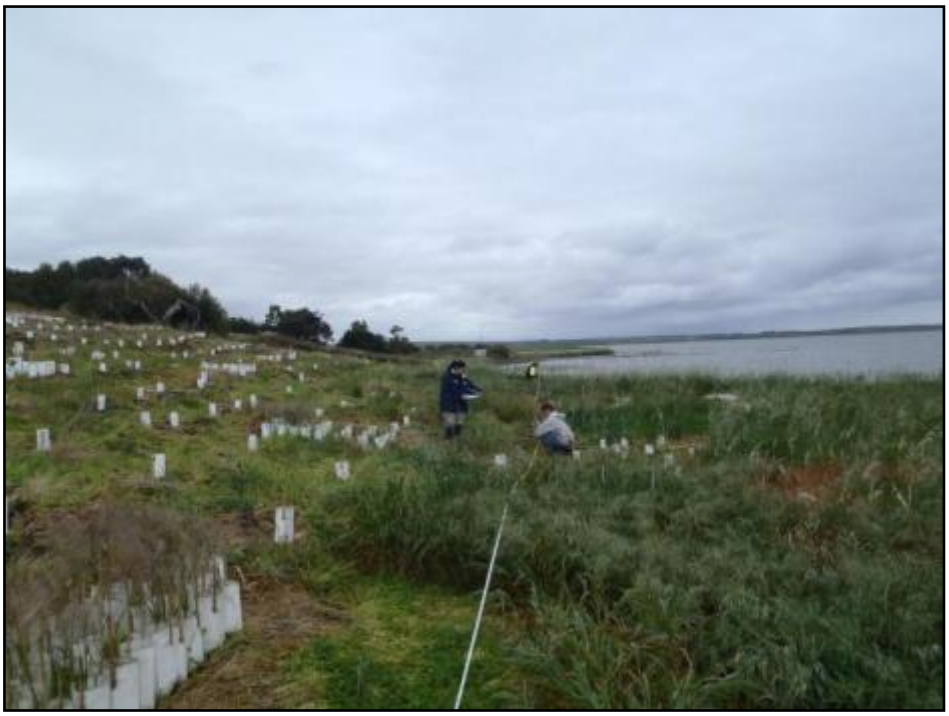
GOOLWA TO WELLINGTON LOCAL ACTION PLANNING ASSOCIATION INC

COORONG DISTRICT COUNCIL

Vegetation Survivorship Monitoring of the Community Revegetation Project Summary Final Report – June 30th 2012



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1. Executive Summary

This project was commissioned by the South Australian Department of Environment and Natural Resources (DENR) and managed by the Goolwa to Wellington Local Action Planning Association Inc. (GWLAP) which would engage the community to monitor vegetation survivorship of the Coorong, Lower Lakes & Murray Mouth Community Revegetation Project.

This is a Summary report of the "*Vegetation Survivorship Monitoring of the Community Revegetation Project – FINAL REPORT June 30th 2012*" The complete report is 135 pages in total, if you would like a full copy of the report please contact Tony Randall GWLAP Program Manager on (08) 8536 5612 or Regina Durbridge on (08) 8537 0808.

The objective of this project was to calculate survivorship of plant species of the community revegetation sites, install photo points and to record any incidental site observations/disturbances with community members undertaking the monitoring.

This monitoring project consists of two rounds of monitoring undertaken in Spring 2011 and Autumn 2012 at a combination of 2010 and 2011 planted sites. During the Spring 2011 monitoring round 138 surveys were conducted over a 3 month period, with an area monitored of 12.64 ha with 34,387 plants counted which provides an approximate 20% representative count of the 158,134 plants that were planted.

In the Autumn 2012 monitoring round 145 surveys were conducted over a 3 month period, with an area monitored of 15.26 ha with 47,311 plants counted which provides an approximate 20% representative count of the 219,896 plants that were planted

A total of 81,698 plants were recorded during the 283 monitoring surveys over a period of 6 months for the 2 monitoring rounds. With a total area monitored of 27.9 ha.

A total of 279 photos were taken during the 2 rounds of monitoring with a further 86 photo points established on 2012 and 2013 Community Revegetation sites.

Survivorship of the 14 x 2010 Community Revegetation sites has remained stable, with 5 sites scoring greater than 80 % survivorship, 4 sites scoring between 60 – 80 % survivorship, 4 sites scoring between 40 – 60 % survivorship and 1 site scoring between 20 – 40 % survivorship.

Survivorship on the 24 x 2011 Community Revegetation sites results consisted of; 10 sites scoring greater than 80% survivorship, 10 sites scoring between 60 – 80 % survivorship, 4 sites scoring between 40 – 60 % survivorship and one site scoring between 20 – 40 % survivorship. Sandy soils and not having all understorey species guarded contributed to lower survivorship at a number of sites, with inundation in low lying zones at 2 sites also a contributing factor.

This monitoring project has established some key areas for improvement on future re-vegetation projects, and highlights the need for ongoing weed control.

Soil samples were also collected by the GWLAP monitoring team for DENR during the Autumn 2012 round of monitoring for Soil Nutrient Analysis testing to see if there was any relationship to soil nutrient levels and survivorship results. Initial plant survivorship was high 3 months post planting on the 2011 sites, however the second round of monitoring conducted in Autumn 2012 saw some high losses in zones with sandy soils. Soil type appears to be a contributing factor to survivorship with sandy soils resulting in lower results. Soil nutrient analysis testing did show that some trace elements

were low, however moisture loss over the Summer period is possibly the biggest contributing factor. It is therefore recommended to plant sandy sites early in the planting season to give plants full benefit of winter rain and maximise establishment of roots. Also schedule monthly site visits to inspect plant health, weed threats and check moisture levels and provide additional summer watering if required.

Further soil nutrient analysis and soil texture testing on existing revegetation sites would be beneficial for future planning.

Changes to the 2012 program such as the guarding of **all** plants to assist with weed control as not all plants were guarded for the 2011 planting season as species which were deemed unpalatable to rabbits and kangaroos were not guarded however weed control around these unguarded plants was an issue at some of the 2011 sites.

TerraCottem (soil conditioner) is being trialled at one of the 2012 infill sites with sandy soil, where low survivorship was recorded.

This project will assist in identifying key areas and sites for continued monitoring/research and also establish a baseline for monitoring biodiversity longer term. The method and protocol developed for this community monitoring project ensures that consistent monitoring is undertaken at all sites, and could easily be adapted to other areas or projects.

Having community involvement in all facets of the project from nursery propagation to planting and monitoring has enabled the program to attain significant additional information that would otherwise not be gathered.

This monitoring project has also identified some knowledge gaps with the project;

- Has there been any regeneration of the only annual species in this program *Atriplex suberecta*? Results may guide the use of further annual species in future revegetation.
- Regeneration of perennial grasses?
- Optimal spacing's of understorey species on different soils– plant mat forming species closer together?
- Individual species survivorship scores in relation to soil/aspect.
- Have soil nutrient levels impacted on survivorship results?
- Regeneration of native species where fencing has been erected and stock excluded.

Continued survivorship monitoring to species level is recommended to ascertain success of individual species especially as revegetation diversity has increased from; 23 species in 2010, 115 species in 2011, 129 species in 2012 and proposed 168 species for the 2013 Community Revegetation Project.

Monitoring is an essential component of the project guiding future works and determining the success of the revegetation. Recommendations from this Survivorship monitoring project have been implemented on the 2012 Community Revegetation sites.

The community vegetation monitoring program fits into the broader CLLMM monitoring framework and provides valuable information to the GWLAP and DENR CLLMM Vegetation teams.

2. Acknowledgements

The author would like to acknowledge the South Australian Department of Environment and Natural Resources CLLMM Vegetation team and thank project officer Katherine Goss for technical advice, support, preparation of pivot tables on survivorship data and comments on draft final report.

Acknowledgements to GWLAP Project Officers; Carole Richardson for comments on draft final report, Aaron Cheesman for technical advice and Kerri Bartley for field assistance, GWLAP Site Managers Amelia Graham & Jill Dennis for assistance with photo points and Ken Strother from Coorong & District Local Action Plan Committee for field assistance.

Finally the Community Vegetation Survivorship Monitoring Team; Robyn Barry, Daniel Benshoshan, Wendy Conaghty, Jill Dennis, Sarah Guscott, Tammy Holder, Debrah Melville, Freda Mills, Nic Nicole, Richard Owen, Allan Stewart, Stephen Stewart, Mandy Stewart, Angela Wilde, Greg A. Withers, Greg Withers, Loretta Withers and Rianna Withers for their time spent in the field monitoring and to the participating landholders in this project for access to private land for site visits and monitoring.

3. Disclaimer

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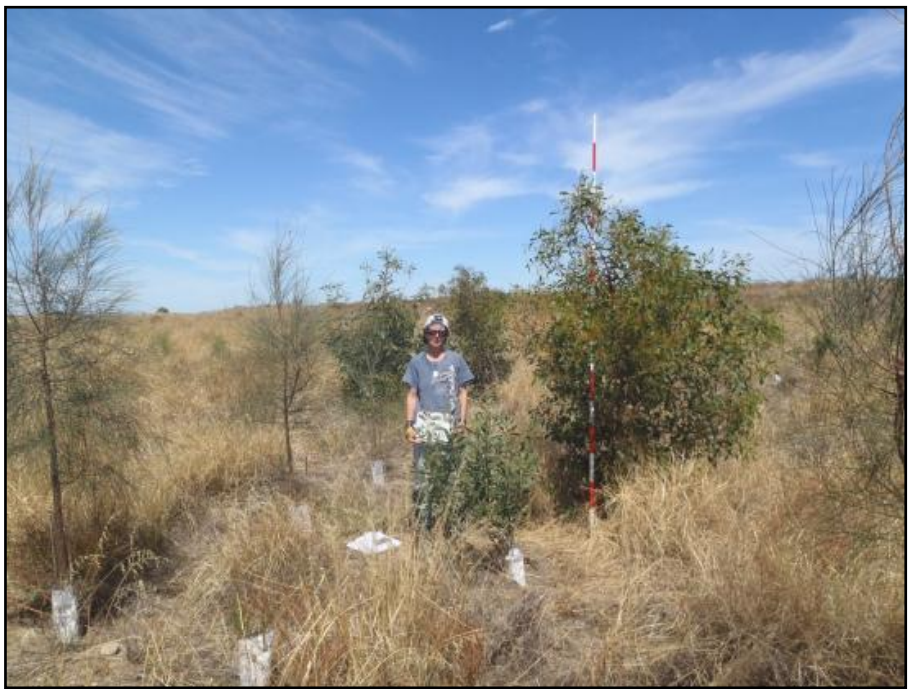

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4. Introduction

The Community Revegetation Program is a component of a five year adaptive management response plan, established to rehabilitate the Lakes Alexandrina, Albert and Coorong Ramsar site during a period of climatic stress and uncertainty.

The Revegetation project is part of the Coorong and Lower Lakes Recovery funded by the Australian Government and supported by the South Australian Department of Environment and Natural Resources.

The project aims to:

- Engage the wider community in on-ground activity through revegetation and bush care activities.
- Maintain stock exclusion from the lake edge environment to increase regeneration capacity, protect water quality, enhance degraded remnant vegetation, and assist revegetation activities.
- Implement an environmental weed and vermin control program to encourage natural regeneration of remnant vegetation.

Through community revegetation activities establish a suite of local native plants at appropriate densities to:

- add organic matter to the tributaries,
- add to the visual amenity of the area,
- increase native plant diversity at the site level,
- stabilise sandy soils and cliffs prone to erosion,
- suppress grassy and herbaceous weed growth,
- preserve and enhance remnant vegetation and plantings on site.

The Revegetation Program consists of a number of sub-projects that include:

- Community involvement
- Seed collection
- Propagation – community
- Fencing
- Revegetation of specific shorelines, wetlands and riparian areas
- Monitoring and evaluation

5. Objectives

The objective of this project was to calculate survivorship of plant species of the community revegetation sites, install photo points and to record any incidental site observations/disturbances with community members undertaking the monitoring.

Local graduate students from the Cert.111 & 1V Conservation and Land Management program held at the Milang Old School House Community Centre (MOSHCC) in Milang have continued to be involved with the Survivorship Monitoring, a further 16 community members were trained for the Revegetation Monitoring project to further develop skills and build capacity within the community.

The community participants are paid for their time monitoring, ensuring that increased knowledge gained with experience by the community can be called on at each monitoring round. A total of 569 hours paid work, made up of 193.5 hours for the Spring 2011 round and 375.5 hours for the Autumn 2012 round of monitoring (which does not include travel time) was undertaken by the community for this monitoring project.

6. Study Site

- The Spring 2011 monitoring concentrates on the 14 - 2010 sites located in the Finniss, Currency Creek catchment and Point Sturt and 15 of the twenty four 2011 Lower Lakes sites which includes 1 of the Hindmarsh Island multi-sites.
- The Autumn 2012 monitoring round consists of 7 of the 2010 sites and the 24 - 2011 sites, which includes 1 of the Hindmarsh Island multi-sites.

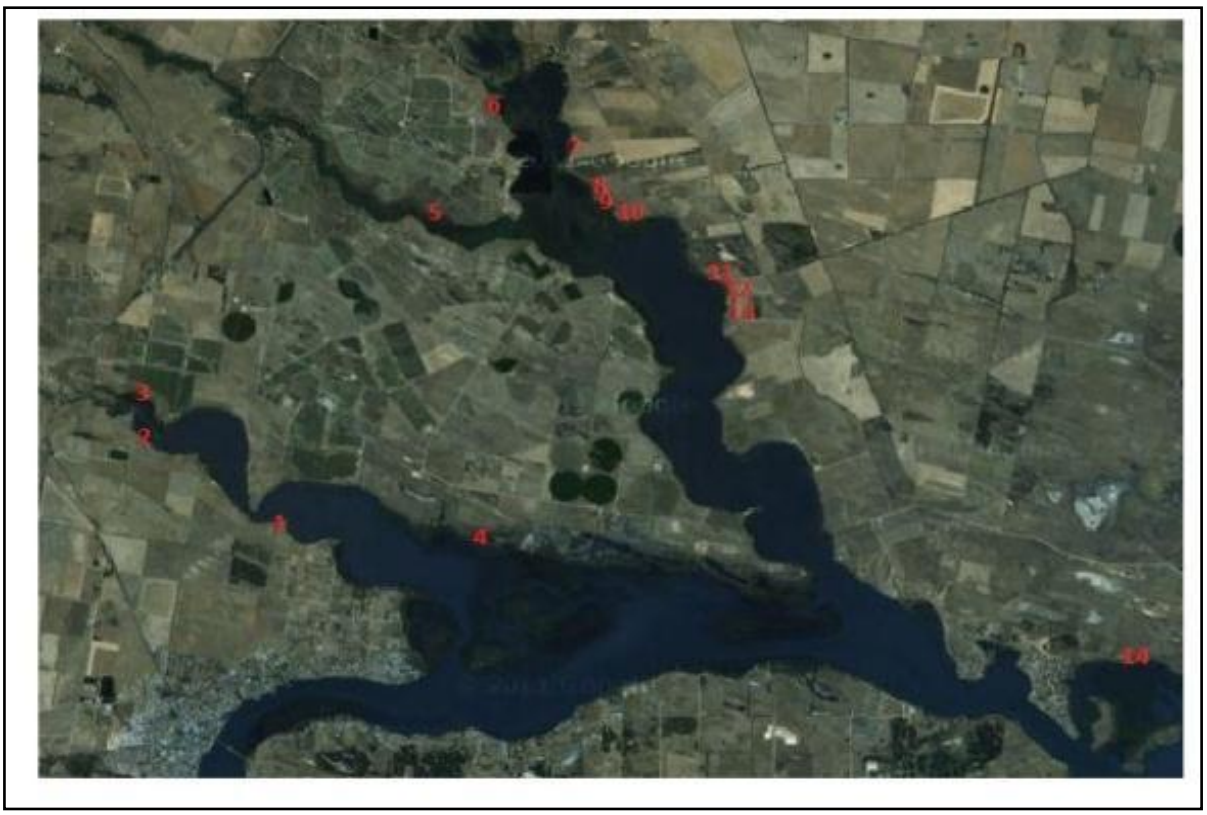

Figure 3. Map of 14 x 2010 community revegetation sites; Currency Creek, Finniss and Point Sturt, Lower Lakes, South Australia

Table 1. Site names for Figure 3

No.	2010 Revegetation Sites
1	MKY – Currency Creek
2	SKW – Currency Creek
3	SHW – Currency Creek
4	GBT – Currency Creek
5	WKN - Tookayerta
6	MCH - Finniss
7	DIX - Finniss
8	FZN - Finniss
9	ALT - Finniss
10	GDR - Finniss
11	PND - Finniss
12	JNS - Finniss
13	HYR - Finniss
14	WMR – Point Sturt

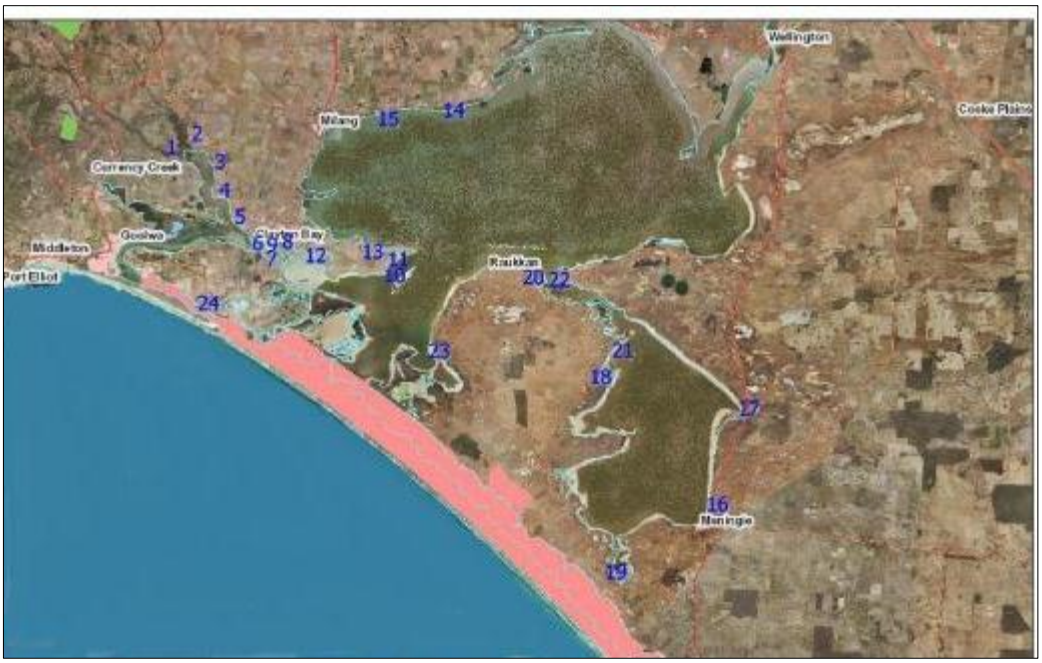

Figure 4. Map of 24 x 2011 community revegetation sites, Lakes Alexandrina and Albert, South Australia

Table 2. Site names for Figure 4

No.	Lake Alexandrina
1	WKN - Finniss
2	VLI - Finniss
3	AOV - Finniss
4	BKE - Finniss
5	BNS - Finniss
6	KPN - Finniss
7	CBF - Clayton Bay
8	BDK - Clayton Bay
9	ABT - Clayton Bay
10	HNT - Point Sturt
11	HZO - Point Sturt
12	GFN - Point Sturt
13	CTR - Point Sturt
14	HAL - Milang
15	CGT - Milang
	Lake Albert
16	BBM - Meningie
17	FBG - Waltowa
18	BHL - Narrung Peninsula
19	KBY - Lake Albert
20	NWD - Narrung
21	NRA - Narrung Peninsula
22	PTM - Narrung
23	LYB - Narrung Peninsula
24	GBT – Hindmarsh Island

7. Methods

The monitoring method and protocol was developed by GWLAP project officers and DENR CLLMM Vegetation Monitoring team to monitor the success of community revegetation. Monitoring protocols and methodologies were developed and tested on site, and adjusted as required.

The monitoring method was based on a 30m x 30m quadrant, due to the differing sizes of revegetation zones measurements were adjusted to accommodate the different zones for the individual sites. Counting 15% of plants in each zone was established to be the minimum required for calculating plant survivorship.

Once each zone was established from the site management plan the survey area was measured out recording quadrant size and compass bearings. The quadrant area was then marked out with flagging pins and tape and a survey peg was installed at the centre point with the GPS co-ordinates recorded for future ongoing monitoring.

Individual species for each survey zone were then tallied on the Vegetation Monitoring Worksheet.

Incidental observations such as weed and pest animal impacts were recorded for each of the zones also documenting native flora and fauna observed.

As part of GWLAP policy photo points have been installed on all revegetation sites to provide a record of changes to the site over time, with photos taken annually.

8. Vegetation Survival

Once all plants have been recorded for the survey quadrant, survivorship is calculated.

All tallies from the vegetation monitoring worksheets are entered into an excel worksheet, recording survey number, with individual species; alive count, dead count, unidentified dead count, coded for overstorey, midstorey, understorey and grasses. Survivorship for the overstorey and midstorey is calculated together and the understorey survivorship results calculated separately. Survivorship tables were then formatted for each survey.

9. Overall Results

Table 3. Legend for Percentage Survivorship Results

%	Colour	
n/a		No plantings
n/r		None recorded
0 - 20		Very Poor
20 - 40		Poor
40-60		Average
60-80		Good
80-100		Excellent

Pictured in Table 3 is the legend for Percentage Survivorship Results. The individual site results have the overstorey and midstorey results calculated together and the understorey species scored separately with the 2011 sites having grasses scored separately. The "*Vegetation Survivorship Monitoring of the Community Revegetation Project – FINAL REPORT June 30th 2012*" shows individual results for each sites survey zones with additional survey comments.

Table 4. Results Summary Table 7 X 2010 Sites in Spring 2011

Site ID	Survivorship %		
	Over and Midstorey	Understorey	Total
ALT	92.81	72.03	79.73
JNS	100.00	87.21	96.11
DIX	50.81	17.11	32.20
FZN	96.30	73.83	88.04
GDR	99.35	68.12	95.29
MCH	58.33	22.22	47.71
SKW	88.35	47.58	77.90

Table 4 shows the final results from the second round of monitoring undertaken in Spring 2011 on 7 of the 14 2010 sites fifteen months after planting with 5 sites scoring greater than 75 % survivorship, 1 site scoring 47.71 % survivorship and 1 site scoring 32.20 % survivorship. Understorey species typically had lower survivorships than overstorey and mid storey plants.

Table 5. Results Summary Table 7 x 2010 Sites in Autumn 2012

Site ID	Survivorship %		
	Over and Midstorey	Understorey	Total
GBT	74.14	19.92	55.1
HYR	93.07	71.65	84.71
MKY	71.83	32.85	59.91
PND	97.33	49.68	77.75
SHW	84.36	46.74	80.45
WKN	43.47	72.97	45.33
WMR	84.54	38.63	66.38

Table 5 shows the final results from the third round of monitoring undertaken in Autumn 2012 on the remaining 7 of the 2010 sites twenty four months after planting with 2 sites scoring greater than 80 % survivorship, 2 sites scoring between 60 – 80 % survivorship and 3 sites scoring between 40 – 60 % survivorship.

Table 6. Results Table 24 x 2011 Sites Autumn 2012

Site ID	Survivorship %			
	Over and Midstorey	Understorey	Grasses	Total
ABT	82.22	77.42	98.62	80.25
AOV	66.94	51.10	82.03	55.59
BBM	90.45	74.13	94.44	75.63
BDK	97.95	78.20	80.57	83.23
BHL	86.73	48.39	89.21	67.34
BKE	97.37	98.75	90.63	88.87
BNS	64.71	33.42	37.50	35.71
CBF	95.24	75.78	89.70	80.92
CGT	95.35	57.53		60.39
CTR	94.64	68.00	84.54	74.58
FBG	96.25	51.72	88.83	66.04
GBT HI	95.04			91.68
GFN	95.74	78.36		73.28
HAL	100.00	31.60		41.54
HNT	94.51	99.05	95.34	91.89
HZO	87.02	37.36	89.93	46.74
KPN	98.28	93.41		90.66
KYB	77.04	59.97	96.81	67.15
LYB	99.47	82.04	100.00	85.54
NRA	97.83	89.56	86.04	88.47
NWD	93.35	83.64	77.81	77.81
PTM	100.00	42.33	96.83	70.03
VLI	89.74	93.88	99.47	92.62
WK2	94.61	54.48		50.32

Table 6 shows the final results for the 24 2011 sites monitored in Autumn 2012 which consist of; 10 sites scoring greater than 80 % survivorship, 10 sites scoring between 60 – 80 % survivorship, 4 sites scoring between 40 – 60% survivorship and one site scoring between 20 – 40 % survivorship.

Sandy soils and not having all the understorey species guarded contributed to lower survivorship at a number of sites, with inundation in low lying zones at 2 sites also a contributing factor.

10. Conclusions and Recommendations

Survivorship of the 14 2010 Community Revegetation sites has remained stable, with 5 sites scoring greater than 80 % survivorship, 4 sites scoring between 60 – 80 % survivorship, 4 sites scoring between 40 – 60 % survivorship and 1 site scoring between 20 – 40 % survivorship.

Survivorship on the 24 x 2011 Community Revegetation sites results consisted of; 10 sites scoring greater than 80% survivorship, 10 sites scoring between 60 – 80 % survivorship, 4 sites scoring between 40 – 60 % survivorship and one site scoring between 20 – 40 % survivorship. Sandy soils and not having all understorey species guarded contributed to lower survivorship at a number of sites, with inundation in low lying zones at 2 sites also a contributing factor.

This monitoring project has established some key areas for improvement on future re-vegetation projects.

Key Project Management Recommendations;

- Guard **all** future revegetation species as weed control was an issue around clumps of plants which had not been guarded at some sites.
- Soil testing in sandy areas during site planning
- Trial TerraCottem on sandy soil
- Plant sandy sites early in the planting season to give plants full benefit of winter rain and maximise establishment of roots.
- Inspect all newly planted sites regularly, especially those with sandy zones, to ascertain post planting watering needs.

2011/2012 Monitoring Learning's & Recommendations

- Perennial grasses survivorship has been greater than 80% at most sites, however regeneration capacity of these grasses is unknown.
- *Juncus kraussii* survivorship in general was very poor this species did reduce survivorship results at a number of sites. The low survivorship of this species is thought to be because they were grown in speedling trays which have very small cells that only allow for limited root ball development. This in turn facilitates rapid drying of the root mass after planting and subsequent death.
- Quadrant size does not equal the 30m x 30m for statistical analysis but this method may not be suitable for all sites.
- Guard **all** species as weed control proved to be a problem in some zones.
- Sandy soils on the lake edge had poorer survivorship.
- Sandy soils over limestone had higher survivorship.
- Monitoring 3 months post planting enables individual species survival to be determined and 9 months post planting monitoring enables a greater degree of accuracy of survivorship.
- Monitoring time was greatly reduced due to the 2011 planting sites having the majority of plants being midstorey and understorey species and also having the grasses planted in groupings
- Soil samples have been collected from a selection of the community revegetation sites where survivorship has been low and high to assist with future planning. It would be beneficial to collect further samples from other revegetation sites as well.
- An annual species (*Atriplex suberecta*) was grown for the first time in the 2011 project with a survivorship score of approximately 96% however regeneration capacity is unknown.
- Site managers on site during planting have been beneficial with plants being planted in an appropriate method and in the correct zones and spacing's.
- Having community involvement in all facets of the project from nursery propagation to planting and monitoring has enabled the program to attain significant additional information that would otherwise not be gathered. This information was provided to the community based monitoring program. i.e. pot bound plants, plants too small at time of planting, has guided the delivery of the revegetation program to great effect.

- Inundation was a problem at a couple of sites – one was from de-salination water and another was due to natural conditions.
- Regular site inspections after heavy rainfall and seasonally in low lying areas to ascertain optimal placement for plants.
- Soil nutrient analysis and texture testing to be undertaken at the planning stage.
- Continued survivorship monitoring to species level to ascertain success of individual species especially as revegetation diversity has increased from; 23 species in 2010, 115 species in 2011, 129 species in 2012 and proposed 168 species for the 2013 Community Revegetation Project.

Further questions:

- Has there been any regeneration of the only annual species, *Atriplex suberecta* currently in the program? Results may guide the use of further annual species in future revegetation.
- Has there been any regeneration of the perennial grasses?
- What are the optimal plant spacing's for understorey species on different soils? Measure cover of these species and rate of growth on different soils.
- When is the optimal time to remove guards on the mat forming understorey species? Weed control would need to be undertaken beforehand.
- Individual species survivorship scores, species and soil?
- Do soil nutrient levels or soil particle size impact on survivorship?
- Regeneration of native species where fencing has been erected and stock excluded?

The GWLAP has implemented some of the recommendations for the 2012 plantings;

- **All** species are now to be guarded.
- Speedling trays are no longer used in propagation.
- Additional site managers have been employed for the 2012 planting to oversee plant layout and groupings and to assist community planters.
- Range pole placement in photo points is now 10 metres from steel dropper.
- TerraCottem (soil conditioner) has been applied to the sandy zones at the BNS site 2012 infill plantings, with 2 control zones to trial if survivorship of those plants with the product is greater than survivorship of those without.
- More frequent watering in sandy zones of future plantings.