing	1 (1)	
Total plantings	24	



Plate 9: Monitoring Site TSP9. The image on the left is from autumn 2014 and the right spring 2014.

3.1.10 Monitoring site TSP10

Jurisdiction	NSW	TSP10 is located about 6,425 m from the LLPS within the Johanson property, NSW. About 61% of plantings were in good health and suggests a reasonable result, however, there has been a declining trend in success since spring 2013. At least 15 tree guards were choked with chicory or grass resulting in either death or poor health of plantings. Recommendation: Replace dead and missing specimens and improve planting maintenance (see Section 3.5 of the LRTEMP).
Co-ordinates	697084 – 6060204	
No. of tree & shrub species planted	8	
Seedling health		
Good	85 (94)	
Poor	19 (12)	
Dead / Missing	35 (33)	
Total plantings	139	



Plate 10: Monitoring Site TSP10. The image on the left is from autumn 2014 and the right spring 2014.

3.1.11 Monitoring site TSP11

Jurisdiction	NSW	TSP11 is located about 9,300 m from the LLPS within the Latimer property, NSW.
Co-ordinates	699277 – 6061925	
No. of tree & shrub species planted	3	Specimen growth was vigorous with above 80% success rate.
Seedling health		
Good	9 (10)	Recommendation: Continue planting maintenance (see Section 3.5 of the LRTEMP).
Poor	1 (0)	
Dead / Missing	1 (1)	
Total plantings	11	



Plate 11: Monitoring Site TSP11. The image on the left is from autumn 2014 and the right spring 2014.

3.1.12 Monitoring site TSP12

Jurisdiction	NSW	TSP12 is located about 11,900 m from the LLPS near the discharge facility, NSW.
Co-ordinates	701346 – 6063099	
No. of tree & shrub species planted	4	Just over half of the sample remains in good health with about a third either dead or missing. Planting success was about 80% in the period between spring 2012 and spring 2013, but has since declined to 55%. Recommendation: Replace dead and missing specimens and improved planting maintenance (see Section 3.5 of the LRTEMP).
Seedling health		
Good	36 (42)	
Poor	8 (5)	
Dead / Missing	21 (18)	
Total plantings	65	



Plate 12: Monitoring Site TSP12. The image on the left is from autumn 2014 and the right spring 2014.

3.2 Weeds

Broad-leaf weeds such as *Conyza* sp. (Fleabane), *Hypericum perforatum* (St John's Wort), *Echium vulgare* (Viper's Bugloss) and *Verbena bonariensis* (Purple-top) as well as a variety of annual and perennial exotic grasses *Bromus* sp. (Brome), *Lolium* sp. (Rye Grass), *Vulpia* sp. (Fescue), and *Paspalum dilatatum* (Paspalum) were widely encountered within the construction corridor and is discussed in greater detail in Sections 4.9 and 5 of the M2G Seeding (Plot) Monitoring Report: Spring 2015. The main problem for plantings is the smothering of plantings within planting

3.3 Threatened plants

No new observations to report.

3.4 Threatened fauna

No new observations to report.

3.5 Main Observations

- The proportion of plantings in good health continues to decline and is currently at 42%.
- The proportion of specimens that were dead or missing increased to 43.5% and those in poor condition also increased slightly to 14%.
- Planting success was significantly greater in NSW (61%) than in the ACT (30%).

3.6 Key Performance Targets

The KPT for tree and shrub plantings was arbitrarily set at 90% (see Section 2.4), however, the target has not been clearly articulated in the LRTEMP (2014), which states:

'High Conservation Value Woodland: Ground Cover - >70% 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 3.1 in the LRTEMP).

The KPT for tree and shrub planting should be reviewed and clarified, but most of all it needs to be achievable and consistent with industry standards.

3.7 Suggested Actions

- Given the declining trend in planting success, particularly in the ACT, replacement planting should be undertaken (see 'Potential Mitigation Measures' in Table 3.3 of LRTEMP (2014)).
- There needs to be an improvement in planting maintenance: particularly the control of smothering grass and broad-leaf weeds within planting guards; improving the design of planting guards – many of which have been displaced by either herbivores or wind; and provide adequate watering particularly during drier periods.
- Finally, it is recommended that a KPT of 70% survival rate be adopted for planted trees and shrubs.

4 Conclusion

Monitoring surveys were conducted in October 2014 to measure the performance of tree and shrub rehabilitation plantings within the M2G construction corridor and structure sites. A simple quantitative sampling method was applied to determine planting success.

About 14% (700 specimens) of all tree and shrub plantings were sampled at twelve monitoring sites. The current survey found 295 (42.1%) specimens to be in good health, 100 (14.3%) in poor health and 305 (43.6%) either dead or missing. This represents a 24% decline in specimen health since autumn 2013 and while the current decline (7%) was less than the previous period (15.5%) it maintains a downward trend in specimen health.

Extensive supplementary planting will be required in order to meet the current KPT of 90%. Greater effort will be required , ACTEW should commitment to the maintenance of existing and future plantings as this appears to be one of the main deficiencies in the tree and shrub revegetation program.

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Appendix 1: Figures

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

- **Figure 1:** Western section
- **Figure 2:** Central-western section
- **Figure 3:** Central-eastern section
- **Figure 4:** Eastern section



Figure 1: Location of tree and shrub monitoring sites within the western section of the M2G construction corridor.

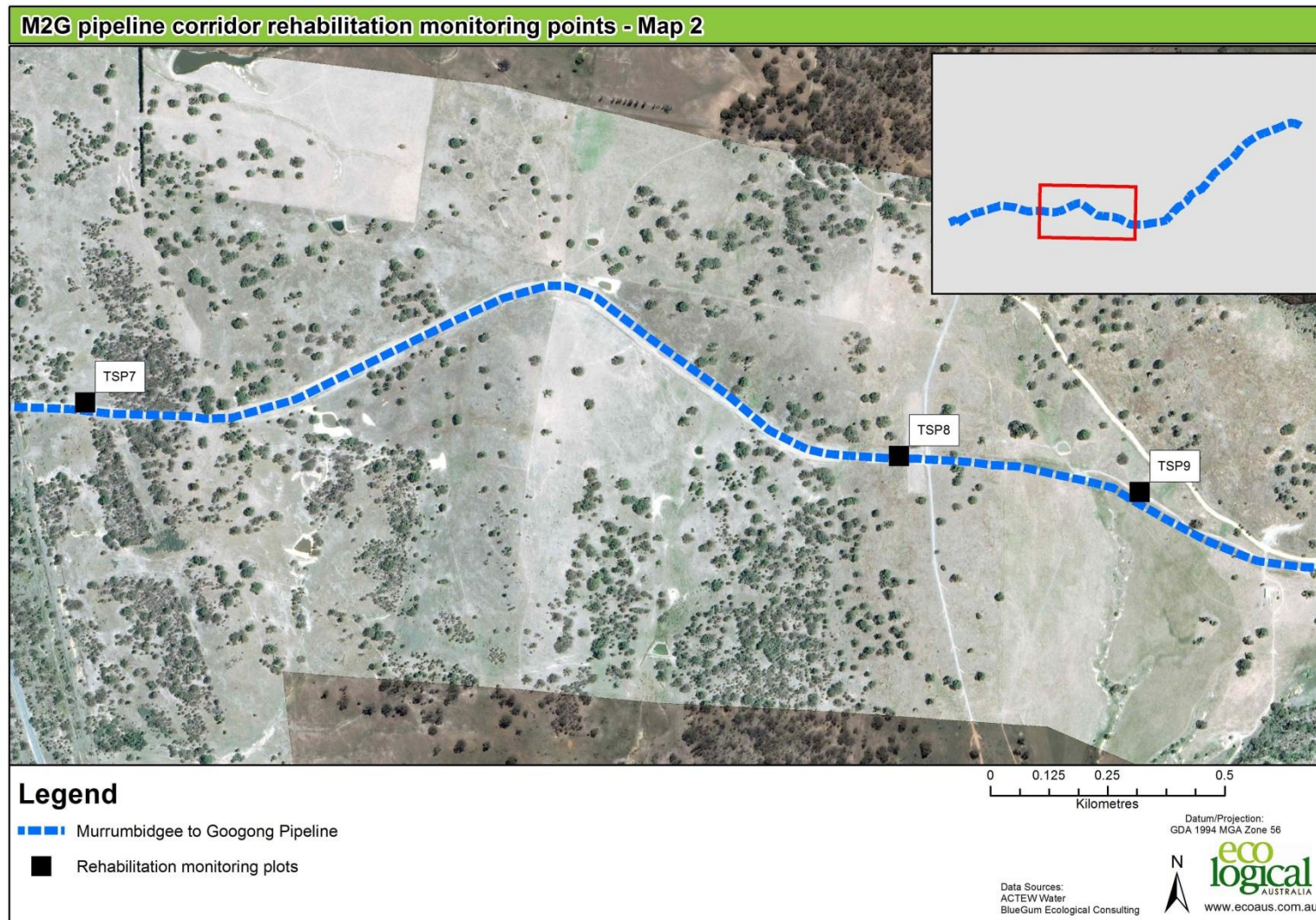


Figure 2: The location of tree and shrub monitoring sites within the central-western section of the M2G construction corridor.

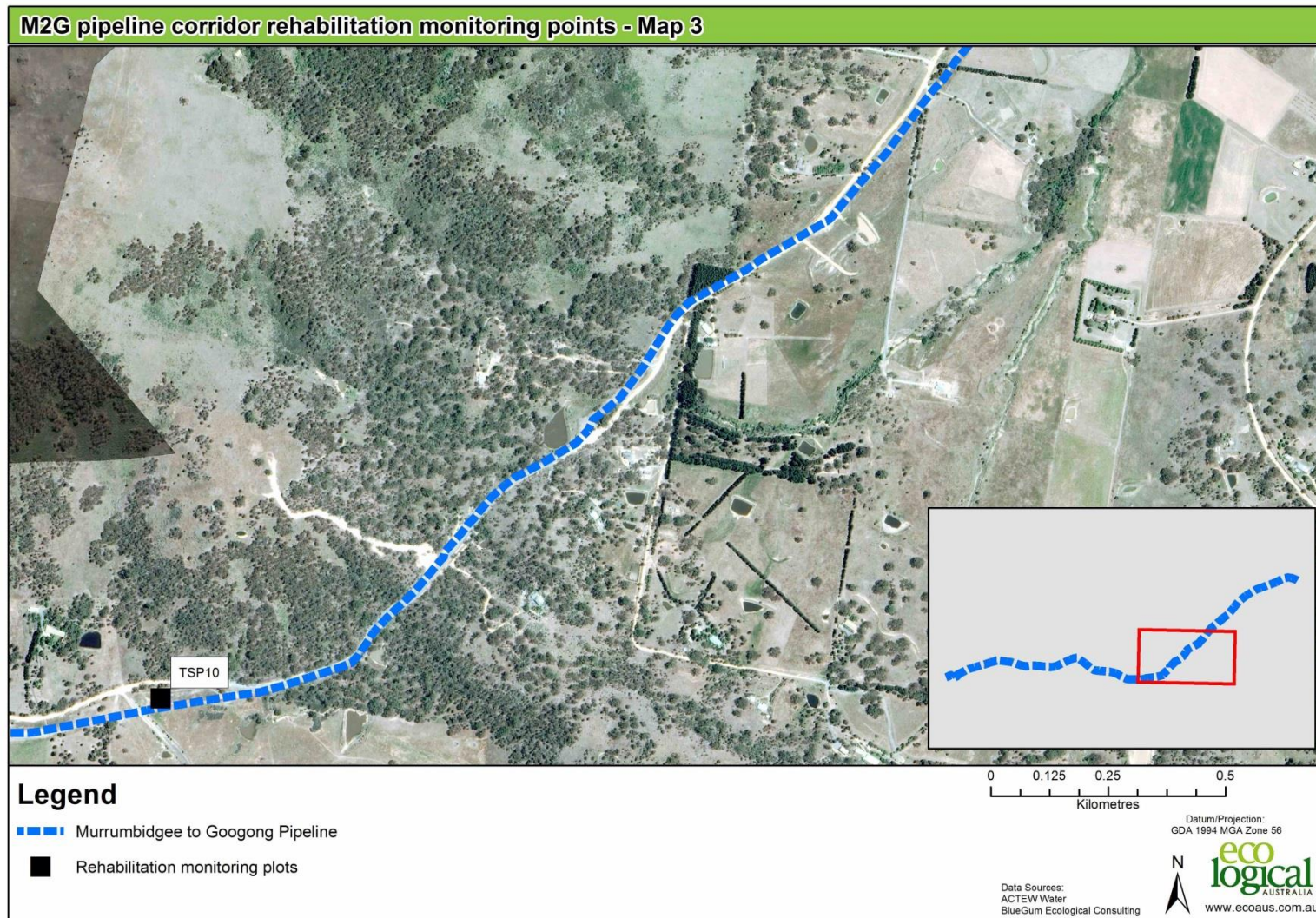


Figure 3: The location of tree and shrub monitoring sites within the central-eastern section of the M2G construction corridor.

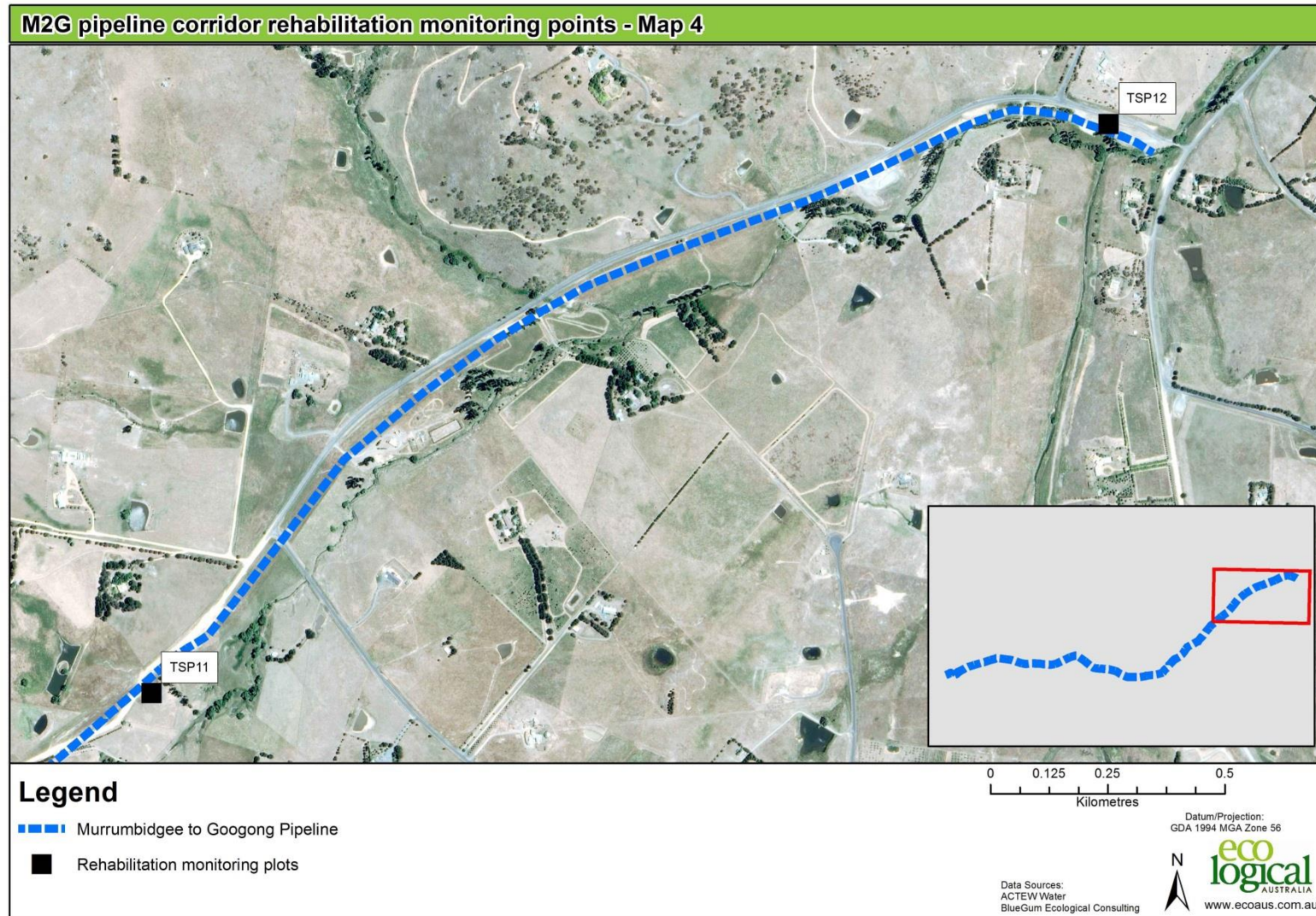


Figure 4: The location of tree and shrub monitoring sites within the eastern section of the M2G construction corridor.

Appendix 2: Floristic data – tree & shrub plantings

Table 5: Tree and shrub planting data from twelve sample sites: spring 2014 monitoring session.

- figures not species specific.

Site ID	Species	Good Health	Poor Health*	Dead	Missing	Total
TSP1	<i>Acacia sp.</i>	16	6	1		23
TSP1	<i>Bursaria spinosa</i>	3	1			4
TSP1	<i>Cassinia sp.</i>	7	2	1		10
TSP1	<i>E. mannifera</i>	7	2			9
TSP1	<i>E. melliodora</i>	3	4			7
TSP1	<i>Grevillea sp.</i>	1				1
TSP1	<i>Hakea sp.</i>					0
TSP1	<i>Leptospermum sp.</i>	1				1
TSP1	<i>Unknown</i>			15	22	37
Total		38	15	17	22	92
% good health						41.3%
% poor/dead/missing						58.7%
TSP2	<i>Acacia sp.</i>	49	7			56
TSP2	<i>Bursaria spinosa</i>	7	6			13
TSP2	<i>Cassinia sp.</i>					0
TSP2	<i>Grevillea sp.</i>	5				5
TSP2	<i>Kunzea sp.</i>	6	5	2		13
TSP2	<i>Leptospermum sp.</i>	1				1
TSP2	<i>Unknown</i>			2	37	39
Total Spring 2014		68	18	4	37	127
% good health						53.9%
% poor/dead/missing						46.5%
TSP3	<i>Acacia sp.</i>		5	2		7
TSP3	<i>Bursaria spinosa</i>	5	3	2		10
TSP3	<i>Leptospermum/Kunzea</i>	9	4	1		14
TSP3	<i>Unknown</i>			8	56	64
Total Spring 2014		14	12	13	56	95
% good health						14.7%
% poor/dead/missing						85.3%
TSP4	<i>Acacia sp.</i>	4	6			10
TSP4	<i>Bursaria spinosa</i>	1				1
TSP4	<i>Leptospermum sp.</i>	1	1	1	62	65
TSP4	<i>Unknown</i>					0
Total Spring 2014		6	7	1	62	76
% good health						7.9%
% poor/dead/missing						92.1%
TSP5	<i>E. bridgesiana</i>	2	1	1		4

TSP5	<i>E. dives</i> *		1			1
TSP5	<i>E. melliodora</i>		1			1
TSP5	<i>unknown</i>				13	13
Total Spring 2014		2	3	1	13	19
% good health						10.5%
% poor/dead/missing						89.5%
	Species	Seedling success	Poor Health (not sp. specific)	Dead (not sp. specific)	Unaccounted	Total
TSP6	<i>E. blakelyi</i>		1			1
TSP6	<i>E. bridgesiana</i>		1	1		2
TSP6	<i>E. melliodora</i>	2	3			5
TSP6	<i>Unknown</i>			4	9	13
Total Spring 2014		2	5	5	9	21
% good health						9.5%
% poor/dead/missing						90.5%
	Species	Seedling success	Poor Health (not sp. specific)	Dead (not sp. specific)	Unaccounted	Total
TSP7	<i>E. blakelyi</i>	3				3
TSP7	<i>E. bridgesiana</i> ^A	8				8
TSP7	<i>E. melliodora</i> ^B	5				5
TSP7	<i>E. dives</i> ^C				1	1
TSP7	<i>Unknown</i>			1	4	5
Total Spring 2014		16	0	1	5	22
% good health						72.7%
% poor/dead/missing						27.3%
	Species	Seedling success	Poor (not sp. specific)	Dead (not sp. specific)	Unaccounted	Total
TSP8	<i>E. mannifera</i>	3				3
TSP8	<i>E. melliodora</i>	3	2			5
TSP8	<i>Leptospermum sp.</i>					0
TSP8	<i>Unknown</i>				1	1
Total Spring 2014		6	2	0	1	9
% good health						66.7%
% poor/dead/missing						33.3%
TSP9	<i>E. melliodora</i>	10	7	1		18
TSP9	<i>E. polyanthemos</i>	2				2
TSP9	<i>E. blakelyi</i>	1	3			4
Total Spring 2014		13	10	1	0	24
% good health						54.2%
% poor/dead/missing						45.8%
TSP10	<i>Acacia sp.</i>	22	3	1		26
TSP10	<i>Callistemon sp.</i>	8				8
TSP10	<i>Dodonaea sp.</i>	4	2			6
TSP10	<i>E. mannifera</i>	7	2			9
TSP10	<i>E. melliodora</i>	4	3			7
TSP10	<i>E. polyanthemos</i>	39	8			47

TSP10	<i>Unknown</i>	1	1	23	11	36
Total Autumn 2014		85	19	24	11	139
% good health						61.2%
% poor/dead/missing						38.8%
TSP11	<i>E. bridgesiana</i>	5				5
TSP11	<i>E. melliodora</i>	4	1			5
TSP11	<i>Unknown</i>			1		1
Total Spring 2014		9	1	1	0	11
% good health						81.8%
% poor/dead/missing						18.2%
TSP12	<i>Acacia sp.</i>	18	4	3		25
TSP12	<i>Bursaria spinosa</i>	8	4	2		14
TSP12	<i>Leptospermum/Kunzea</i>	10				10
TSP12	<i>Unknown</i>			5	11	16
Total Spring 2014		36	8	10	11	65
% good health						55.4%
% poor/dead/missing						44.6%

^A = replanting

^B = one natural recruitment

^C = natural recruitment

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