Vegetation Monitoring of Lake Toolibin and Reserves

FOR DEPARTMENT OF ENVIRONMENT AND CONSERVATION

ecoscape

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Direct all inquiries to:

Ecoscape (Australia) Pty Ltd
9 Stirling Highway • PO Box 50 North Fremantle WA 6159
Ph: (08) 9430 8955 Fax: (08) 9430 8977

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1.0 Executive Summary

Vegetation Monitoring of Lake Toolibin and Reserves

Overall trend in the vigour of key terrestrial tree species has not changed significantly since 2006. The condition and vigour of *Eucalyptus salmonophloia* remains stable as does *Eucalyptus loxophleba*, *Eucalyptus wandoo* and *Allocasuarina huegeliana*. Two *Banksia prionotes* individuals were recorded as dead within plot 13 during the 2009 survey which were healthy in 2006, and there was no evidence of seedling regeneration.

The *Eucalyptus* seedlings found in plots 7, 28 and 33 were identified as *Eucalyptus loxophleba*. The *Eucalyptus loxophleba – Acacia acuminata* woodlands and the *Melaleuca* and *Acacia* plots showed a slight decline in crown health. The salinity class at these plots has improved over time, however it appears that vegetation health is still declining. This was thought to be due to water regimes and rainfall amounts rather than increases in salinity.

The three transects established for monitoring the *Casuarina obesa* seedlings that germinated in 1998 on the west side of the lake around pump 9 were re-monitored. From the 2009 results the numbers of seedlings within each transect remained stable and were recorded as being healthy and still growing. However, it was noted that it is becoming increasingly difficult to count the seedlings accurately due to the large amount and size of the seedlings (some over 4 m high).

Discrepancies between the EM38 EC measurements and the direct EC measurements from the soil samples were noted. However, the results are still useful to determine changes in salinity across the study area as the discrepancies can be explained.

The results of the EM38 readings showed that salinity levels decreased within the northern section of the Dulbining Nature Reserve (plots 15, 16 and 17) and from the northern part of Lake Toolibin (plots 3, 11, 34 and 38). Areas where salinity has increased were in the southern part of Lake Toolibin (plots 28, 35 and 42) these results are presented on **Map 2**.

The mature *Melaleuca strobophylla* population has declined continuously since 1977 and this trend has continued over the last two years. Of the original 111 tagged live trees assessed in 1977 only five remain in 2009. Of the surviving trees in 2009 only two were healthy, and five were found dead. This continued decline was not thought to be caused by continuing increases in salinity as most plots did not show significant increases in salinity levels over the past two years. There was also evidence of *Melaleuca strobophylla* seedling growth at all the plots where it was previously recorded.

Lastly, there was only minimal change to the understorey plant communities with the most significant change being the presence of *Mesembryanthemum nodiflorum* (Slender Ice plant), a weed species which has not been previously observed within the study area. This species is thought to be an indicator of increasing salinity, however since Lake Toolibin and surrounding Reserves are already saline it is assumed that it has been brought onto the site through other means.

Grazing of seedlings and establishing understorey species such as *Maireana brevifoli*a was noted to be of concern. Many of the previously recorded *Casuarina obesa* seedlings were found to be dead or with minimal growth since the 2006 monitoring. The presence of grassy weeds was also noted to be more abundant across most of the areas surrounding Lake Toolibin.

From the 2009 monitoring program, it is recommended that:

1. The heights of seedlings are measured until they reach a nominal height of 4 metres. When they reach this height they are deemed to be 'mature' and then allocated to height classes as well as numbered and tagged with loose wiring to minimise damage to still growing trees.
2. The protocol for tagging recently matured trees to minimise damage to still growing individuals is to loosely fix wiring around the stem to allow for growth.
3. Newly 'mature' and tagged trees should be closely monitored during assessment and the wiring changed to continually allow for further growth
4. A single estimate of the percentage cover of each overstorey species in each plot continues.
5. All dead trees are removed from the data set if they have been recorded as dead for two monitoring periods.
6. All dead trees are to be removed from analysis and data representation.
7. Previous raw data is made available to the data collectors to enable consistent data collection at individual plots and ease of data analysis.
8. The monitoring program is reviewed and long term trends start from 2002 as this is the earliest date with the most consistent data.
9. Review the vegetation descriptions for each of the plots (still include original description).
10. Soil samples to continue to be taken at 25 and 50 cm depths only for validation of the EM38 horizontal readings.
11. EM38 vertical readings are no longer required to be taken in the field due to lack of calibration from soil samples.
12. The sampling regime for soil salinities should be reviewed to allow adequate time in the field to ensure the one soil sample is taken to the depth of 50 cm at each site and not just from the topsoil.

13. At each plot notes of soil type (e.g. clay, loam, sand etc), soil temperature, recent rain/soil moisture should be taken to help explain any discrepancies in salinity data.
14. Re-establish the fencing trials to allow seedling establishment.
15. Enter all available data into one database, e.g. MS Access or Excel to easily compare trends and supply the dataset to consultant to make it easier to analyse the data.
16. Photo monitoring and general condition observations to be made every two years and comprehensive vegetation monitoring to occur every five years to allow sufficient time to capture changes in the condition. This is to occur except after a flood event when monitoring should occur the subsequent year to monitor the survivability of species.
17. Re-establish seedling transect lines and place fence droppers at five metre intervals to improve accuracy of data collection.

2.0 Introduction

Vegetation Monitoring of Lake Toolibin and Reserves

2.1 Background

The monitoring of Lake Toolibin and surrounding Reserve is an integral part of the Recovery Plan and has been conducted since 1977 when a baseline flora and vegetation survey was conducted for the Northern Arthur River Wetlands Rehabilitation Committee by Mattiske Consulting.

The baseline work involved the establishment of 22 monitoring plots and the mapping of plant communities and their status and condition. Four additional plots were established in 1980 in the reserve to the north of the Lake, to record the impact of burning and clearing activities. Of these 26 plots, eleven are located on the lake bed, with the remainder located in the reserves to the north east of the lake. Reassessment of the plots was conducted in 1980, 1982, 1986 and 1992.

In 1983, additional research plots were established by Dr Ray Froend, Edith Cowan University, to investigate the causes of lake bed tree mortality. Four plots were established in this study, one across the Northern Arthur River channel, two plots on the lake edge with similar elevation gradients and vegetation zonation but differing soil conditions, and a plot located on the lake bed with no elevation gradient.

Five more vegetation plots were added in 1998, 2 in the Banksia prionotes woodland in the south east of the reserve and 3 on the lake bed. The lake bed plots were located in the west and south west areas of the lake to improve the coverage in these areas and to replace the plots lost during construction of the separator channel.

The 1998 Vegetation Monitoring of Toolibin Lake and Reserves found a general decline in the health of both the aquatic and terrestrial vegetation in most of the 30 plots sampled. Some recovery of trees was noted in certain areas of the lake, particularly in the vicinity of pump 9 on the western side where significant numbers of seedlings were found. This improvement in both the tree health and soil salinity was likely to be in response to the effectiveness of the groundwater pump. The existing vegetation monitoring plots were not well located to monitor the effectiveness of the network of groundwater abstraction bores so in 2000, five additional plots were established on the lake bed in close vicinity to pumps

1, 2, 12, 13 and 15. Independent monitoring of the seedling recruitment around pump 9 was also undertaken in 2000 and these transects have now been formally marked and added to the Lake Toolibin vegetation monitoring plots. The system of monitoring plots now consists of 18 plots on the lake bed, 2 in the reserve to the east of the lake, 15 in the reserves to the north east and 3 seedling transects on the west side of the lake.

In the 1998 monitoring, all existing plots were upgraded to the standard of the Salinity Action Plan Wetland Vegetation Monitoring program and all new plots have been established using this methodology. Regular (every three years) monitoring of these plots using the Salinity Action Plan methods was a key recommendation of the 1998 report.

The Department of Environment and Conservation (DEC) have overseen and implemented the monitoring of Toolibin Lake and surrounding reserve for many years as part of the Toolibin Lake Recovery Plan. Ecoscape has undertaken the monitoring in 2004, 2006 and 2009. This report documents the results of the 2009 monitoring period.

2.2 Objectives

This report constitutes the 2009 vegetation monitoring of the Toolibin Lake and reserves and includes the following:

1. Re-survey and reassess 35 monitoring plots in and around Lake Toolibin consistent with the methodology adapted from Froend *et al*. (1998)
2. Record EM38 readings across all plots and validate against soil samples
3. Monitor the seedling transects (plots 39-41 established in 2000) for seedling number, seedling height and soil salinity
4. Establish and survey 3 new transects in Dulbining Nature Reserve consistent with the design and methodology adapted from Froend *et al*. (1998) to help evaluate the success of a surface water diversion channel currently being constructed in the reserve
5. Present data and results in a similar format to Froend *et al*. (1998)
6. Discuss management options in light of the results of the vegetation monitoring.

3.0 Method

3.1 Overview of the Salinity Action Plan Methodology

The Salinity Action Plan (SAP) methodology used in the 1998 reassessment involved the collection of a significant amount of data on biotic and abiotic factors. The methodology used was specifically designed to address change in wetland vegetation floristics, physiognomy, individual plant vigour and population vigour and dynamics in response to long-term changes in hydrology and salinity. An overview of the various parameters used in the SAP methodology is described below:

1. Transect establishment

   The location of each transect was determined using GPS and marked on maps for future reference. All location markers and tags are metal. Transects were made up of contiguous 20 m x 20 m quadrats running perpendicular to the shoreline into upland vegetation. Each of the 20 m x 20 m quadrats divided into five 4 m x 20 m quadrats. Photographs were taken each monitoring year from a standard marked reference point (predominantly the NW corner but some plots differed).

2. Floristic composition

   Within each 4 m x 20 m subplot of each 20 m x 20 m quadrat all overstorey species and large understorey species (>1.5 m) were identified. All trees were tagged and given a unique reference number. Data for each overstorey subplot will be kept distinct to determine gradient transitions. Understorey 4 m x 4 m subplots focus on species < 1.5 m. Presence of seedlings of tree and large shrub species recorded in overstorey sub-plots.

3. Density and foliage cover

   Density of understorey species was estimated within each 4 m x 4 m subplot. Percentage foliage cover for each overstorey species was estimated within entire plots.

4. Physiognomy

   Height range for each vegetation strata measured within quadrats and subplots.

5. Tree vigour

   The vigour of each individual tree within overstorey subplots categorised using the Ladd (1996) methodology, a subjective 3 factor system based on crown density, presence of dead branches and epicormic growth.

6. Population dynamics

   The size class structure of key tree species was determined by measuring height and diameter at breast height (DBH) of each individual in each 20 x 20 m quadrat. Seedling recruitment events recorded in the field when found.

7. Physio-chemical parameters

   Transects are located adjacent to piezometers (if present) established as part of the Wetland Monitoring Project. Information on groundwater level and salinity is vital to correct interpretation of vegetation change. Surface soil salinities at each transect measured each monitoring year using an EM 38 and validated with limited soil sampling.

8. Database

   All data collected as part of the wetland vegetation monitoring project are entered into a database using Microsoft Excel and presented to the Department of Environment and Conservation in digital form.

3.2 Plot Establishment and Maintenance

Each plot was subdivided into subplots for measurement of understorey and overstorey vegetation. From the north-west corner of each plot, 4 x 20m subplots were marked out in a southerly direction for assessment of the overstorey. Understorey subplots were then established at the northern end of each overstorey subplot to provide a set of contiguous 4 x 4m understorey plots (**Figure 2.1**).

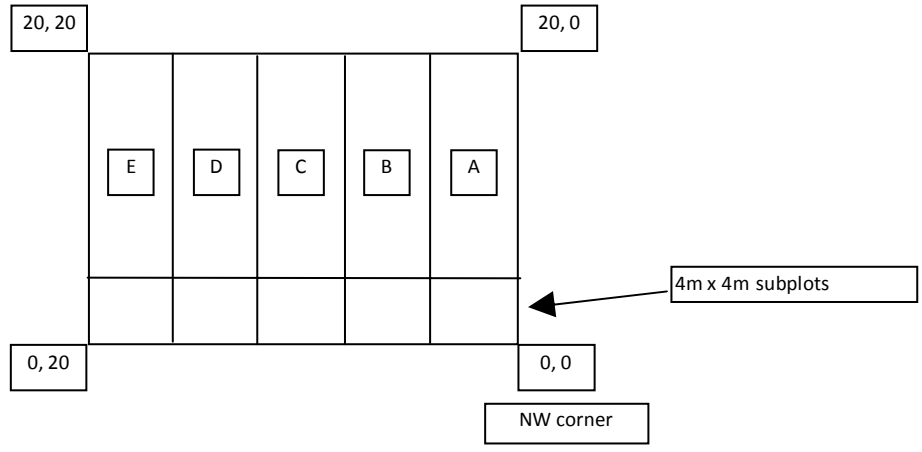


Figure 2.1: Plot Design

Where plot markers were missing, the original location was determined with tapes and an optical square and a new star picket installed. All tree tags were inspected and replaced

where necessary. Some trees, which have increased in girth have begun to enclose the head of the nail making reading the tag number impossible. Attempts to remove the nails appeared to do more damage to the tree therefore, a new tag was attached. Most tags that had worn through from swinging on the nail were found and reattached or replaced with a new tag. The remaining tags were bent over the nail head to prevent this from occurring in the future.

More regular inspection of the trees within the monitoring plots may be necessary to prevent tags and nails damaging vigorously growing trees.

Where plants had reached the nominal 4 metres to be permanently tagged as 'mature', tree tag numbers started from the last number in that plot.

Three additional plots were established in 2009 within the Dulbining Nature Reserve to provide data to help evaluate the success of a surface water conveyance structure which is being constructed within the Reserve. Trees tagged in these new plots started at 1.

3.3 Overstorey

The tag number, diameter at tag height and crown condition was recorded for each tree within each 4 x 20m subplot. Stem diameter was measured directly under the tag if nailed or at breast height if wired onto the tree. In the case of individual trees with multiple stems, all stems were measured at the same height as the position of the tag or at breast height.

Crown assessment was carried out using a subjective three-part scale where a score is recorded for crown density, dead branches and epicormic growth. Using diagrams for comparison (see **Figure 2.2**), crown density is given a score out of nine, dead branches a score out of nine and epicormic growth a score out of five (Ladd 1996). The higher the overall score, the better the condition classification of the tree. For the purpose of comparison with previous results, crown assessment values less than or equal to 11 were considered stressed and values greater than 11 considered healthy. It was found that recording the number of dead individuals became problematic over time as some had fallen over, some remained standing and some could not be found due to decomposition. It has been recommended to possibly exclude dead species from the dataset if they were recorded as dead over two prior monitoring periods.

In dense stands of trees, stand height was measured and presented as a height range for each species present. In open woodlands, height was measured for each tree less than 4

metres only. Number, species and height of seedlings were also measured within the 4 x 20m subplots.

3.4 EM 38 Readings

The Geonics EM38 is a portable instrument designed to take in situ field measurements of soil conductivity to about 1.5 m depth. The EM38 allows rapid, reliable estimates of soil salinity to be obtained from large areas without intensive soil sampling and is very useful for delineating the extent and severity of saline areas (Bennett, George & Ryder 1995).

The EM38 is able to estimate soil conductivity by setting up a primary electromagnetic field which induces small horizontal electrical currents in the soil which induces a secondary electromagnetic field. It is the ratio between the primary and secondary fields that is the measure of soil electrical conductivity, which is displayed in units of mS/m (Bennett, George & Ryder 1995).

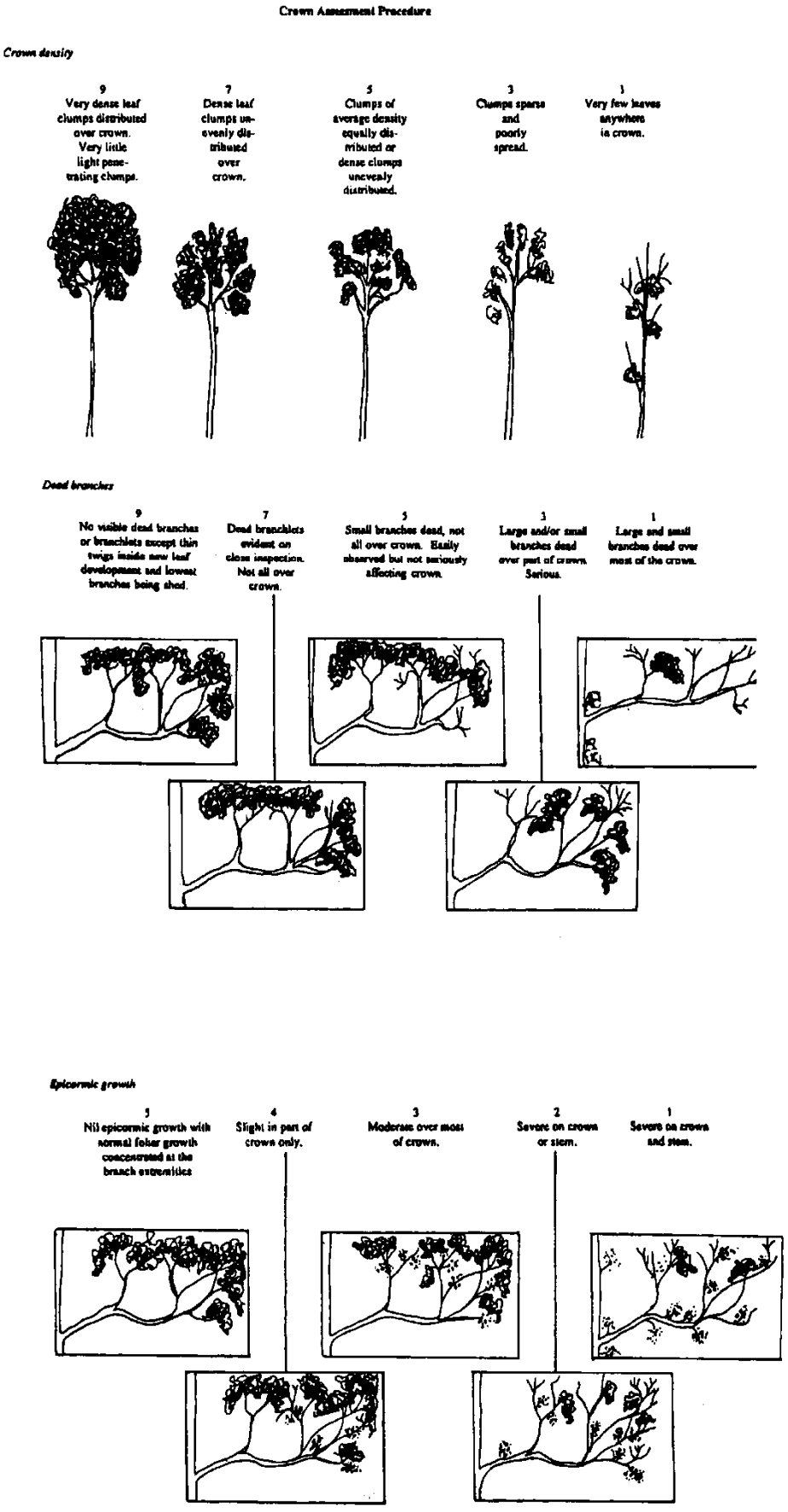


Figure 2.2: Crown Assessment Procedure Diagrams (Ladd, 1996)

3.5 Understorey

All perennial understorey species within the 4 x 4 m subplots, were identified and percentage foliage cover estimated. Height ranges for each species was also recorded.

3.6 Soil Salinity

For each monitoring plot, EM38 measurements were recorded to determine soil conductivity over 1-1.5m depths. Measurements were recorded every four metres along three north-south transect lines at ten metre intervals. That is, one line at zero metres, one line at ten metres and the third line at 20 metres. Adequate distance was always allowed when measuring near the fence posts or other metallic objects in the plots. EM38 data was validated against direct conductivity measurement of one soil sample taken at the North West corner of each plot up to 50 cm depth. For the seedling plots 39 to 41, vertical and horizontal EM38 measurements were taken down the centre of the 5m wide transects every 5 metres from 0 to 100m. Salinity measurements are interpreted using the Agwest Soil Salinity Classes for Revegetation (Department of Agriculture and Food Western Australia 2006) which provides a more accurate comparison for EM38 data than the modified Hunt and Gilkes (1992) scale used in the 1998 report.

The salinity status of the plots was based on EM38 horizontal readings and the class boundaries shown in **Table 2.1**.

Table 2.1 Salinity Class Boundaries

	Measures and Units	
Classes	ECe (mS/m)	EM-38 hor (mS/m)
Non-saline	<200	<50
Slightly	200-400	50-100
Moderately	400-800	100-150
Very	800-1600	150-200
Extremely	>1600	>200

(Bennett, George & Ryder 1995)

3.7 Reference Photographs

One photograph was taken from approximately 1m directly behind the tagged corner post looking diagonally across the plot.

3.8 Seedling Transects

Three 100m transects were established in 2000 through a recruitment area of *Casuarina obesa* seedlings. Both the start and end points of the transects are marked and run in a west to east direction with the tagged marker and starting point at the west end. *Casuarina obesa* seedlings were counted to five metres south of the tagged marker and

each five metre section along the transect line. EM38 readings were measured every five metres along the transect.

Coordinates for the transects are shown in **Table 2.2** and seen on **Map 1.**

Table 2.2 Casuarina obesa seedling transect coordinates

Plot	Start Coordinates		End Coordinates	
	northing	easting	northing	easting
39	6357325	555988	6357297	556079
40	6357283	555982	6357255	556075
41	6357242	555978	6357220	556071

4.0 Results

Vegetation Monitoring of Toolibin Lake and Reserves

4.1 Introduction

A total of 41 plots were monitored in 2009. Previously established plots not reassessed were Plots 1, 2, 14 and 31. Plots 1 and 2 were destroyed during the construction of the separator channel. Plot 14, near Dulbining Lake, could not be located in 1998, 2002, 2004 or 2006 and was not searched for in 2009. Plot 31 could not be located in 2004 or 2006 and as a result was not searched for in 2009.

The locations of plots assessed in 2009 are shown in **Map 1** and their co-ordinates (GDA 94 Datum, MGA Zone 50 Projection) are listed in **Table 3.1**.

Table 3.1 Co-ordinates for Plots within Study Area

Plot	Northing	Easting	Plot	Northing	Easting
3	6357405	556083	23	6359500	558891
4	6357442	556413	24	6359428	558858
5	6357462	556423	25	6359808	558828
6	6357575	557266	26	6358783	558882
7	6357711	557496	27	6357284	556032
8	6357664	557391	28	6356601	556189
9	6357844	557519	29	6356584	556496
10	6357950	557117	30	6356494	557422
11	6358405	557036	32	6359030	557307
12	6358562	557122	33	6357330	556116
13	6358921	557643	34	6358111	556927
15	6360835	559729	35	6356552	556796
16	6360805	559788	36	6356958	557290
17	6360778	560503	37	6357053	556887
18	6360808	561068	38	6357859	556708
19	6360800	561345	42	6357715	557540
20	6360428	559060	43	6360356	560452
21	6359773	561051	44	6360072	560646
22	6360018	561128	45	6359931	560646

The average EM38 horizontal reading for each plot and its salinity class is shown in **Table 3.2**. **Map 2** illustrates salinity trends from the years 2002 – 2009. Data from 1998 – 2000 was not available electronically.

Through the EM38 readings a slight reduction in salinity from 1998 – 2009 on the lake and the north western part of Dulbining Nature Reserve was observed as indicated on **Map 2**. All non-saline plots have remained non-saline.

Table 3.2 Salinity Classes of Plots

Plot	Average EM38 horizontal reading for Plot (mS/m)	Salinity Class	Plot	Average EM38 horizontal reading for Plot (mS/m)	Salinity Class
3	107	Moderately	25	112	Moderately
4	228	Extremely	26	57	Slightly
5	239	Extremely	27	82	Slightly
6	172	Very	28	252	Extremely
7	170	Very	29	313	Extremely
8	181	Very	30	2	Non-saline
9	188	Very	32 (RF1)	219	Extremely
10	224	Extremely	33 (RF4)	136	Moderately
11	189	Very	34	180	Very
12	47	Non-saline	35	271	Extremely
13	15	Non-saline	36	277	Extremely
15	129	Moderately	37	318	Extremely
16	126	Moderately	38	169	Very
17	138	Moderately	39 (seedling)	82	Slightly
18	287	Extremely	40 (seedling)	67	Slightly
19	342	Extremely	41 (seedling)	95	Slightly
20	118	Moderately	42 (seedling)	205	Extremely
21	886	Extremely	43 (new plot)	143	Moderately
22	662	Extremely	44 (new plot)	157	Very
23	168	Very	45 (new plot)	327	Extremely
24	142	Moderately			

Data collected from each plot is presented in **Section 3.2**, including vegetation description, tree vigour trends, salinity trends and a reference photograph. Tree vigour categories are Healthy (H), Stressed (S) and Dead (D). Seedlings are not included in the vigour graphs, only tagged trees and dead trees were not represented either, in order to reduce complication with regards to long dead individuals.

Map 3 illustrates the percentage of stressed plant individuals from 1998-2009, which gives an indication of tree vigour trends across the study area.

An overall decline in vegetation crown health since 2004 was observed as indicated on **Map 3**. However there is a limitation to the Ladd (1996) methodology used for assessing crown health of species other than *Eucalyptus*, for example, nil epicormic growth on *Casuarina* and *Melaleuca* species does not necessarily mean it is healthy.

A summary table of data for the 2000-2009 monitoring period has been compiled for each plot (see **Tables 3.4 to 3.41**). The data prior to 2000 was not available to add to the dataset, while the comment in each table refers to observations made for 2009 only.

The data collected during 2009 is included in the Appendices of this report:

- **Appendix 1** includes overstorey data for each plot. This includes species composition, DBH, height and crown health
- **Appendix 2** comprises the understorey data, including the density, percent cover and height of perennial species
- **Appendix 3** contains EM38 readings
- **Appendix 4** contains seedling number, seedling height and EM38 data for the three transects established in April 2000 to monitor the *Casuarina obesa* recruitment on the west side of the lake around pump 9
- **Appendix 5** comprises the percentage cover of each overstorey species within all the Plots.

4.2 Plot Data

Plots 1 and 2

Destroyed during construction of separator channel.

Plot 3

Location E 556083; N 6357405

Western side of the lake bed, east of track and north of pump 9.

Information:

This Plot is tagged in the north east corner with the tape running south east, with sub-plot A starting in the south east corner. Tree number 182 was retagged in 2009.

Vegetation Description:

Low woodland of *Casuarina obesa*. Understorey was originally of *Tecticornia lepidosperma* and *Maireana brevifolia*

Salinity Class:

Moderately Saline.

Condition in 2009 and Trend To-date:

Most of the original *Casuarina obesa* trees have died with only three remaining. Since the 2006 survey one of the *Casuarina obesa* individual's was recorded as stressed, reducing the overall condition of the plot.

The number of Casuarina seedlings increased in 2009, with the majority found in subplot E. There appeared to be very little growth by the seedlings found in 2009. However, this could be explained through the evidence of grazing.

The understorey species composition within the subplots have changed slightly since the 2006 survey with *Atriplex semibaccata* still remaining and the presence of *Tecticornia lepidosperma* still absent. *Maireana brevifolia* was recorded again in subplot D, while *Angianthus tomentosus* was recorded for the first time in this plot in 2009.

Table 3.4: Plot 3 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comments
Salinity class	no data	Moderate	Very	Extreme	Moderate	
Overstorey total mature individuals	no data	3	3	3	3	*Casuarina obesa*
Number of seedlings	no data	11	9	20	30	*C. obesa* seedlings. Height range 0.1 - 3.14m, 9 grazed.
% of stressed overstorey	no data	66.7	0.0	0.0	66.7	decline in crown health
Understorey average % cover	no data	7.0	4.5	1.0	5.2	New species observed (*Angianthus tomentosus*) in 2009.

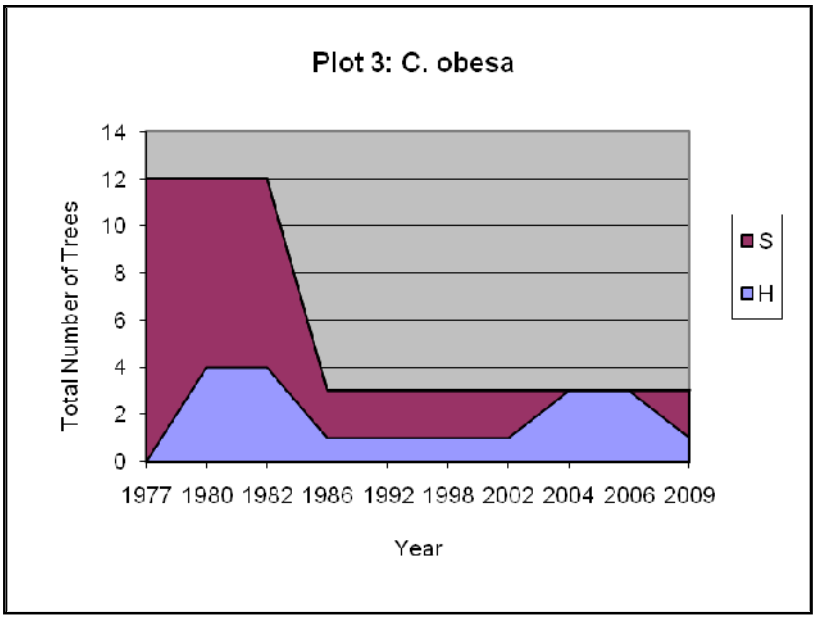


Figure 3.1: Trend in the vigour of Casuarina obesa at Plot 3

Plate 1: Facing SW across Plot 3 (tag in NE corner)

Plot 4

Location: E 556413; N 6357442

Western side of the lake bed, north-east of pump 9.

Vegetation Description:

Woodland of *Casuarina obesa* and *Melaleuca strobophylla*. Understorey consists of *Tecticornia lepidosperma* and *Atriplex semibaccata*.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

There were two healthy *Casuarina obesa* trees recorded which is the same as the previous monitoring period. It was observed in the raw data (**Appendix 1**) that there was a decrease in the vigor of all individuals in 2009. However, there were four new *Casuarina obesa* seedlings recorded from across the whole plot.

The salinity class increased from Very saline to Extremely saline, however substantial growth of the previous seedlings was recorded, suggesting that salinity levels are still within the tolerance range for germination and plant establishment.

Table 3.5: Plot 4 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Very	Extreme	
Overstorey total mature individuals	no data	12	8	7	7	*Casuarina obesa*
Number of seedlings	no data	0	27	28 1	33 5	*Melaleuca strobophylla*, healthy, 0.25-1.92m high. 4 new 1 previously recorded *C. obesa*, 4 grazed, 0.35-0.8m high.
% of stressed overstorey	no data	100.0	75.0	75.0	71.4	gradual improvement
Understorey average % cover	no data	5.2	13.9	15.7	8.6	Same species composition, *Atriplex semibaccata* has dropped out of Plot A in 2009. *Maireana brevifolia* was recorded for the first time in subplots C, D and E

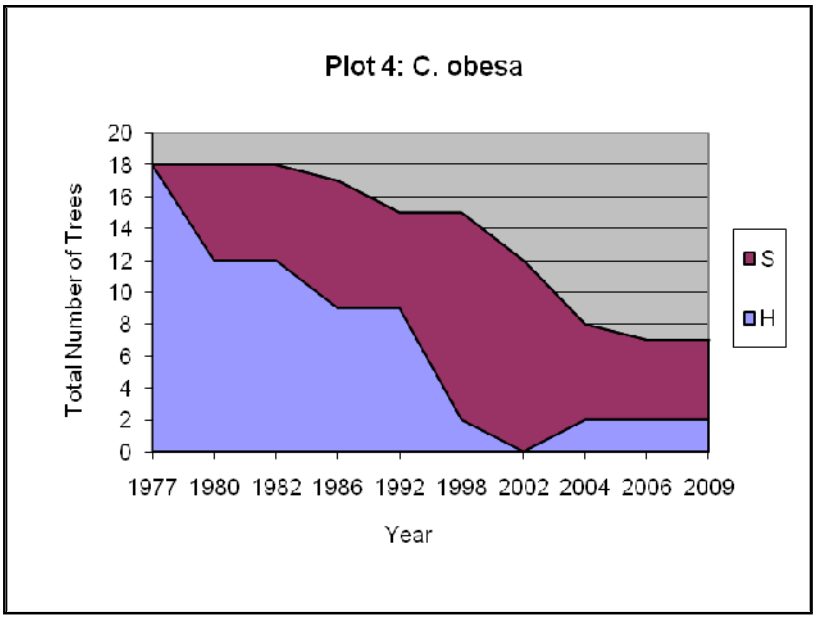


Figure 3.2: Trend in the vigour of Casuarina obesa at Plot 4

Plate 2: Facing South East across Plot 4

Plot 5

Location: E 556423; N 6357462

Western side of the lake bed, adjacent to, and north of, Plot 4.

Information:

Casuarina obesa numbers 215 and 295 were recorded as dead in 2006 but were found to be alive in 2009. *Melaleuca strobophylla* numbers 218, 318 and 379 were recorded as recent deaths. *Casuarina obesa* number 272 could not be found and *Casuarina obesa* number 329 was found leaning over. The subplot runs from south east to north east, with subplot A starting in the south east corner with the tag in the NE corner.

Vegetation Description:

Woodland of *Casuarina obesa* and *Melaleuca strobophylla*. Dense stand in parts (closed canopy). Large number of younger plants. Understorey of *Tecticornia semibaccata* and other *Tecticornia* species.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

Soil salinity has increased and there has been further decline in the number of *Melaleuca strobophylla* individuals. All *Melaleuca strobophylla* individuals were recorded as dead in 2009. Two new *Melaleuca strobophylla* seedlings were found in subplot B, however one of the *Melaleuca strobophylla* seedlings had died in subplot C. The percentage of stressed *Casuarina obesa* individuals had increased even though two previously recorded dead individuals were recorded as alive in 2009.

Table 3.6: Plot 5 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Very	Extreme	
Overstorey total **mature individuals**	no data	82 20	79 11	77 3	77 0	*Casuarina obesa* *Melaleuca strobophylla*
Number of seedlings	no data	0	18 1	18 1	21 1	*M. strobophylla*, healthy, 1-2.21 high. *C. obesa*
% of stressed overstorey	no data	68.6	66.7	82.5	89.9	decline in crown health
Understorey average % cover	no data	7.8	7.6	5.3	2.5	Increase in *Atriplex* and *Tecticornia* since 2004. One new species in Plot E – **Mesembryantheum nodiflorum*

*weed species

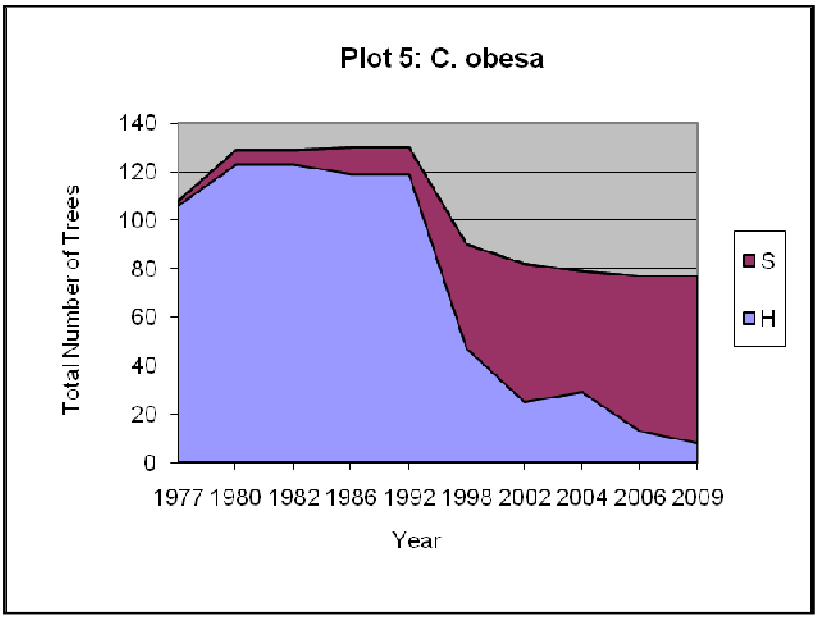


Figure 3.3: Trend in the vigour of C. obesa at Plot 5

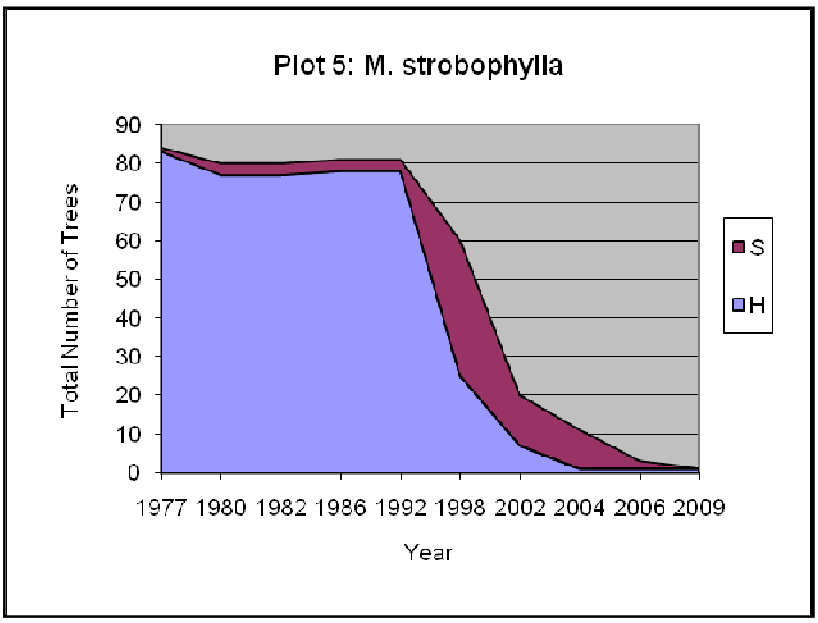


Figure 3.4: Trend in the vigour of the dominant species at Plot 5

Plate 3: Facing south west across Plot 5

Plot 6

Location: E 557266; N 6357575

Eastern edge of lake bed.

Vegetation Description:

Originally an Open Woodland of *Eucalyptus rudis*. Has an understorey of *Tecticornia lepidosperma* and *Atriplex semibaccata*.

Salinity Class:

Very saline.

Condition in 2009 and Trend To-date:

All trees have been dead since 1980. No vigor graph presented.

The understorey was dominated by *Wilsonia rotundifolia*, similar to that recorded prior to 2004. *Atriplex semibaccata* was observed in subplot E and appeared to be highly stressed. *Angianthus tomentosus* was first recorded in 2006, however its presence was slightly reduced in 2009.

Table 3.7: Plot 6 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Very	Very	Very	Very	
Overstorey total mature individuals	no data	0	0	0	0	no overstorey
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	na	na	na	na	
Understorey average % cover	no data	2.5	4.1	6.9	31.8	Increase in *Wilsonia rotundifolia*

Plate 4: Facing south east across Plot 6

Plot 7

Location: E 557496; N 6357711

Eastern edge of lake bed, to the east of Plot 6.

Vegetation Description:

Open woodland of *Casuarina obesa – Eucalyptus rudis* with a sparse understorey of *Tecticornia lepidosperma*, *Maireana brevifolia* and *Atriplex semibaccata.*

Salinity Class:

Very saline.

Condition in 2009 and Trend To-date:

All *Eucalyptus rudis* have been dead since 1986. No vigor graph for *Eucalyptus rudis* is presented.

The vigour of the *Casuarina obesa* trees declined significantly in 1986 and 1992 but increased in 1998, indicating a revival of the adults of this species. The condition of these trees has changed little since 2004. Twenty four new *Casuarina obesa* seedlings were recorded from subplot E, however all were severely grazed. The *Eucalyptus* species seedlings were identified as *Eucalyptus loxophleba* and one was recorded as dead from subplot D.

The composition of the understorey species has changed since the 2004 monitoring period. *Atriplex semibaccata, Maireana brevifolia,* and *Wilsonia rotundifolia* were not observed while *Angianthus tomentosus* and *Goodenia viscida* which were not previously recorded now provide considerable cover.

Table 3.8: Plot 7 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Very	Very	Very	Very	
Overstorey total mature individuals	no data	4	4	4	4	*Casuarina obesa*
Number of seedlings	no data	3	3	3 2	2 26	*Eucalyptus loxophleba*. *C. obesa* all grazed, 0.2 - 1m high.
% of stressed overstorey	no data	0.0	25.0	25.0	25.0	Crown health unchanged
Understorey average % cover	no data	4.0	5.5	6.7	5.3	Similar to previous years, cover slightly reduced except for *Goodenia viscida* which has increased.

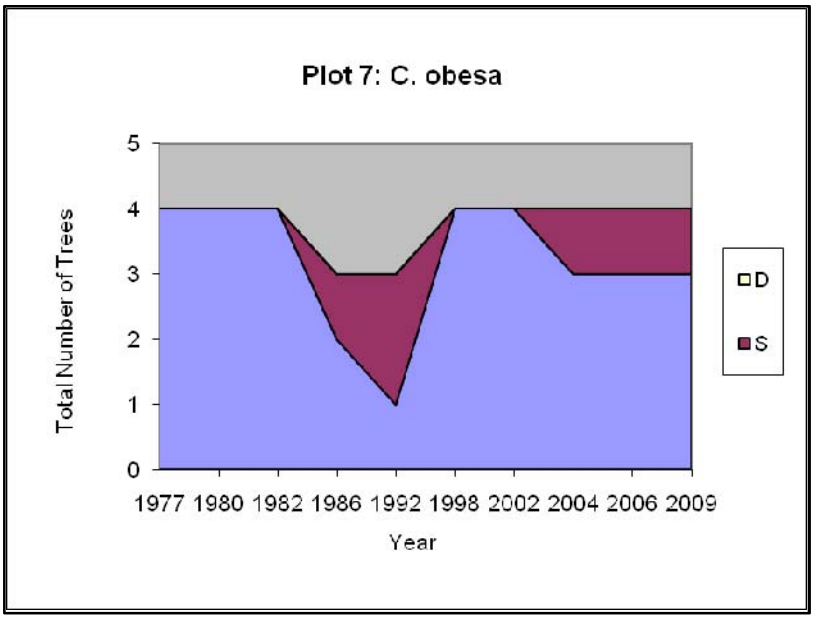


Figure 3.5: Trend in the vigour of the dominant species at Plot 7

Plate 5: Facing south east across Plot 7

Plot 8

Location: E 557391; N 6357664

Eastern edge of lake bed.

Vegetation Description:

Surrounded by open woodland of *Casuarina obesa* – *Melaleuca strobophylla*. The plot has never contained any overstorey trees and has a sparse understorey of *Wilsonia rotundifolia and Angianthus tomentosus*.

Salinity Class:

Very saline.

Condition in 2009 and Trend To-date:

No trees present. The understorey has changed since 2004. *Maireana brevifolia* and *Tecticornia lepidosperma* have been replaced by *Angianthus tomentosus* which provides significant cover.

Table 3.9: Plot 8 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Moderate	Very	Very	Very	
Overstorey total mature idividuals	no data	0	0	0	0	no overstorey
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	na	na	na	na	
Understorey average % cover	no data	8.4	6.6	10.0	32.5	Increase in *Angianthus tomentosus* ranging from 50-80% cover in all plots.

Plate 6: Facing south east across Plot 8

Plot 9

Location: E 557519; N 6357844

Eastern fringe of the lake bed.

Information:

Casuarina obesa tree number 118 was recorded as leaning over. Tree number 121 was recorded as dead while number 182 in subplot E could not be found.

Vegetation Description:

Woodland of *Casuarina obesa – Melaleuca strobophylla*. No understorey.

Salinity Class:

Very saline.

Condition in 2009 and Trend To-date:

The *Melaleuca strobophylla* population has been in poor condition since assessment began and all individuals were dead by 1998.

The percentage of stressed individual *Casuarina obesa* trees has increased since 2004, while soil salinity has decreased since 2004.

No recruitment was recorded in the plot. There continues to be no understorey in the subplots.

Table 3.10: Plot 9 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Very	Very	
Overstorey total mature individuals	no data	73	67	67	66	*Casuarina obesa*
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	71.2	50.7	56.7	98.5	Decline in crown health
Understorey average % cover	no data					No understorey

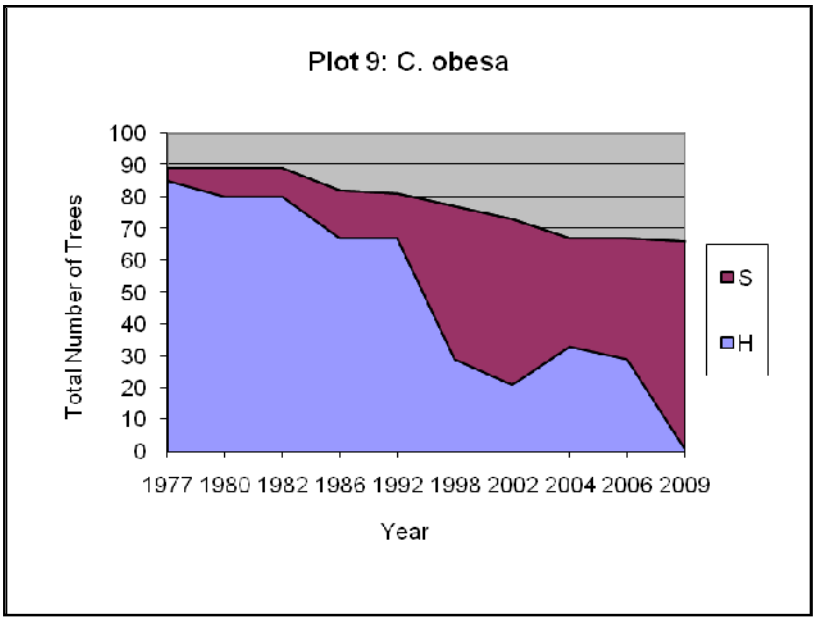


Figure 3.6: Trend in the vigour of C. obesa at Plot 9

Plate 7: Facing south east across Plot 9

Plot 10

Location: E 557117; N 6357950

Northern end of lake bed.

Vegetation Description:

Open woodland of *Casuarina obesa, Melaleuca strobophylla* and *Eucalyptus rudis*. Understorey of *Tecticornia lepidosperma* and *Atriplex semibaccata*.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

All *Eucalyptus rudis* trees have been dead since 1980.

The proportion of live *C. obesa* that are healthy has declined in 2009. The one stressed *M. strobophylla* individual from 2004 still remains in 2009.

Table 3.11: Plot 10 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Extreme	
Overstorey total mature individuals	no data	29 2	21 1	19 1	19 1	*Casuarina obesa* *Melaleuca strobophylla*
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	74.2	45.5	45.0	50.0	Decline in crown health
Understorey average % cover	no data	7.6	8.6	6.5	10.5	Increase in *Wilsonia rotundifolia*, also slight increase in the *Tecticornia* species. *Atriplex semibaccata* also increased although some stressed. **Mesembryanthemum nodiflorum* is a new addition in 2009 as was *Maireana platycarpa*

*Weed species

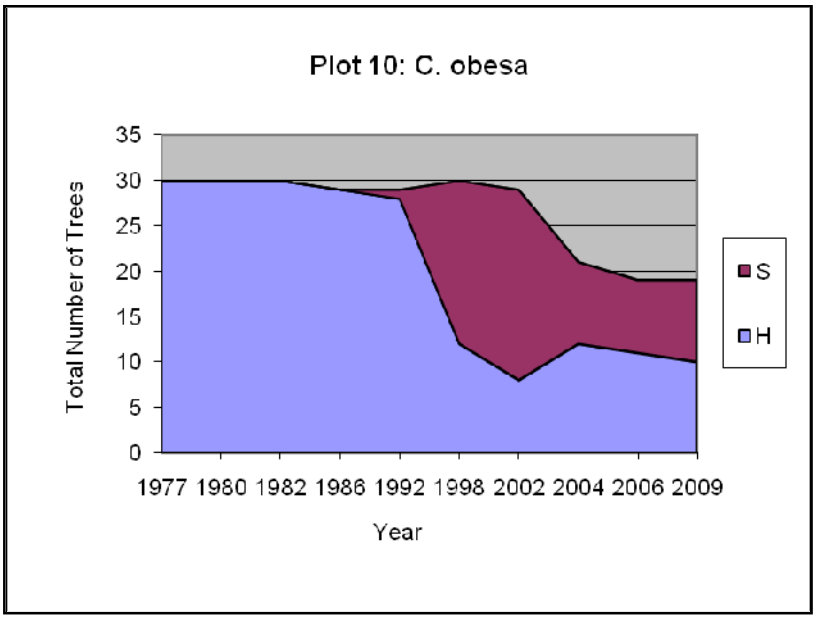


Figure 3.7: Trend in the vigour of the dominant species at Plot 10

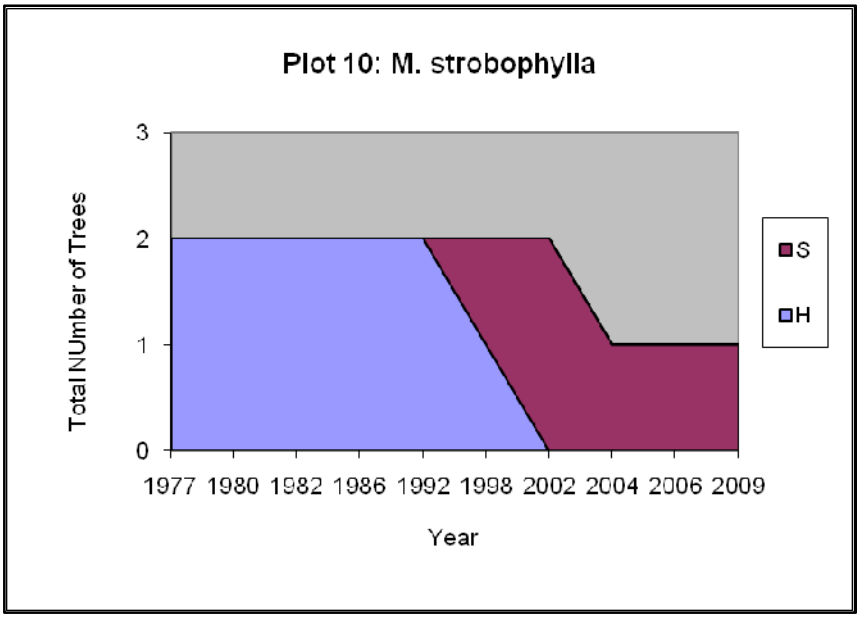


Figure 3.8: Trend in the vigour of M. strobophylla at Plot 10

Plate 8: Facing south east across Plot 10

Plot 11

Location: E 557036; N 6358405

Northern lake edge.

Vegetation Description:

Originally a woodland of *Eucalyptus rudis* with substorey of *Melaleuca strobophylla* and *Casuarina obesa*. Now an open woodland of *Casuarina obesa* with a dense understorey of *Tecticornia lepidosperma* and *Tecticornia indica.*

Salinity Class:

Very saline.

Condition in 2009 and Trend To-date:

All *M. strobophylla* trees have been dead since 1992. *Melaleuca lateriflora* was recorded for the first time in 2009 in subplot D. The condition of the *Casuarina obesa* trees has remained stable since 2000.

Table 3.12: Plot 11 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Very	
Overstorey total mature individuals	no data	5	5	5	5	*Casuarina obesa*
Number of seedlings	no data				1	*M. lateriflora*, healthy, 2.05m high.
% of stressed overstorey	no data	0.0	0.0	0.0	0.0	Crown health unchanged
Understorey average % cover	no data	18.2	15.6	8.5	9.6	*Tecticornia lepidosperma* increased cover by 35% in plot B. In all other plots *Tecticornia* species has reduced. **Mesembryanthemum nodiflorum* is a new addition in 2009.

*weed species

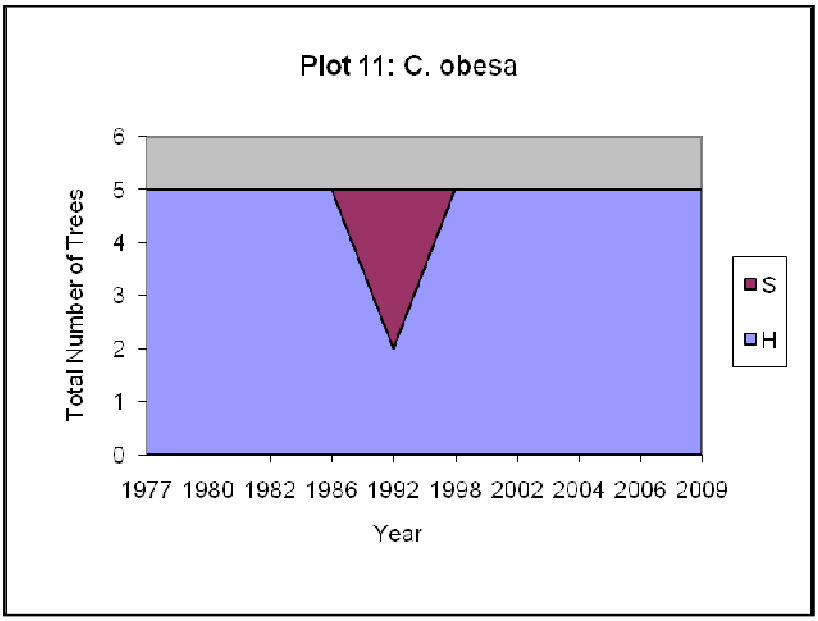


Figure 3.9: Trend in the vigour of the dominant species at Plot 11

Plate 9: Facing south east across Plot 11

Plot 12

Location: E 557122; N 6358562

On sandy soils to the north of the lake.

Information:

Tree number 347 was re-tagged.

Vegetation Description:

Woodland of *Eucalyptus loxophleba* with a substorey of *Acacia acuminata* and *Allocasuarina huegeliana*. Understorey dominated by *Atriplex semibaccata* and *Austrostipa elegantissima.*

Salinity Class:

Non-saline.

Condition in 2009 and Trend To-date:

There has been minimal change in the vigour of *E. loxophleba* and *A. acuminata* from 2002.

Atriplex semibaccata was only recorded within subplot E in 2009 and *Austrostipa compressa* was recorded in subplot A and B where it had not previously been recorded.

Table 3.13: Plot 12 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Non Saline	Non Saline	Non Saline	Non Saline	
Overstorey total mature individuals	no data	6 7 1	6 7 1	6 7 1	6 7 1	*Eucalyptus loxophleba* *Acacia acuminata* *Allocasuarina huegeliana*
Number of seedlings	no data	1	1	1	1	*Acacia acuminata* at 1.95m high.
% of stressed overstorey	no data	28.6	0.0	28.6	35.7	slight decline in crown health
Understorey average % cover	no data			2	0.5	No understorey prior to 2006, species composition remains the same (*Atriplex* and *Austrostipa*)

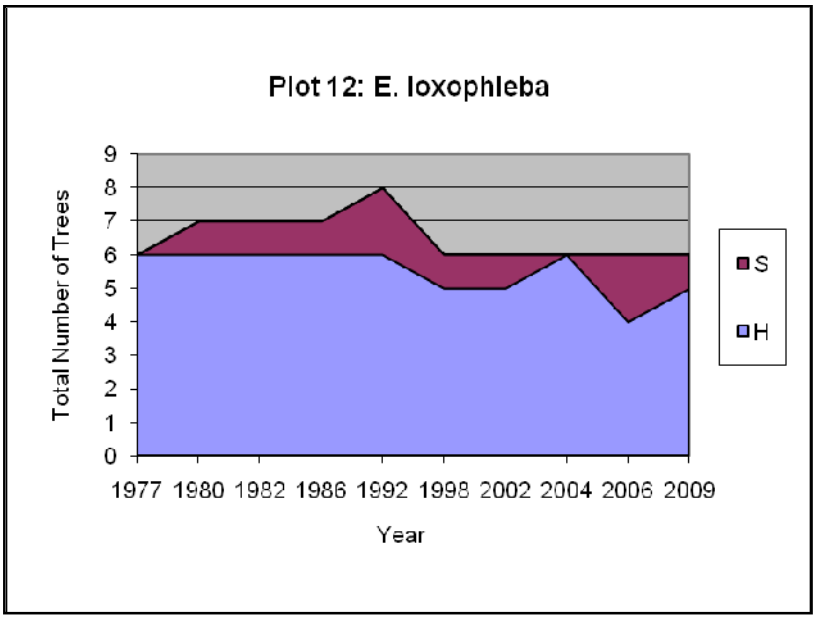


Figure 3.10: Trend in the vigour of the dominant species at Plot 12

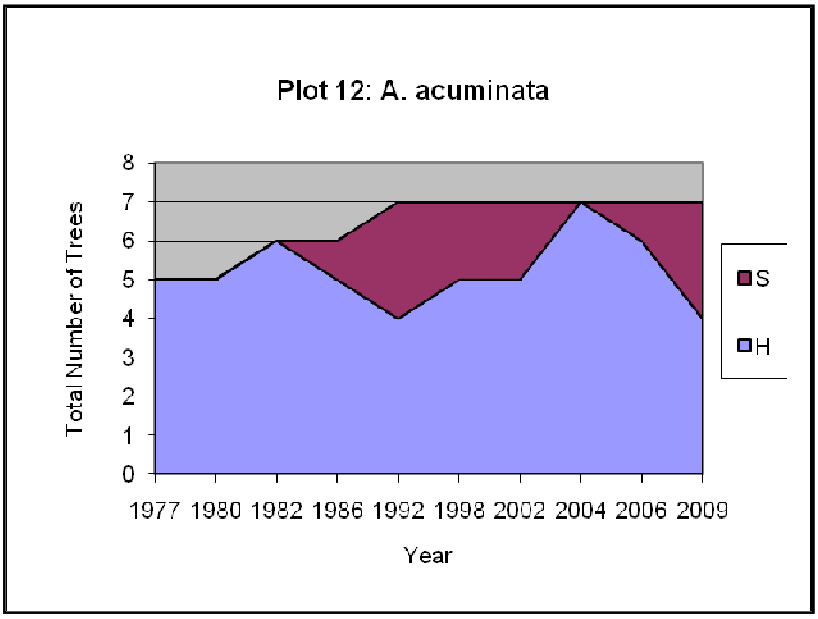


Figure 3.11: Trend in the vigour of Acacia acuminata at Plot 12

Plate 10: Facing south east across Plot 12

Plot 13

Location: E 557643; N 6358921

North of the lake, roadside.

Information:

An *Allocasuarina huegeliana* seedling was newly tagged in 2009 with the number 960.

Vegetation Description:

Low open forest of *Allocasuarina huegeliana – Banksia prionotes*. *Banksia attenuata* also nearby on sandy soils. Diverse understorey dominated by *Jacksonia furcellata*.

Salinity Class:

Non-saline.

Condition in 2009 and Trend To-date:

The condition of the mature *Allocasuarina huegeliana* population remains relatively unchanged.

Two *Banksia prionotes* individuals were recorded as recently dead in 2009. The remaining individuals are within the healthy class range.

Of the 12 *Jacksonia furcellata* seedlings recorded from 2004, 7 remained in 2009.

Table 3.14: Plot 13 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Non Saline	Non Saline	Non Saline	Non Saline	
Overstorey total mature idividuals	no data	19 5	19 5	21 5	19 3	*Allocasuarina huegeliana* *Banksia prionotes*
Number of seedlings	no data	4 5	8 12	5 10	6 7 1	*A. huegeliana*, healthy, 0.8-3.65m high. *J. furcellata*, 3 stressed, 0.5-3.11m high. *B. prionotes*, healthy, 1m high
% of stressed overstorey	no data	4.2	29.2	7.1	0.0	Improvement in crown health
Understorey average % cover	no data	10.5	4.2	3.9	2.4	Slight reduction in cover across all species, particularly *Austrostipa elegantissima* in plot E.

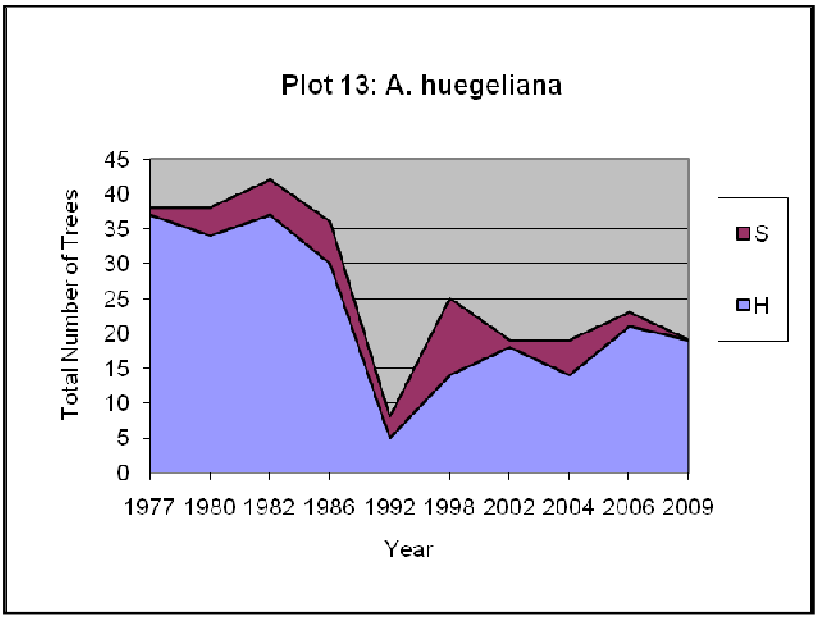


Figure 3.12: Trend in the vigour of the dominant species at Plot 13

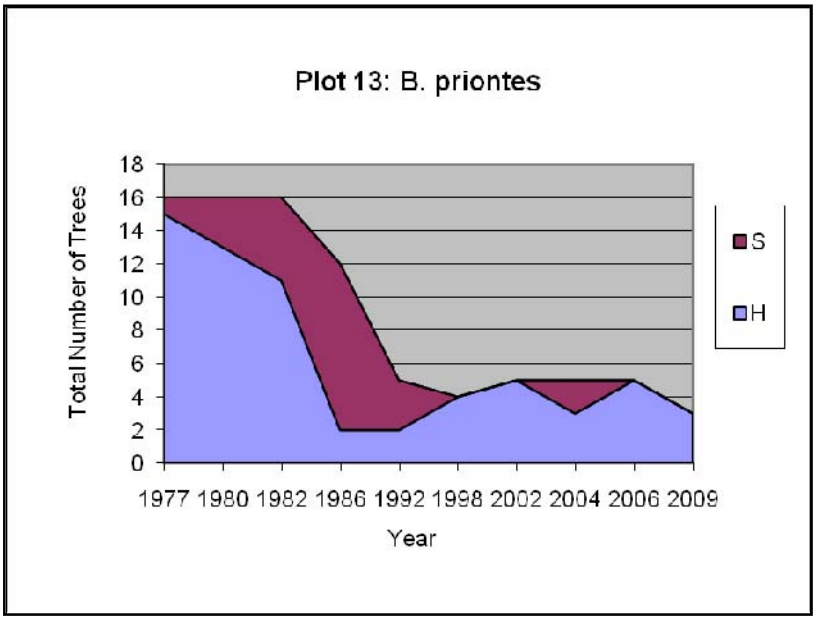


Figure 3.13: Trend in the vigour of B. prionotes at Plot 13

Plate 11: Facing south east across Plot 13

Plot 15

Location: E 559729; N 6360835

On northern fence-line of Dulbining Nature Reserve, south of dam in adjacent property.

Vegetation Description:

Open woodland of *Eucalyptus salmonophloia – Eucalyptus wandoo*. Understorey of *Gahnia ancistrophylla, Lomandra micrantha* and *Daviesia debilior.*

Salinity Class:

Moderately saline.

Condition in 2009 and Trend To-date:

All *Eucalyptus wandoo* individuals have been dead since 1998. *Eucalyptus salmonophloia* condition has remained unchanged since 1996.

There was no significant change in understorey species.

Table 3.15: Plot 15 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Very	Very	Moderate	Moderate	
Overstorey total mature individuals	no data	3	3	3	3	*Eucalyptus salmonophloia*
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	0.0	0.0	0.0	0.0	Crown health unchanged
Understorey average % cover	no data	3.8	2.6	3.5	6.0	Increased cover of *Gahnia ancistrophylla* and *Daviesia debilior*, cover remained similar for all other species.

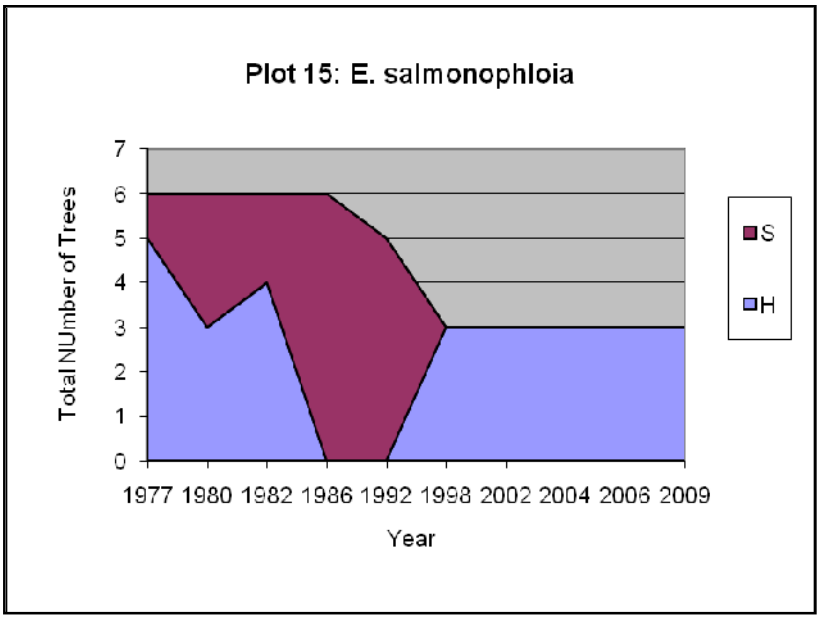


Figure 3.14: Trend in the vigour of E. salmonophloia at Plot 15

Plate 12: Facing south east across Plot 15

Plot 16

Location: E 559788; N 6360805

Situated on the northern fringe of Dulbining Nature Reserve; south of dam in adjacent property; just east of Plot 15.

Vegetation Description:

Open woodland of *Eucalyptus salmonophloia*. Understorey dominated by *Gahnia trifida* and *Lomandra micrantha.*

Salinity Class:

Moderately saline.

Condition in 2009 and Trend To-date:

Eucalyptus salmonophloia tree health has remained stable since 1996.

A decline in understorey cover was noted in 2009.

Table 3.16: Plot 16– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Moderate	Very	Moderate	Moderate	
Overstorey total mature individuals	no data	2	2	2	2	*Eucalyptus salmonophloia*
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	0.0	0.0	0.0	0.0	
Understorey average % cover	no data	5.0	2.6	3.1	2.2	Slight reduction for most species particularly for *Lomandra micrantha* and *Gahnia trifida*. Increase in *Daviesia debilior* in plot E.

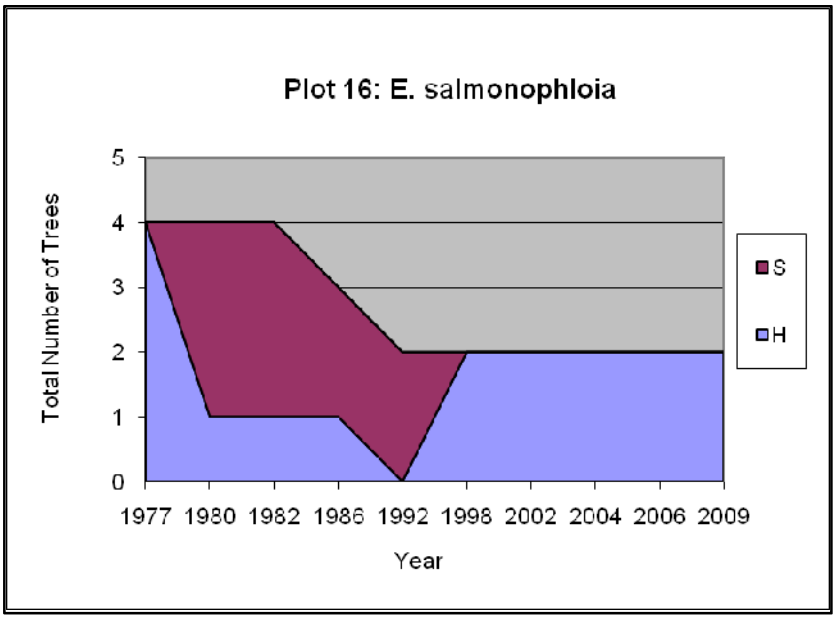


Figure 3.15: Trend in the vigour of the dominant species at Plot 16

Plate 13: Facing south east across Plot 16

Plot 17

Location: E 560503; N 6360778

Situated on the northern fringe of the Dulbining Nature Reserve; south of the fence-line and east of Plots 15 and 16.

Vegetation Description:

Initially an open woodland of *Eucalyptus salmonophloia*. Understorey dominated by *Melaleuca acuminata* and *Gahnia ancistrophylla*.

Salinity Class:

Moderately saline.

Condition in 2009 and Trend To-date:

All *Eucalyptus salmonophloia* have been dead since 1998.

There was a slight decline in *Melaleuca acuminata* vigour.

The weed species *Mesembryanthemum nodiflorum* was recorded for the first time in 2009; however the composition of the remaining understorey is relatively unchanged.

Table 3.17: Plot 17 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Very	Very	Very	Moderate	
Overstorey total mature individuals	no data	21	22	22	21	*Melaleuca acuminata*
Number of seedlings	no data					Melaleuca plot
% of stressed overstorey	no data	4.8	9.1	4.5	14.3	Slight decline in crown health
Understorey average % cover	no data	3.9	1.0	4.3	3.1	**Mesembryanthemum nodiflorum* is a new addition in 2009. All other species composition and cover remains similar.

*weed species

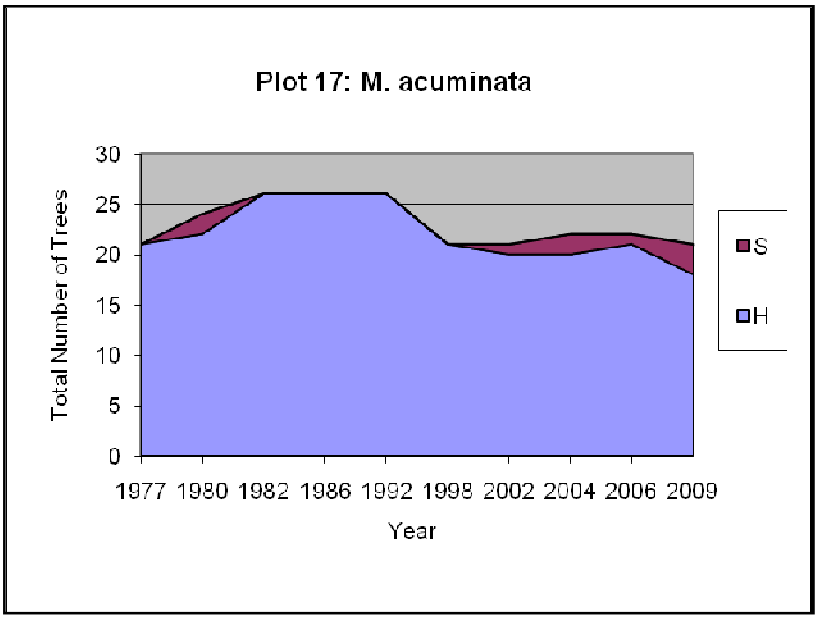


Figure 3.16: Trend in the vigour of the dominant species at Plot 17

Plate 14: Facing south east across Plot 17

Plot 18

Location: E 561068; N 6360808

Situated on the northern fringe of Dulbining Nature Reserve; east of Plot 17.

Vegetation Description:

Originally an open woodland of *Eucalyptus salmonophloia*. Understorey dominated by *Melaleuca acuminata* and grasses.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

All *Eucalyptus salmonophloia* and *Eucalyptus loxophleba* have been dead since monitoring began.

Monitoring of *Melaleuca acuminata* commenced in 2002, as this is now the dominant overstorey species. The change in the number of Melaleuca's may reflect the number of individuals on the boundary of the plot that were counted. The percentage of *M. acuminata* under stress has increased.

Table 3.18: Plot 18 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Very	Extreme	
Overstorey total mature individuals	no data	25	38	32	36	*Melaleuca acuminata*
Number of seedlings	no data		7	7	10	3 new seedlings found in subplot B
% of stressed overstorey	no data	0.0	7.9	0.0	27.8	Decline in crown health
Understorey average % cover	no data	1.8	0.8	1.7	4.4	A slight increase across all species, particularly in Plot E where in previous years there was little to no cover. *Mesembryanthemum nodiflorum* is a new addition in 2009.

*weed species

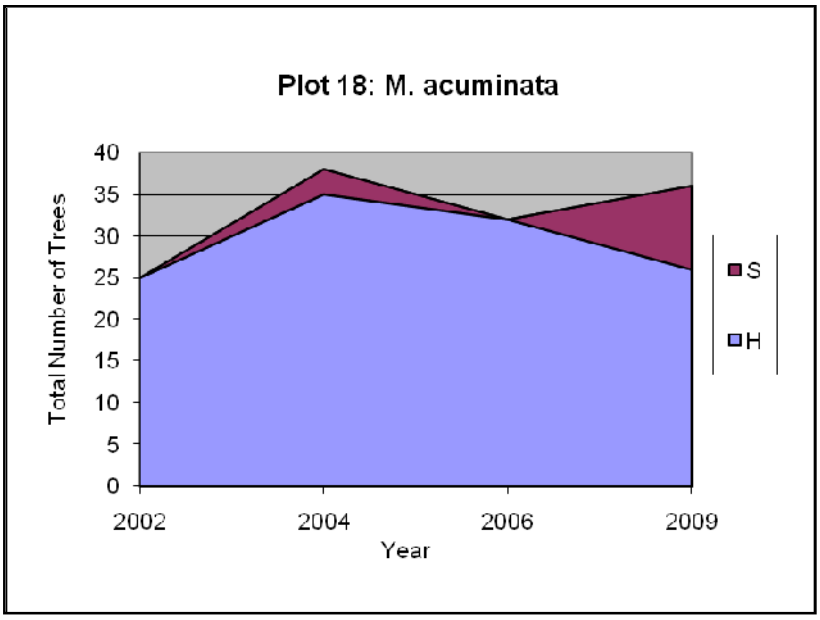


Figure 3.17: Trend in the vigour of the dominant species at Plot 18

Plate 15: Facing south east across Plot 18

Plot 19

Location: E 561345; N 6360800

Northern fringe of Dulbining Nature Reserve on western edge of drain.

Vegetation Description:

Closed scrub of *Melaleuca lateriflora.* Very dense stand. Sparse understorey of *Atriplex semibaccata.*

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

There was a reduction in the number of *Melaleuca lateriflora*; which may be due to an increase in plant deaths as well as the difficulty to count individuals due to the density in some areas.

Atriplex semibaccata has returned to the subplots

Table 3.19: Plot 19 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Extreme	
Overstorey total mature individuals	no data	159	198	191	161	*Melaleuca lateriflora*
Number of seedlings	no data					Melaleuca plot
% of stressed overstorey	no data	17.6	0.0	0.0	100.0	Decline in crown health
Understorey average % cover	no data	0.5	1.0	4.8	6.2	**Mesembryanthemum nodiflorum* is a new species present in all plots which has contributed to increased % cover.

*weed species

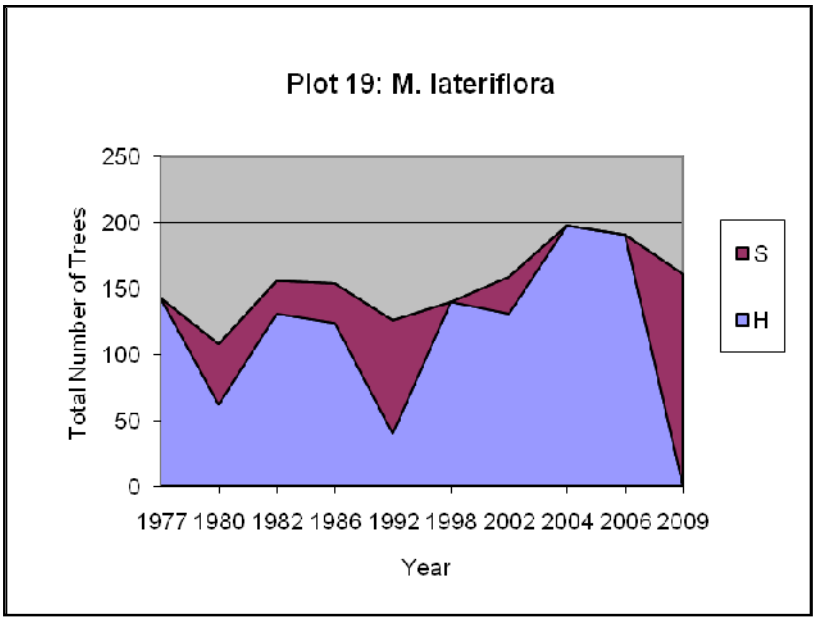


Figure 3.18: Trend in the vigour of the dominant species at Plot 19

Plate 16: Facing south east across Plot 19

Plot 20

Location: E 559060; N 6360428

Situated in Dulbining Nature Reserve, near Oval Rd (between Chadwick's block and the reserve).

Vegetation Description:

Initially an open woodland of *Eucalyptus salmonophloia*. Understorey dominated by *Melaleuca acuminata* and grasses.

Salinity Class:

Moderately saline.

Condition in 2009 and Trend To-date:

All *Eucalyptus salmonophloia* trees have been dead since 1998. All the *Melaleuca acuminata* individuals were recorded as slightly stressed in 2009.

Table 3.20: Plot 20 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Very	Very	Moderate	Moderate	
Overstorey total mature individuals	no data	47	47	47	50	*Melaleuca acuminata*
Number of seedlings	no data					Melaleuca plot
% of stressed overstorey	no data	6.4	2.1	6.4	100.0	Decline in crown health
Understorey average % cover	no data	6.8	1.9	2.6	4.9	Increase in *Gahnia trifida* and *Austrostipa elegantissima*, other species remain similar to previous years.

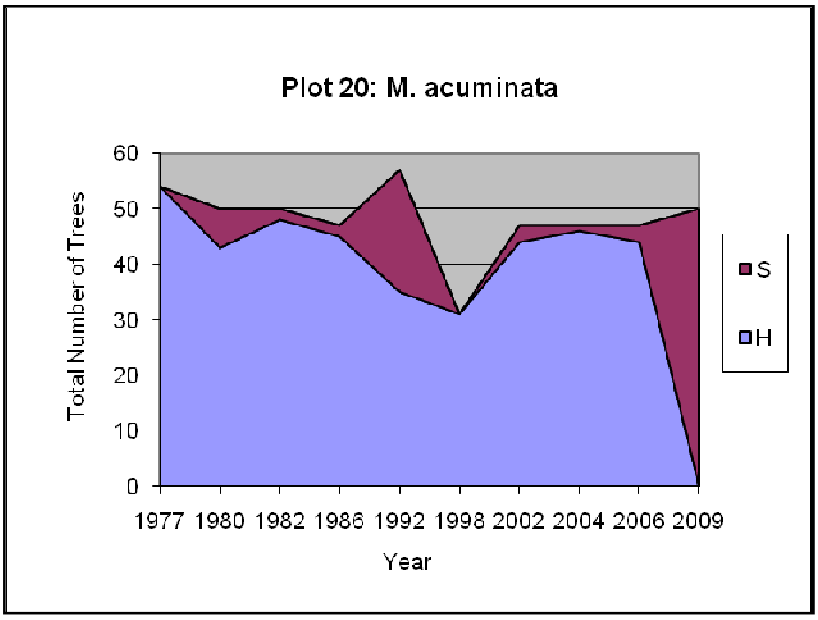


Figure 3.19: Trend in the vigour of the dominant species at Plot 20

Plate 17: Facing south east across Plot 20

Plot 21

Location: E 561051; N 6359773

Situated on the southern fringe of Dulbining Nature Reserve, just north of dam on adjacent property.

Vegetation Description:

Originally a woodland of *Eucalyptus rudis, Casuarina obesa* and *Melaleuca strobophylla*. Understorey of *Melaleuca lateriflora*. Only *Tecticornia* species remain.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

All trees have been dead since monitoring began.

In 2006 only *Tecticornia indica* was recorded. There was also an increase in the percentage cover of the individuals. In 2009 *Tecticornia pergranulata* was recorded.

Table 3.21: Plot 21 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Extreme	
Overstorey total mature individuals	no data	0	0	0	0	Dead overstorey
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	na	na	na	na	
Understorey average % cover	no data	9.6	6.5	22.0	10.0	A decrease in *Tecticornia indica* across most plots and *Tecticornia pergranulata* recorded in subplots A, B and E

Plate 18: Facing south east across Plot 21

Plot 22

Location: E 561128; N 6360018

Located on the southern fringe of Dulbining Nature Reserve, immediately west of dam in reserve (not the same dam as mentioned near Plot 21).

Vegetation Description:

Originally a woodland of *Eucalyptus rudis, Casuarina obesa* and *Melaleuca strobophylla*. Understorey of *Melaleuca lateriflora*. Only *Tecticornia indica* and *H. lepidosperma* remain.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

All trees have been dead since monitoring began.

The understorey of samphires has been present since 1977. There were hundreds of *Tecticornia indica* germinants in 2009.

Table 3.22: Plot 22 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Extreme	
Overstorey total mature individuals	no data	0	0	0	0	Dead overstorey
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	na	na	na	na	
Understorey average % cover	no data	19.0	5.0	4.5	9.0	An increase in *Tecticornia indica* in plots A-D.

Plate 19: Facing south east across Plot 22

Plot 23

Location: E 558891; N 6359500

On the Dulbining Nature Reserve to the west of Oval Rd. The plot occurs within the bulldozed and burnt area of Dulbining Nature Reserve. Monitoring began in 1980, after the disturbance.

Information:

The identification tag for this plot is in the south west corner and runs west to east.

Vegetation Description:

Open woodland of *Eucalyptus salmonophloia, E. loxophleba*. Understorey of dense *Melaleuca acuminata* and *Melaleuca lateriflora*.

Salinity Class:

Very saline.

Condition in 2009 and Trend To-date:

The vigour of the *Eucalyptus loxophleba* trees has declined since 1986 and this trend has continued with four additional individual deaths since 2006.

There was a reduction in the number of *M. acuminata* individuals recorded, but their overall vigour has increased slightly. *Atriplex semibaccata* was recorded in the understorey in 2009 where there has previously been nothing.

Table 3.23: Plot 23 – summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Very	Extreme	Very	Very	
Overstorey total mature individuals	no data	11	10	9	5	*Eucalyptus loxophleba*
		6	4	4	6	*Melaleuca lateriflora*
		148	173	168	135	*Melaleuca acuminata*
		1	1	1	1	*Melaleuca strobophylla*
		1	1	1	1	*Hakea preissii*
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	7.8	3.2	4.9	5.4	Slight improvement
Understorey average % cover	no data	0.0	0.0	0.0	3.5	Presence of *Atriplex semibaccata* in plots C, E.

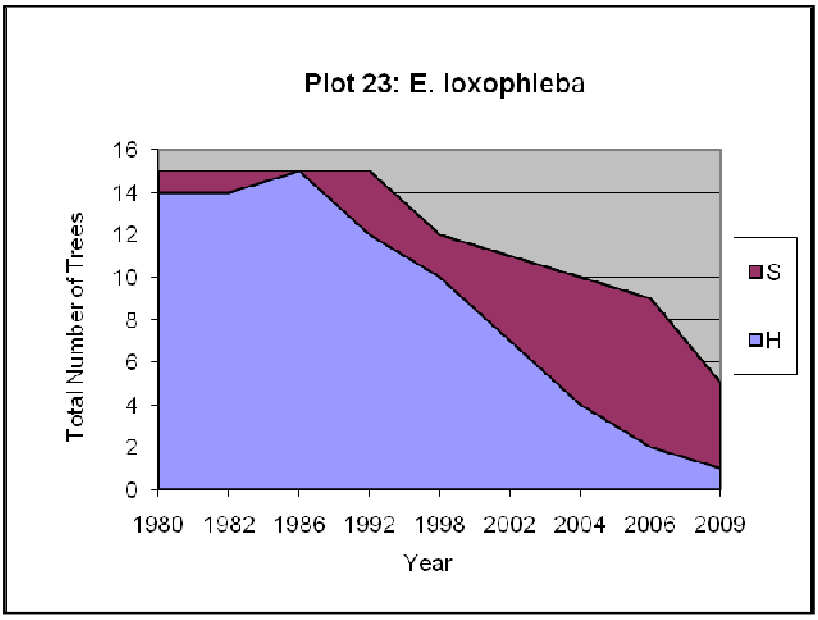


Figure 3.20: Trend in the vigour of the dominant species at Plot 23

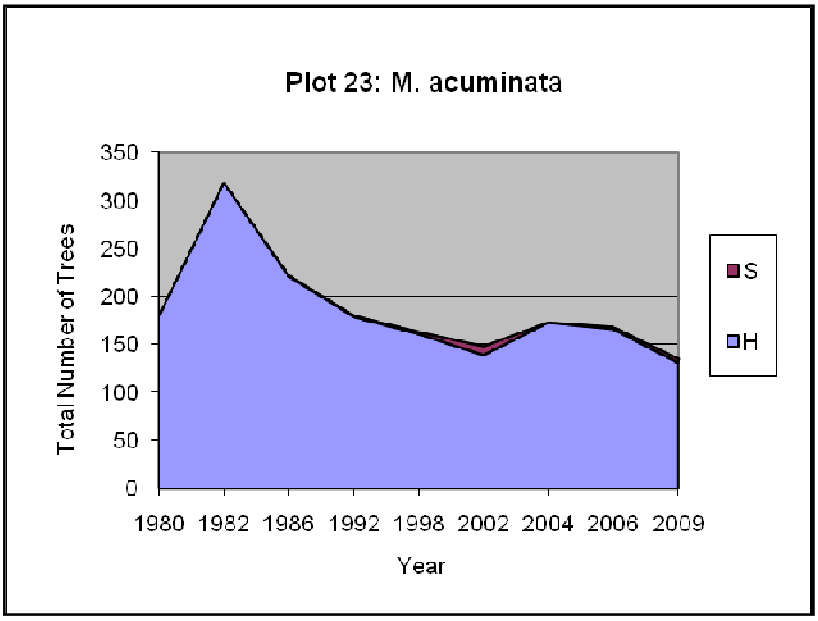


Figure 3.21: Trend in the vigour of M. acuminata at Plot 23

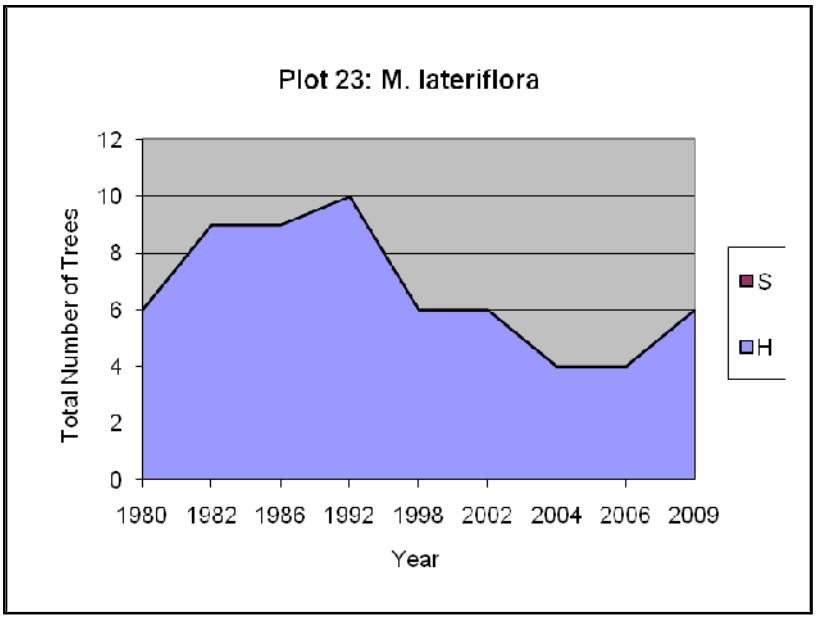


Figure 3.22: Trend in the vigour of M. lateriflora at Plot 23

Plate 20: Facing north east across Plot 23

Plot 24

Location: E 558858; N 6359428

Approximately 100m west of Oval Rd. In the regeneration area to the south of Plot 23. The plot occurs within the bulldozed and burnt area of Dulbining Nature Reserve. Monitoring began in 1980, after the disturbance.

Information:

This plot is densely vegetated which made counting individuals difficult. Therefore within each of the subplots, due to the number of plants being too great to count, the number of individuals was estimated within a $1m^2$ area and calculated for the areas of highest density.

Vegetation Description:

Originally open woodland of *Eucalyptus salmonophloia*. Now an open woodland of *Eucalyptus loxophleba* and *Eucalyptus wandoo*. Dense understorey of *Melaleuca acuminata* and *Melaleuca lateriflora*.

Salinity Class:

Moderately saline.

Condition in 2009 and Trend To-date:

The overall vigour of *M. lateriflora* and *M. acuminata* declined between 2006 and 2009 with an increase in stressed and dead individuals. A new species, *Melaleuca ?pauperiflora* was recorded in 2009

Table 3.24: Plot 24– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Very	Extreme	Moderate	Moderate	
Overstorey total mature individuals	no data	172	162	158	212	*Melaleuca lateriflora*
		45	35	30	34	*Melaleuca acuminata*
		1	1			*Eucalyptus wandoo*
		1	1	1	1	*Eucalyptus loxophleba*
					1	*Melaleuca ?pauperiflora*
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	21.9	0.5	4.2	8.5	Slight decline since 2004
Understorey average % cover	no data	4.6	1.0	1.0	0.5	Slight decrease across all species. Absence of *Gahnia trifida*.

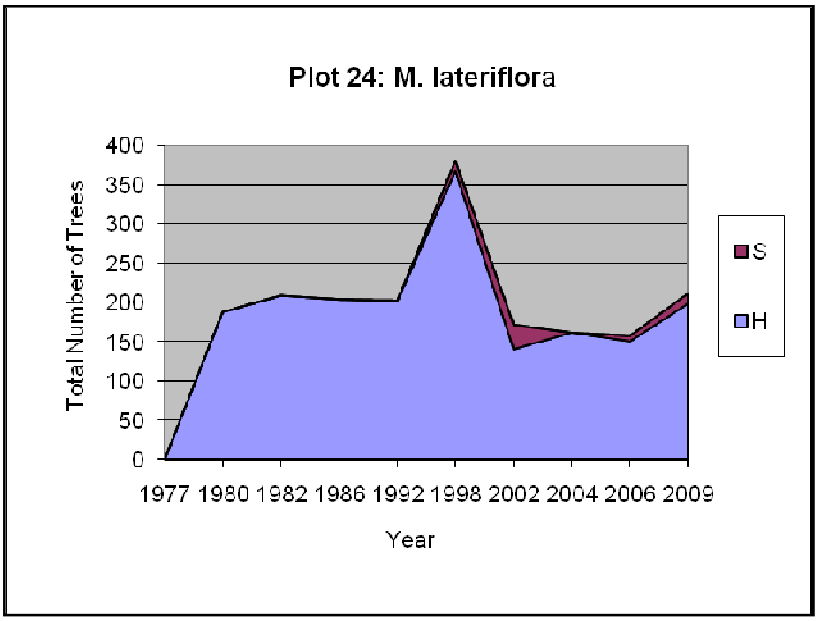


Figure 3.23: Trend in the vigour of the dominant species at Plot 24

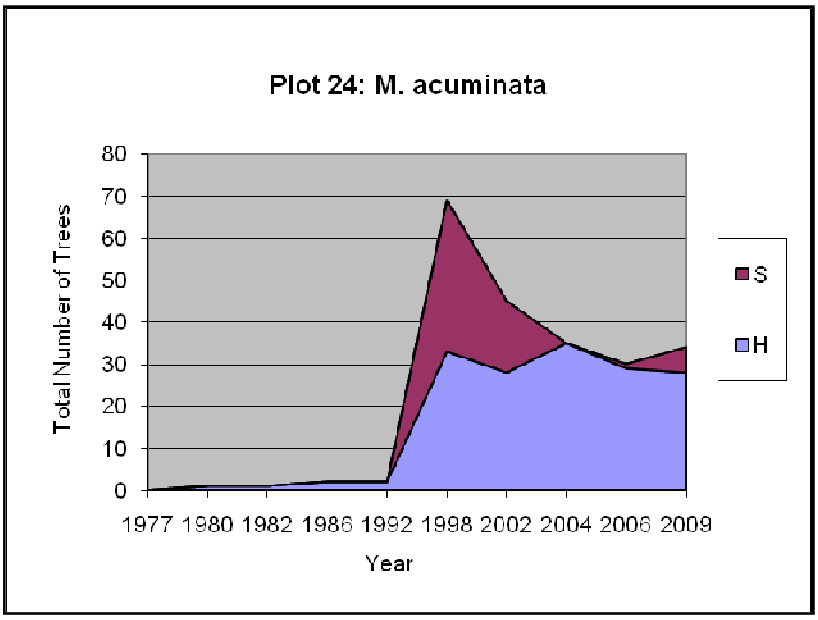


Figure 3.24: Trend in the vigour of M. acuminata at Plot 24

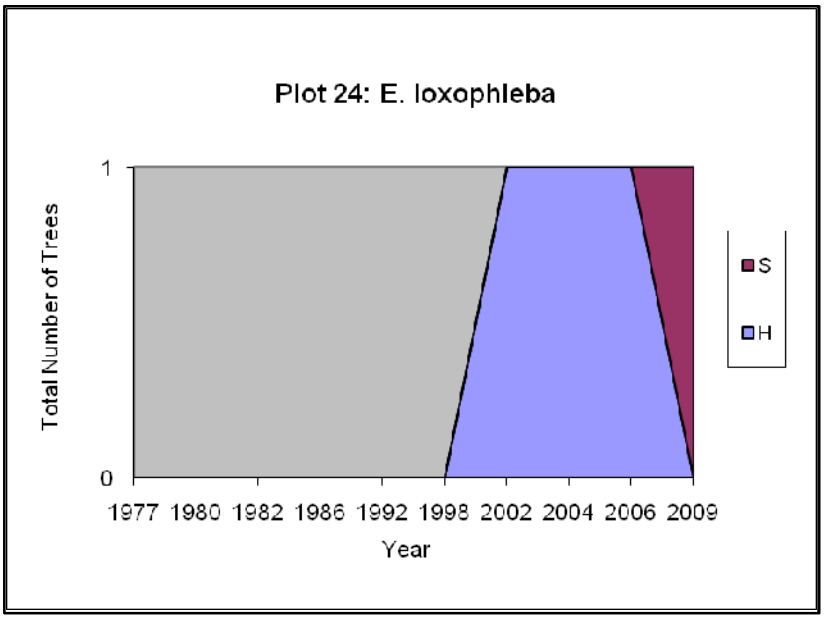


Figure 3.25: Trend in the vigour of E. loxophleba at Plot 24

Plate 21: Facing south east across Plot 24

Plot 25

Location: E 558828; N 6359808

On the Dulbining Nature Reserve to the west of Oval Rd. Plot is approximately 150m south of northern boundary and 100m west of Oval Rd.

Vegetation Description:

Open woodland of *Eucalyptus wandoo* (identified as *E. salmonophloia* in reports prior to 1998). Understorey of dense *Melaleuca acuminata*, grasses and small herbs

Salinity Class:

Moderately saline.

Condition in 2009 and Trend To-date:

The vigour of *E. wandoo* onsite remains unchanged. There were four *E. wandoo* seedlings recorded in 2009.

There was no significant change in the number of *M. acuminata* individuals from 2006 to 2009. *Chorizandra enodis*, *Neurachne alopecuroidea and Lepidosperma tenue* were recorded in the understorey in 2009.

Table 3.25: Plot 25– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Moderate	Very	Moderate	Moderate	
Overstorey total mature individuals	no data	25 211	23 278	22 271	22 278	*Eucalyptus wandoo* *Melaleuca acuminata*
Number of seedlings	no data	4	3	2	4	*E. wandoo, stressed,* 0.8 - 2.5m high.
% of stressed overstorey	no data	14.4	7.3	7.2	5.3	Similar condition.
Understorey average % cover	no data	1.0	1.0	1.0	0.4	2006 and 2009 have less species diversity than previous years although 2009 has improved since 2006 but percent cover is still low.

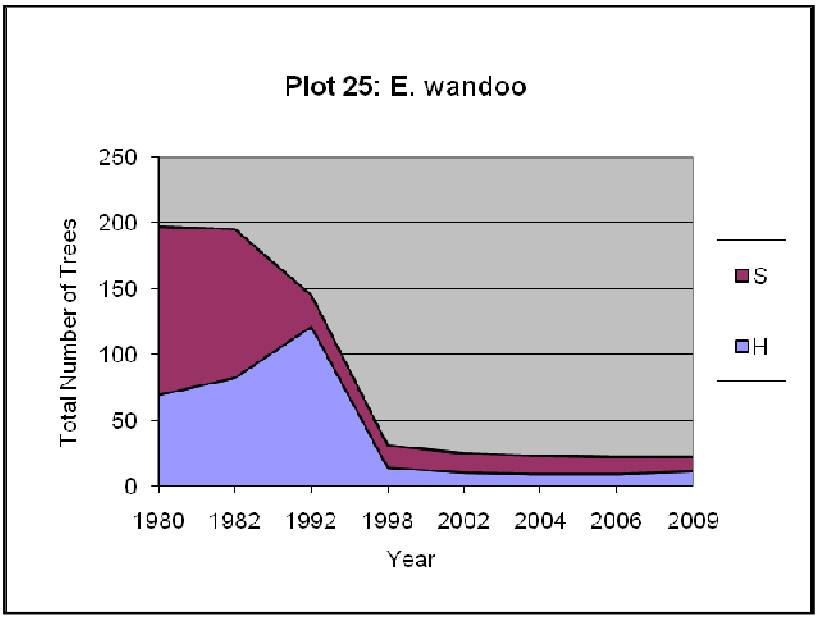


Figure 3.26: Trend in the vigour of the dominant species at Plot 25

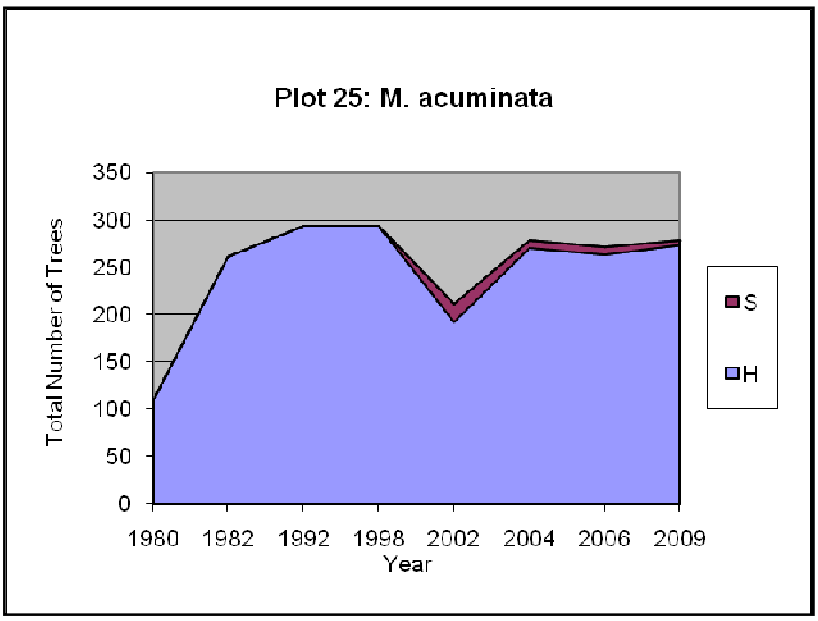


Figure 3.27: Trend in the vigour of M. acuminata at Plot 25

Plate 22: Facing south east across Plot 25

Plot 26

Location: E 558882; N 6358783

To the west of Oval Rd. Located in the regeneration area to the south of Plots 23-25.

Information:

Subplot A starts in the south west corner and runs to the south east corner. Tree number 560 was re-tagged while *Acacia acuminata* tree (tag number 15) could not be found.

Vegetation Description:

Originally *Eucalyptus loxophleba* with *Acacia acuminata* and *Casuarina obesa* (identified as *Allocasuarina huegeliana* in previous reports) dominated the mid storey. Now only *Acacia acuminata* and *Casuarina obesa* remain. No perennial understorey.

Salinity Class:

Slightly saline.

Condition in 2009 and Trend To-date:

There has been very little change since 2006 for both overstorey and understorey.

Table 3.26: Plot 26– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Slightly	Slightly	Slightly	Slightly	
Overstorey total mature individuals	no data	17 2	15 2	14 2	14 2	*Acacia acuminata* *Casuarina obesa*
Number of seedlings	no data	0	0	0	1 1	*A. acuminata* at 0.3m high. *E. wandoo* at 1.85 m high
% of stressed overstorey	no data	15.8	29.4	37.5	43.8	Decline in crown health
Understorey average % cover	no data	0.0	0.0	0.0	40.0	No understorey prior to 2009, only evidence of *Waitzia* species present.

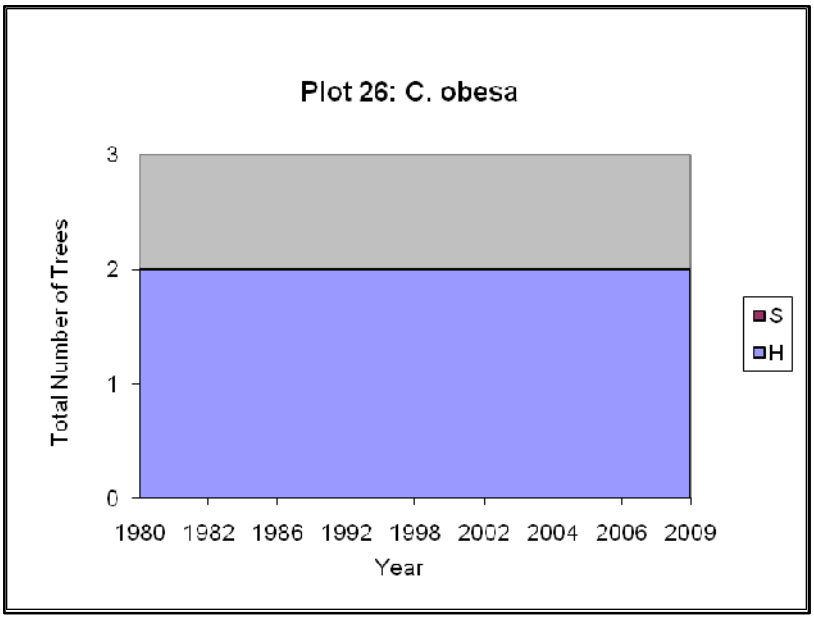


Figure 3.28: Trend in the vigour of the dominant species at Plot 26

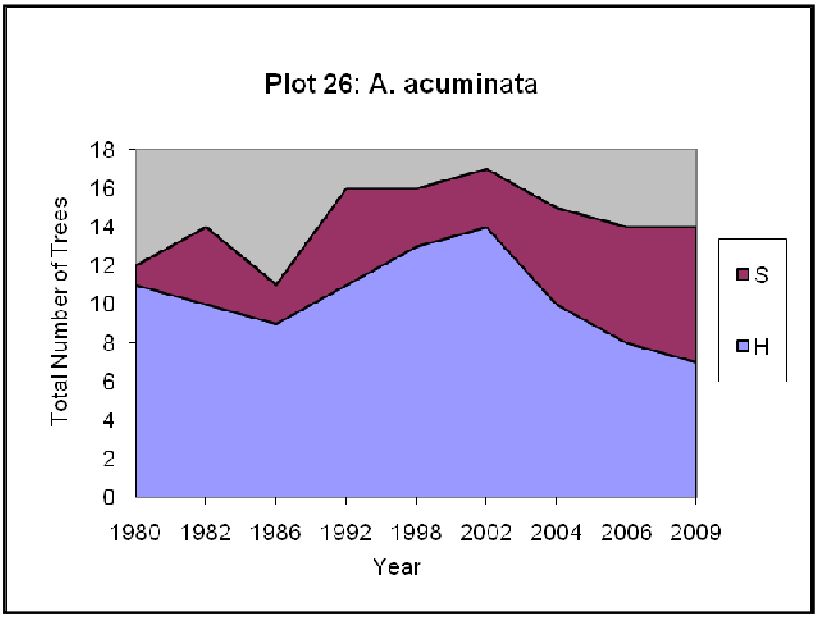


Figure 3.29: Trend in the vigour of A. acuminata at Plot 26

Plate 23: Facing south east across Plot 26

Plot 27

Location: E 556032; N 6357284

Western edge of lake bed, just south of Plot 3. Plot established in 1998.

Vegetation Description:

Open woodland of *Casuarina obesa*.

Salinity Class:

Slightly saline.

Condition in 2009 and Trend To-date:

Over half of the mature *C. obesa* trees were recorded in a stressed condition. The *C. obesa* seedlings remained in good health, however some grazing was noted.

Table 3.27: Plot 27– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Slightly	Slightly	Slightly	Slightly	
Overstorey total mature individuals	no data	12	12	12	12	*Casuarina obesa*
Number of seedlings	no data	692	1069	1072	1047	*C. obesa*, 0.2-3.3m high. Seedlings less than 1m were grazed.
% of stressed overstorey	no data	8.3	0.0	8.3	58.3	Decline in crown health
Understorey average % cover	no data					no understorey

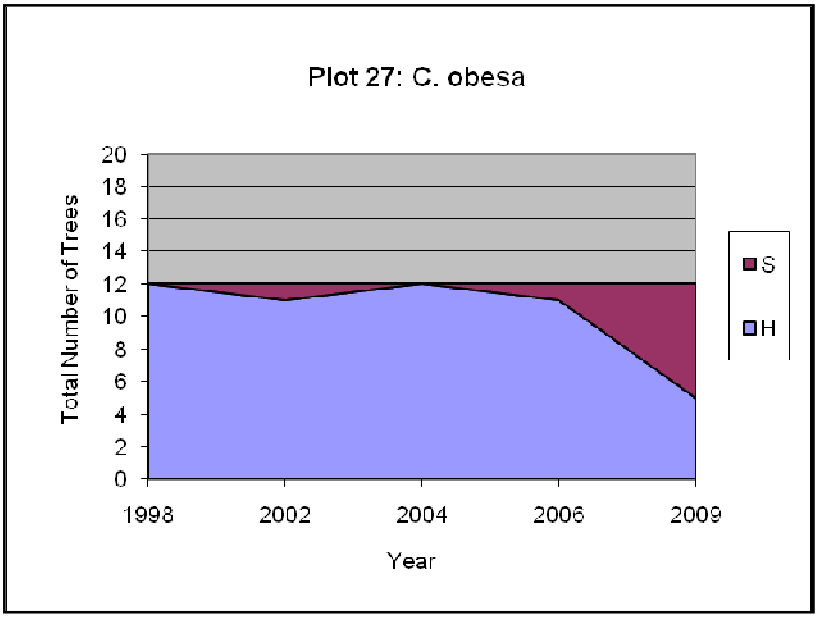


Figure 3.30: Trend in the vigour of the dominant species at Plot 27

Plate 24: Facing south east across Plot 27

Plot 28

Location: E 556189; N 6356601

Southern portion of lake bed, near abstraction bore 7. Plot established in 1998.

Vegetation Description:

Woodland of *Casuarina obesa*. Some *Melaleuca strobophylla*. Very sparse understorey of *Tecticornia lepidosperma* and *Maireana brevifolia.*

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

The number of *C. obesa* remains stable however, there appeared to be a decline in their vigour. One *M. strobophylla* tree is still present and is still stressed. The one *M. strobophylla* seedling first recorded in 2002 was recorded as healthy.

The unidentified eucalypt seedlings from 2004 were identified as *Eucalyptus loxophleba.*

Table 3.28: Plot 28– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Very	Extreme	
Overstorey total **mature individuals**	no data	58 1	52 1	51 1	51 1	*Casuarina obesa* *Melaleuca strobophylla*
Number of seedlings	no data	1 6	1 5	1 5	1 4 3	*M. strobophylla*, healthy, 2.5m high. *Eucalyptus loxophleba*, 2 stressed, 1.2-2.17m high. *C. obesa*, healthy, 0.3-0.6m high.
% of stressed overstorey	no data	52.5	60.4	65.4	84.6	Decline in crown health
Understorey average % cover	no data	3.3	3.3	5.1	7.0	Increase in *Maireana brevifolia* across all plots and a decrease in *Tecticornia lepidosperma*.

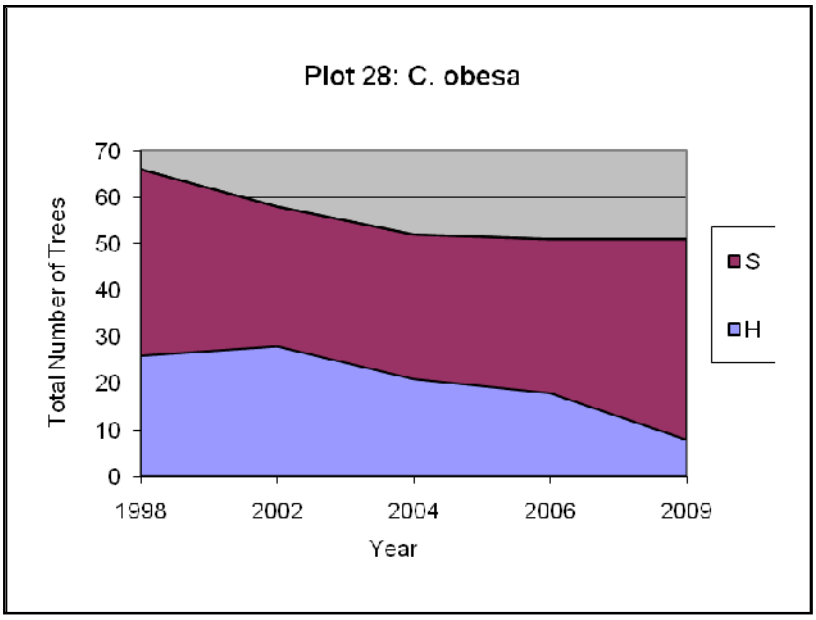


Figure 3.31: Trend in the vigour of the dominant species at Plot 28

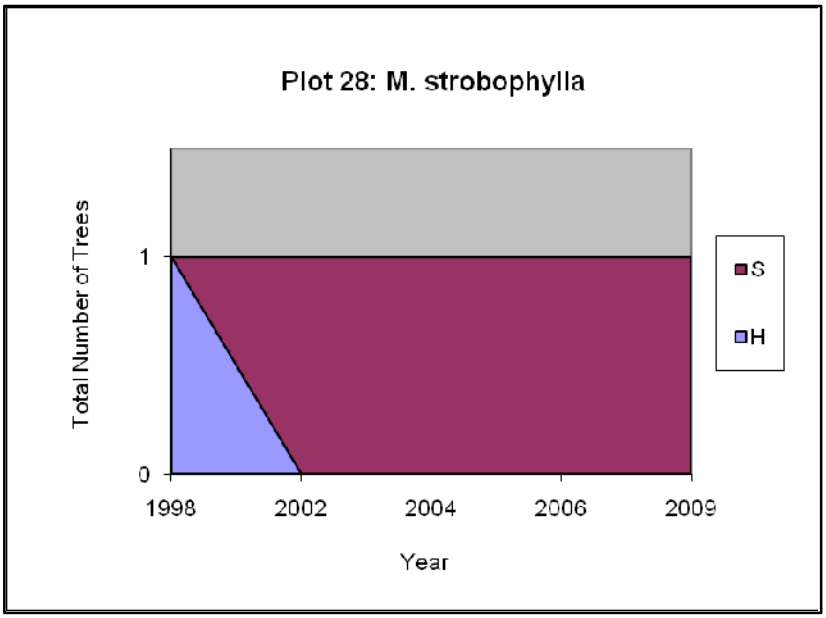


Figure 3.32: Trend in the vigour of M. strobophylla at Plot 28

Plate 25: Facing south east across Plot 28

Plot 29

Location: E 556496; N 6356584

Southern portion of lake bed, 300m east of Plot 28. Plot established in 1998.

Vegetation Description:

Open woodland of *Casuarina obesa*. Very sparse understorey of *Tecticornia lepidosperma*.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

There was a slight improvement in the overall vigour of *C. obesa* from 2006 to 2009.

The composition of understorey species changed to include the weed *Mesembryanthemum nodiflora* and *Angianthus tomentosus*.

Table 3.29: Plot 29– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Extreme	
Overstorey total mature individuals	no data	18	12	12	12	*Casuarina obesa*
Number of seedlings	no data	0	0	0	0	
% of stressed overstorey	no data	100.0	100.0	100.0	91.7	slight improvement in crown health
Understorey average % cover	no data	2.0	1.6	1.7	1.9	An increase in species composition in 2009 with **Mesembryanthemum nodiflorum* and *Angianthus tomentosus* are new additions. Generally low percent cover of all species.

**weed species*

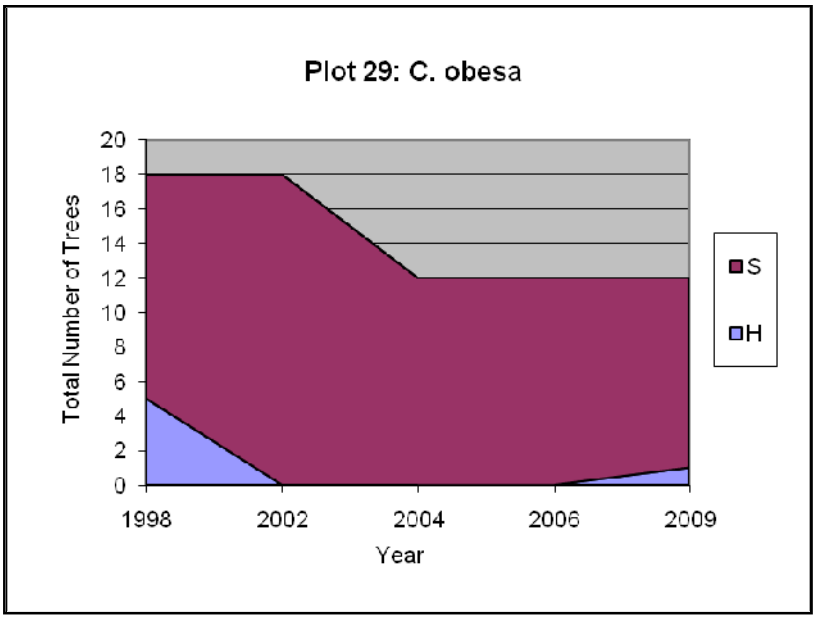


Figure 3.33: Trend in the vigour of the dominant species at Plot 29

Plate 26: Facing south east across Plot 29

Plot 30

Location: E 557422; N 6356494

On the deep sand dunes near the eastern fringe of the lake. Plot established in 1998.

Information:

The remaining *Banksia prionotes* was tagged with Number 955 as it was over 4 metres.

Vegetation Description:

Woodland of *Banksia prionotes*. Understorey of grasses and small herbs.

Salinity Class:

Non-saline.

Condition in 2009 and Trend To-date:

This is a very weedy site with over 80 percent of the understorey plots covered by veldt grass.

The last of the original *B. prionotes* remains healthy. There were 14 new *Jacksonia furcellata* seedlings recorded.

Table 3.30: Plot 30– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Non Saline	Non Saline	Non Saline	Non Saline	
Overstorey total mature individuals	no data	2 1 1	1 1	1 1	2 1	*Banksia prionotes* *Acacia acuminata* *Allocasuarina huegeliana*
Number of seedlings	no data	0	1	0	0 16	*B. prionotes* *J. furcellata*, stressed, 0.3 - 2.5 m high.
% of stressed overstorey	no data	50.0	0.0	0.0	0.0	Improvement in crown health since 2002.
Understorey average % cover	no data	3.0	2.4	3.5	3.5	*Erymophyllum tenellum?* a new addition in 2009, slight increase in *Lomandra rupestris*. About 80% cover of Veldt grass.

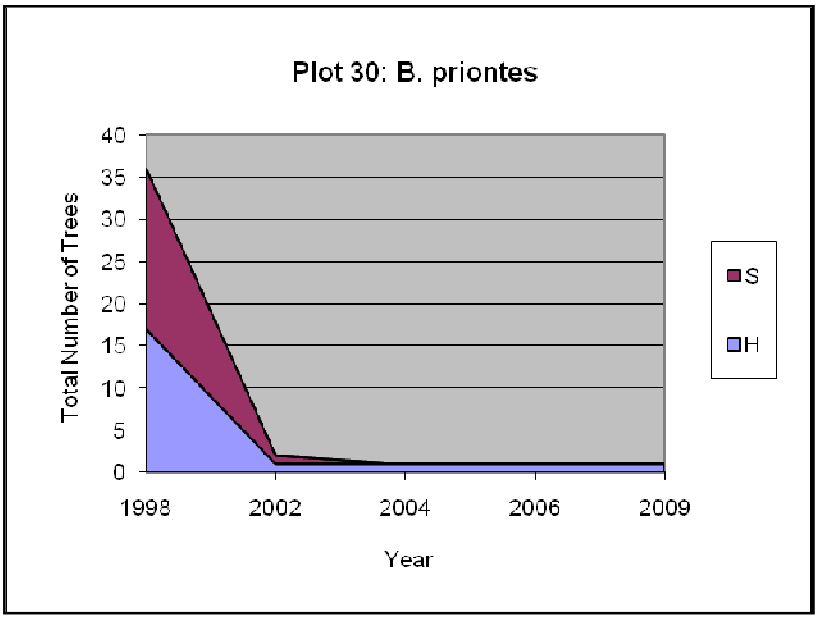


Figure 3.34: Trend in the vigour of the dominant species at Plot 30

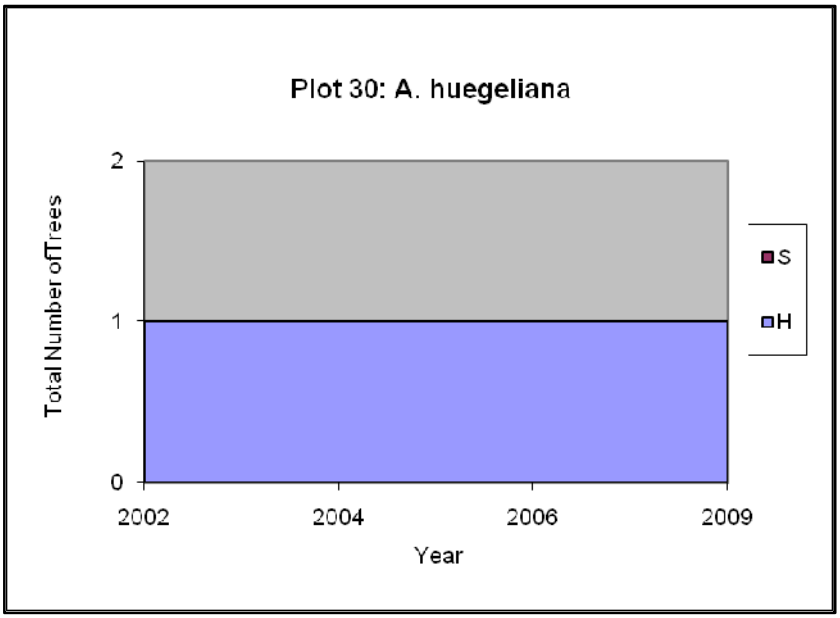


Figure 3.35: Trend in the vigour of Allocasuarina huegeliana at Plot 30

Plate 27: Facing south east across Plot 30

Plot 32 (RF1)

Location: E 557307; N 6359030

Across the Northern Arthur River, 50m south of road. Plot runs across the river and extends approximately 30m east and 30m west from the river channel. Plot originally established in 1983.

Information:

Tree Numbers 87, 103 and 129 were re-tagged, while tree Numbers 105, 121, 122 and 123 were recorded as damaged and leaning over on their sides.

Vegetation Description:

Woodland of *Eucalyptus loxophleba, Casuarina obesa* and *Melaleuca strobophylla*. Understorey of *Tecticornia indica* and *H. lepidosperma*.

Salinity Class:

Extremely saline.

Soil salinities range from Moderate (EM38 horizontal of 98 mS/m) at higher ground to Extreme (EM38 horizontal of 225 mS/m) near or in the channel.

Condition in 2009 and Trend To-date:

The overall vigour of *C. obesa* has remained relatively similar to 2006.

Understorey was estimated across the entire plot rather than recorded on a plot by plot basis. There was a general decline in *Tecticornia* species across the whole plot and new species were also recorded.

Table 3.31: Plot 32– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Very	Moderate	Extreme	
Overstorey total mature individuals	no data	41	37	39	44	*Casuarina obesa*
		4	4	4	4	*Melaleuca strobophylla*
		11	8	11	11	*Eucalyptus loxophleba*
			4	4	4	*Acacia acuminata*
			1	1	1	*Allocasuarina huegeliana*
			1	1	1	*Hakea preissii*
				4	4	*Melaleuca lateriflora*
Number of seedlings	no data	0	0	1	2	*A. acuminata*, healthy, 1-1.25m high.
				1	1	*M. strobophylla*, 3.7m high.
					2	*H. preissii*, healthy, 1.8-1.85m high.
% of stressed overstorey	no data	44.6	29.1	29.7	31.9	Similar condition
Understorey average % cover	no data	8.9	5.7	6.4	3.2	General reduction in *Tecticornia* species across the plot. Three new species present in 2009 – *Mesembryanthemum nodiflorum, Maireana platycarpa, Waitzia* species.

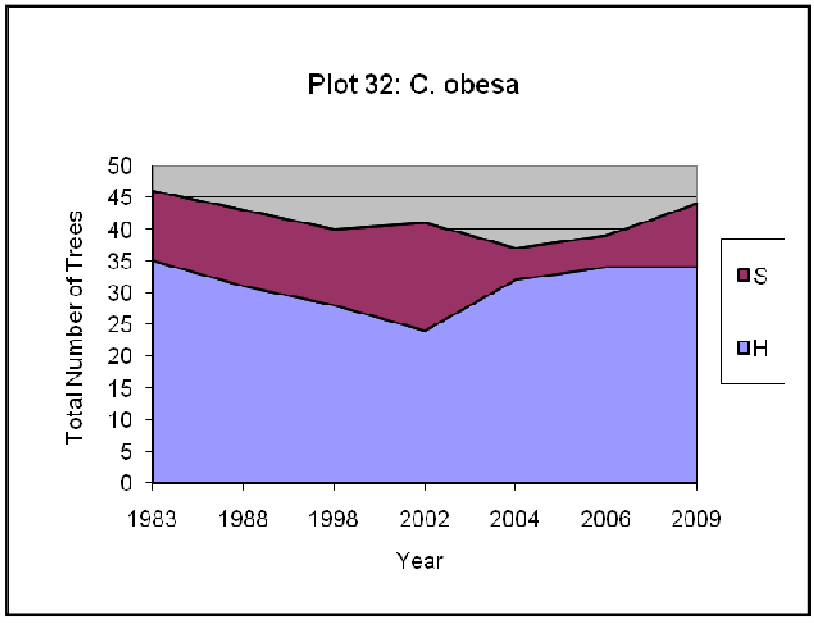


Figure 3.36: Trend in the vigour of the dominant species at Plot 32

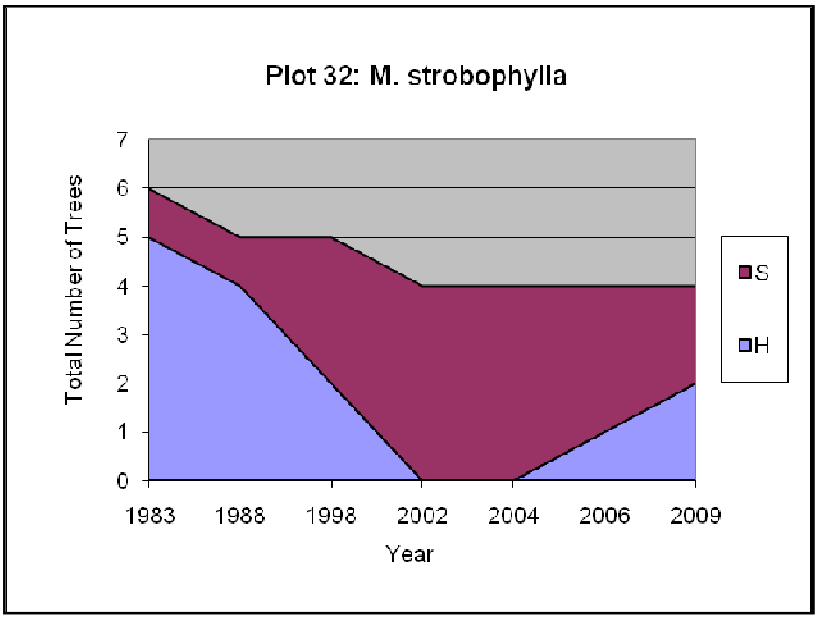


Figure 3.37: Trend in the vigour of the dominant species at Plot 32

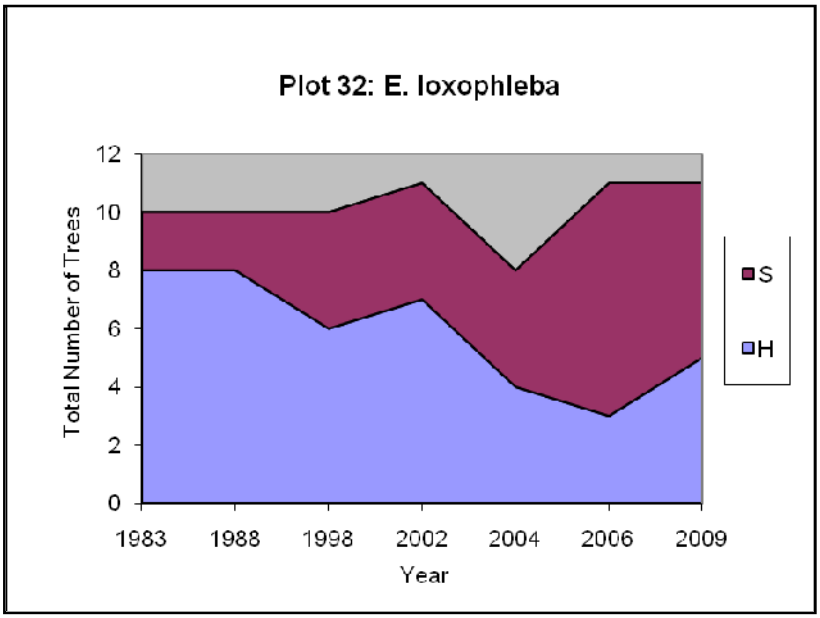


Figure 3.38: Trend in the vigour of the dominant species at Plot 32

Plate 28: Facing south east across Plot 32

Plot 33 (RF4)

Location: E 556116; N 6357330

South west corner of the lake bed. Plot originally established in 1983. Plot is 20 m x 40 m in size.

Information:

Tree Number 202 was re-tagged.

Vegetation Description:

Woodland of *Casuarina obesa*. Understorey of very sparse *Tecticornia lepidosperma* and small herbs.

Salinity Class:

Moderately saline.

Condition in 2009 and Trend To-date:

There has been a decline in the vigour of *C. obesa* in the plot.

The unidentified Eucalypt seedling previously recorded was identified as *Eucalyptus loxophleba*.

Understorey was estimated across the entire plot rather than recorded within subplots. *Maireana brevifolia* was not observed in 2006/2007, *Tecticornia lepidosperma* was not recorded in 2009 while *Angianthus tomentosus* was recorded for the first time.

Table 3.32: Plot 33– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Very	Extreme	Moderate	Very	
Overstorey total mature individuals	no data	24	23	23	23	*Casuarina obesa*
Number of seedlings	no data	0	0	1 3	1 7	*Eucalyptus* species, healthy, 3.38m high. *C. obesa*, 6 grazed, 0.5-1.75m high.
% stressed overstorey	no data	83.3	56.5	30.4	82.6	Decline in crown health.
Understorey average % cover	no data	6.0	6.5	3.0	28.3	80% cover of *Angianthus tomentosus* in 2009 which was not present in previous years. *Tecticornia* not present in 2009.

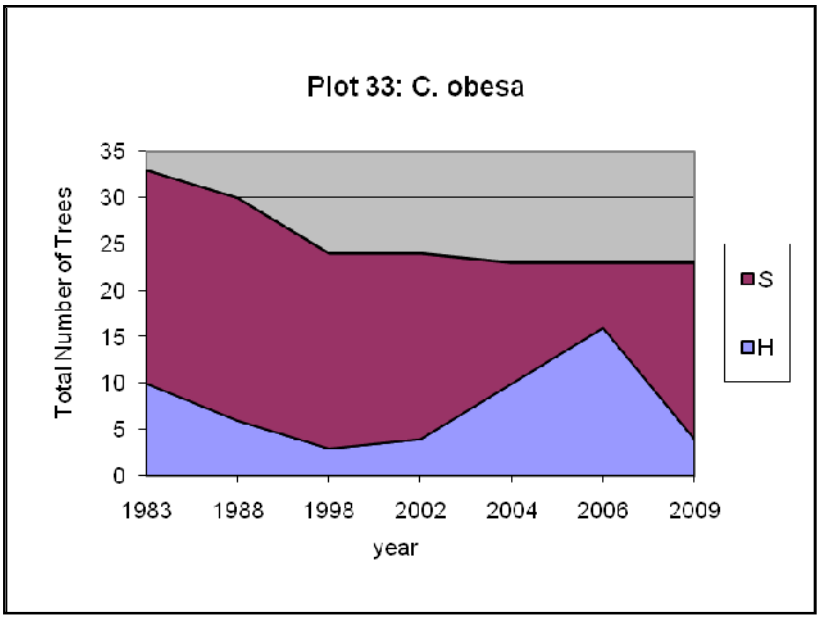


Figure 3.39: Trend in the vigour of the dominant species at Plot 33

Plate 29: Facing south east across Plot 33

Plot 34

Location: E 556927; N 6358111

Approx. 25m east of Pump 1. Plot established in 2000.

Vegetation Description:

Dense *Casuarina obesa* and *Melaleuca strobophylla* stand on undulating gilgai mounds. Scattered *Tecticornia* species understorey.

Salinity Class:

Very saline.

Condition in 2009 and Trend To-date:

This plot is still declining in condition. An additional four *C. obesa* have died in the last two years but two of the individual's vigour remains healthy. All *M. strobophylla* individuals were recorded as dead. It was also noted that the site was very weedy.

Table 3.33: Plot 34– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Very	
Overstorey total **mature individuals**	179 13	174 2	124	114	110	*Casuarina obesa* *Melaleuca strobophylla*
Number of seedlings	0	0	0	0	0	
% of stressed overstorey	96.9	97.2	93.5	99.1	97.3	Similar crown health
Understorey average % cover	no data	26.2	21.7	16.3	12.4	Decline in *Tecticornia lepidosperma*, two new species – **Mesembryanthemum nodiflorum* and *Maireana brevifolia*.

*weed species

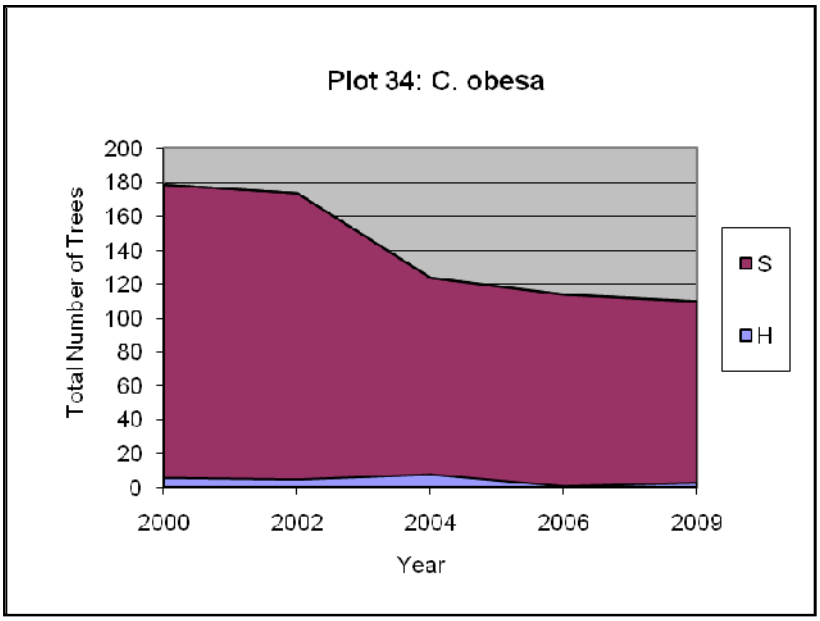


Figure 3.40: Trend in the vigour of the dominant species at Plot 34

Plate 30: Facing diagonally across Plot 34

Plot 35

Location: E 556796; N 6356552

Approximately 50m south west of Pump 13. Plot established in 2000.

Vegetation Description:

Open woodland of *Casuarina obesa*. Generally large trees occurring on flat ground. Occasional *Carpobrotus* species, otherwise no understorey present.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

No *C. obesa* individuals have died since 2004, however, there were more stressed individuals recorded in 2009.

Austrostipa compressa was recorded in 2009 and the occurrence of *Atriplex semibaccata* increased. *Maireana platycarpa* was also a new addition identified within the subplots.

Table 3.34: Plot 35– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Very	Extreme	
Overstorey total mature individuals	28	27	26	26	26	*Casuarina obesa*
Number of seedlings	0	0	0	0	1	*C. obesa*, healthy, 0.2m high.
% of stressed overstorey	64.3	59.3	38.5	61.5	84.6	Decline in crown health
Understorey average % cover	no data	4.0	4.4	0.5	1.2	Reduced species diversity since 2004, 2009 has improved slightly since 2006, *Austrostipa compressa* is a new addition in 2009 as was *Maireana platycarpa*

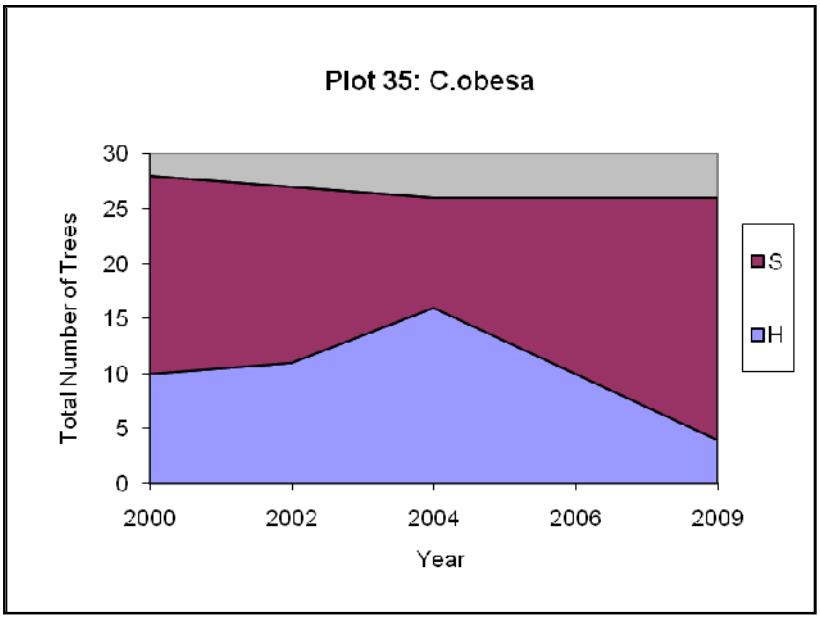


Figure 3.41: Trend in the vigour of the dominant species at Plot 35

Plate 31: Facing south east across Plot 35

Plot 36

Location: E 557290; N 6356958

Approximately 80m west of Pump 15. Plot established in 2000.

Information:

Tree numbers 355, 373 and 380 could not be found and were assumed dead. Tree numbers 371 and 438 were re-tagged, while tree number 399 was previously recorded as dead but was found to be alive.

Vegetation Description:

Woodland of *Casuarina obesa* and *Melaleuca strobophylla*. Density of stems ranges from high on the raised gilgai mounds to low in and around depressions. Understorey consists of occasional *Tecticornia lepidosperma.*

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

There was no significant change in the overall vigour for either species within this plot. There were less healthy *C. obesa* trees, but only one death since 2006. However, two *M. strobophylla* individuals had died since 2006.

The abundance of *Tecticornia* species has increased since 2006 and *Angianthus tomentosus* was recorded for the first time.

Table 3.35: Plot 36– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Extreme	
Overstorey total mature individuals	73 26	63 20	35 5	34 4	33 2	*Casuarina obesa* *Melaleuca strobophylla*
Number of seedlings	0	0	0	0	4	*M. strobophylla*, healthy, 0.1 - 0.5m high.
% of stressed overstorey	96.0	96.4	77.5	94.7	97.1	Similar condition
Understorey average % cover	no data	5.8	11.2	3.8	9.8	Increase in *Tecticornia* species. *Angianthus tomentosus* is a new addition in 2009.

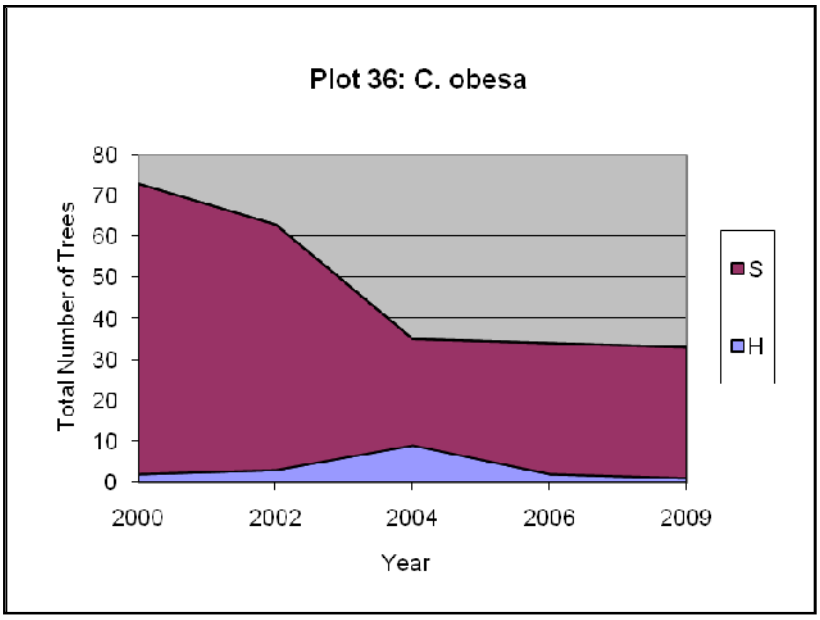


Figure 3.42: Trend in the vigour of the dominant species at Plot 36

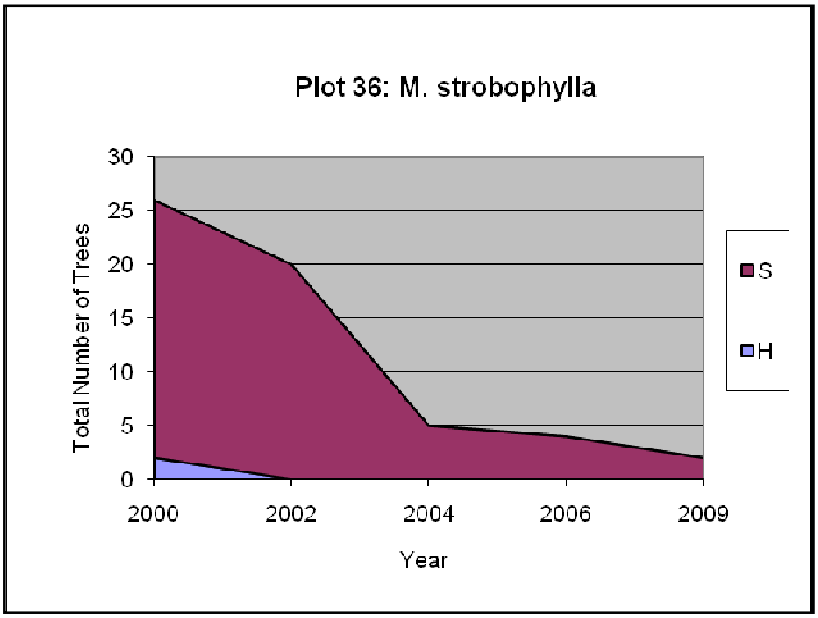


Figure 3.43: Trend in the vigour of the dominant species at Plot 36

Plate 32: Facing south east across Plot 36.

Plot 37

Location: E 556887; N 6357053

Approximately 50m south of Pump 12. Plot established in 2000.

Vegetation Description:

Plot samples one stand of *Casuarina obesa* in an open woodland of *C. obesa*. The majority of trees to the south of Pump 12 are restricted to areas of higher elevation (ie. on gilgai mounds) with scattered *Tecticornia* species in the understorey.

Salinity Class:

Extremely saline.

Condition in 2009 and Trend To-date:

The majority of the *C. obesa* are stressed with four additional dead trees since 2004 and two since 2006.

There was a significant change in the understorey with both *Atriplex semibaccata* and *Tecticornia lepidosperma* recorded again in 2009. *Mesembryanthemum nodiflorum* and *Waitzia* species were also new species recorded in 2009.

Table 3.36: Plot 37– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Extreme	
Overstorey total mature individuals	36	36	25	23	21	*Casuarina obesa*
Number of seedlings	0	0	0	0	0	
% of stressed overstorey	86.1	88.9	80.0	87.0	95.2	slight decline
Understorey average % cover	no data	3.1	5.2	6.4	12.0	Increased species composition and cover since 2006, *Atriplex* and *Tecticornia* present. Two new species – **Mesembryanthemum nodiflorum, Waitzia* species.

*weed species

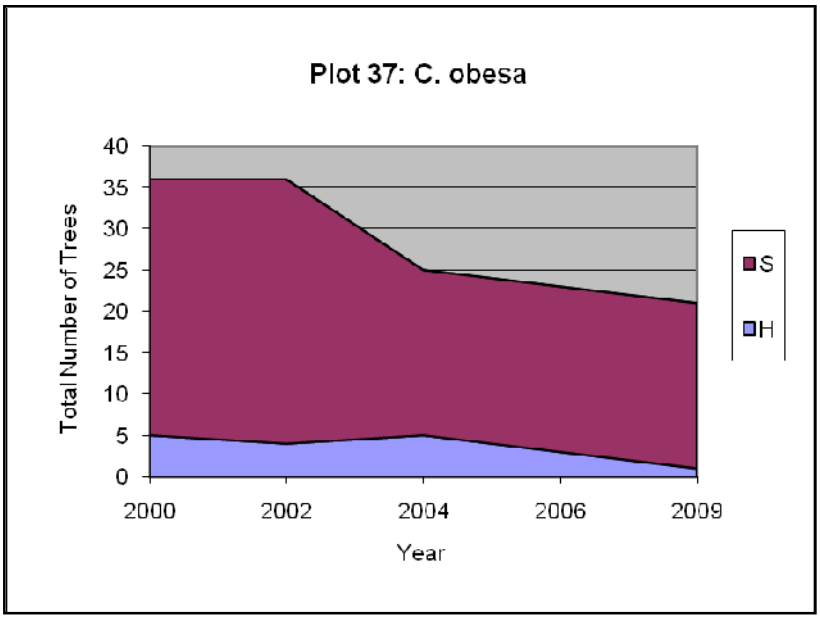


Figure 3.44: Trend in the vigour of the dominant species at Plot 37

Plate 33: Facing south east across Plot 37.

Plot 38

Location: E 556708; N 6357859

Approximately 50m west of Pump 2. Plot established in 2000.

Vegetation Description:

Open woodland of *Casuarina obesa* with low open shrubland of *Tecticornia lepidosperma.*

Salinity Class:

Very saline.

Condition in 2009 and Trend To-date:

The number of healthy *C. obesa* has decreased from 17 to 10 while no trees have died since 2006.

Atriplex semibaccata was not recorded within the subplots in 2006 but was recorded in 2009. *Tecticornia lepidosperma* has decreased during the past two years.

Table 3.37: Plot 38– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	Extreme	Extreme	Extreme	Very	
Overstorey total mature individuals	29	29	27	25	25	*Casuarina obesa*
Number of seedlings	0	0	0	0	0	
% of stressed overstorey	69.0	82.8	48.1	32.0	60.0	Decline since 2004
Understorey average % cover	no data	2.9	6.6	7.8	1.2	Increase in *Atriplex*, one new species – **Mesembryanthemum nodiflorum*, reduced cover in *Tecticornia lepidosperma*.

*weed species

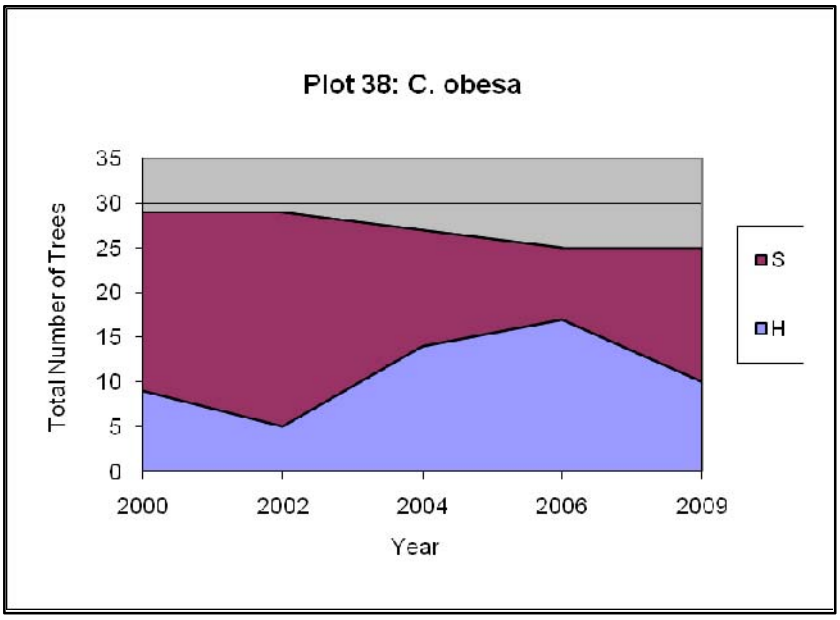


Figure 3.45: Trend in the vigour of the dominant species at Plot 38

Plate 34: Facing south east across Plot 38.

Plot 42 Melaleuca seedling plot (established 2004)

Location: E 557540; N 6357715

Situated on the north-western edge of the lake bed, south of Plot 9 and just east of Plot 7.

Salinity Class:

Extremely saline. Extremely saline in 2004 and very saline in 2006.

Description:

This plot was established in 2004 to monitor a recruitment event by measuring a dense stand of *Melaleuca strobophylla* seedlings. A total of 333 seedlings were present in 2009 all of which were *Melaleuca strobophylla* seedlings.

Table 3.38: Plot 42– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	no data?	Extreme	Very	Extreme	
Overstorey total mature individuals	no data	na	na	na	na	seedling plot, no overstorey
Number of seedlings	no data				333	*M. strobophylla*, healthy, 0.5 - 4.16m high.
% of stressed overstorey	no data					No overstorey
Understorey average % cover	no data					No understorey

Plate 35: Seedling plot 42, photo taken from NW corner post facing south east

Plot 43:

Location: E 560452; N 6360356

Found within the Dulbining Nature Reserve west of a drain line.

Vegetation Description:

Open woodland of *Eucalyptus salmonophloia* with Low Shrubland of *Melaleuca acuminata* over *Lomandra micrantha*

Salinity Class:

Moderately saline.

Description:

This is the first of three new plots established in 2009. It is situated within the best condition vegetation among the three new plots. Five healthy *Eucalyptus salmonophloia* were recorded in this plot and one *Eucalyptus salmonophloia* seedling.

Table 3.39: Plot 43– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	no data	no data	no data	Moderate	
Overstorey total mature individuals	no data	no data	no data	no data	5	*Eucalyptus salmonophloia*
Number of seedlings	no data	no data	no data	no data	13 1	*M. acuminata*, healthy, 2.89 - 4.4m high. *Eucalyptus salmonophloia*
% stressed overstorey	no data	no data	no data	no data	60.0	
Understorey average % cover	no data	no data	no data	no data	8	7 different species. *Lomandra micrantha, Lepidosperma, Acacia lasiocarpa* var *sedifolia* and *Gahnia trifida* were the dominants ranging from 10-20 percent cover.

Plate 36: Plot 43, facing SE diagonally across plot

Plot 44:

Location: E 560646; N 6360072

Situated within the Dulbining Nature Reserve east side of a drain line, approximately 300 m south of Plot 43. Plot established in 2009.

Vegetation Description:

Open woodland of *Eucalyptus wandoo* with Shrubland of *Melaleuca acuminata* and *Hakea preissii*

Salinity Class:

Very saline.

Description:

This plot was established in moderate condition vegetation. The presence of a new *Melaleuc*a species, which was identified as *Melaleuca ?pauperiflora* was an important aspect to plot establishment. Two healthy *Melaleuca pauperiflora* were recorded in the plot and five stressed *Eucalyptus Wandoo* individuals were also recorded. One stressed *Hakea preissii* and 17 *M. acuminata* individuals were also included.

Table 3.40: Plot 44– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	no data	no data	no data	Very	
Overstorey total mature individuals	no data	no data	no data	no data	5 1 2 17	*Eucalyptus wandoo* *Hakea preissii* *M. pauperiflora*, healthy, 1.3-2.61m high. *M. acuminata*, healthy, 1.3 - 3.9m high.
Number of seedlings	no data	no data	no data	no data		
% of stressed overstorey	no data	no data	no data	no data	100.0	Poor crown health
Understorey average % cover	no data	no data	no data	no data	0	No understorey present

Plate 37: Plot 44, facing SE diagonally across plot

Plot 45:

Location: E 560646; N 66359931

Situated within the Dulbining Nature Reserve north of the newly constructed diversion channel. Plot established in 2009.

Vegetation Description:

Shrubland of *Melaleuca lateriflora* and *Melaleuca acuminata* with scattered *Casuarina obesa*.

Salinity Class:

Extremely saline.

Description:

This plot is situated on the border of a completely degraded section of the Reserve. This site was chosen to monitor the effects of the newly constructed diversion channel. One healthy *Melaleuca pauperiflora* was recorded and one stressed *Casuarina obesa*. *Melaleuca lateriflora* and *Melaleuca acuminata* where most abundant; ranging from stressed to healthy.

Table 3.41: Plot 45– summary trend data

Parameter	2000	2002	2004	2006	2009	Comment
Salinity class	no data	no data	no data	no data	Extreme	
Overstorey total mature individuals	no data	no data	no data	no data	1 4 26	*Casuarina obesa* *Melaleuca pauperiflora*, healthy, 1.3-1.9m high. *Melaleuca lateriflora*, 10 stressed, 1.6-4.66m high.
Number of seedlings	no data	no data	no data	no data		
% of stressed overstorey	no data	no data	no data	no data	100.0	Poor crown health
Understorey average % cover	no data	no data	no data	no data	6.0	5 different species. Dominants were *Tecticornia indica and Tecticornia lepidosperma*.

Plate 38: Plot 45, facing SE diagonally across plot

4.3 Seedling Data

Plot 39: Seedling Transect

Location: E 555988; N 6357325

Runs east-west, 60m north of pump 9. Plot established in 2000.

Salinity Class:

Slightly saline.

Description:

The transect runs east to west and is situated at the northern end of the seedling recruitment area. It originally sampled a relatively low density of *Casuarina obesa* seedlings in an open area; however, over the years these transects have become dense clumps.

There was another increase in the number of seedlings over the last two years from 145 to 177. This is likely to be a real increase as there were a number of seedlings less than 50 cm high, suggesting new growth.

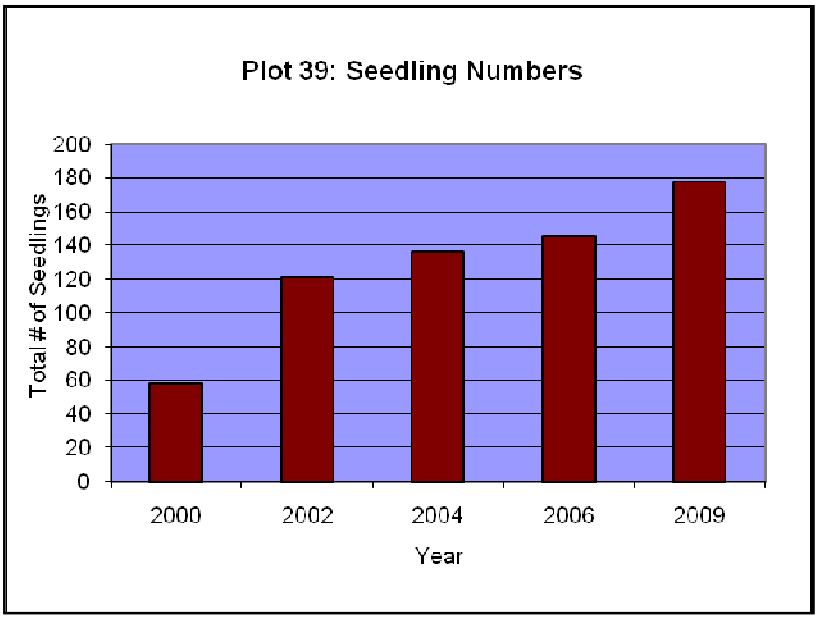


Figure 3.46: Seedling numbers at plot 39

Plate 39: Seedling plot 39, facing east

Plot 40: Seedling Transect

Location: E 555982; N 6357283

Runs east-west, 20m north of pump 9. Plot established in 2000.

Salinity Class:

Slightly saline.

Description:

This transect passes through the stand of *Casuarina obesa* trees just north of pump 9 and into the open area east of the pump. *C. obesa* seedling densities are low under the trees becoming higher in the open areas to the east and west.

Seedling numbers have increased from 517 in 2000 to 927 in 2002 to 1143 in 2004 to 1192 in 2006 and then 1172 in 2009. The decrease in the last two years may be within the range of error in counting large numbers of very small seedlings. It does suggest a slowing of new seedling growth.

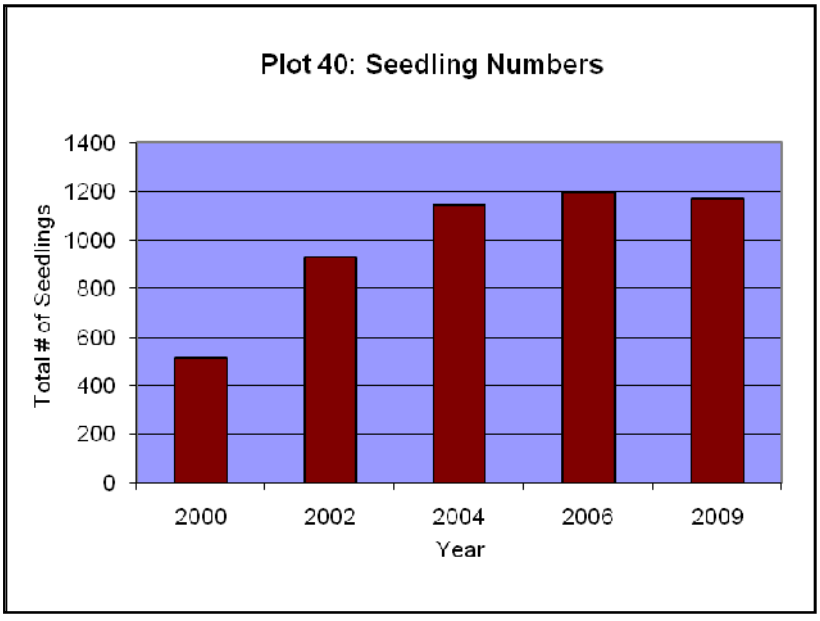


Figure 3.47: Seedling numbers at plot 40

Plate 40: Seedling plot 40, facing east

Plot 41: Seedling Transect

Location: E 555978; N 6357242

Runs east-west, 20m south of pump 9. Plot established in 2000.

Salinity Class:

Slightly saline.

Description:

Very high densities of *Casuarina obesa* seedlings with variable heights occur throughout much of this transect. Soil salinity was extremely saline in 2006 but was recorded as slightly saline in 2009. Seedling numbers have increased from 1469 in 2000 to 2912 in 2002, then declined to 2690 in 2004 and increased to 2719 in 2006 and increased again to 2792 in 2009. The increase between 2006 and 2009 is likely to be within the range of error in counting large numbers of very small seedlings.

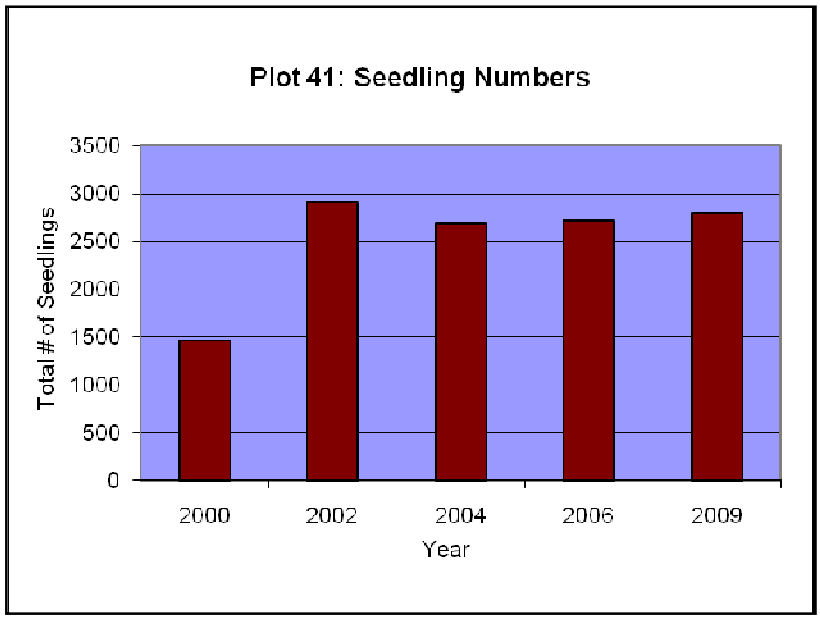


Figure 3.48: Seedling numbers at plot 41

Plate 41: Seedling plot 41, facing east

4.3.1 Seedling Recruitment

During the 1998 reassessment of the Toolibin plots, a significant amount of *Casuarina obesa* seedling recruitment was observed in the western portion of the lake bed. Seedlings were concentrated around Plots 3 and 27 and appeared to have germinated during the autumn/winter of 1998. There was some evidence of grazing however the majority of seedlings appeared healthy. Three 100m seedling transects were established in this area in 2000 to monitor the success of the seedling recruitment event.

From the 2009 results the numbers of seedlings within each transect has remained stable since 2006 and are healthy and still growing. It is becoming increasingly difficult to count accurately due to the large amount and size of the seedlings (some over 4 m high). It is recommended that the transect lines are re-established and fence droppers are placed at 5 m intervals to improve the accuracy of counting seedlings along each of the transects.

4.4 Salinity Data

The validation of EM38 readings with the direct measurement of electrical conductivity of soil samples is first mentioned in the 2002 report, but the method was not elaborated upon, and neither the EC data nor a comparison of the EC and EM38 readings was presented.

From the recommendation made in the 2006 report soil samples were taken at 25cm and 50cm depths where possible. These samples were analysed for EC and compared to the EM38 readings. These were not used to calibrate the EM38 readings as a minimum of 12 sites for each location or major soil type is needed to generate the required linear regression required for calibration (Bennett *et. al*, 1995), but was used for general comparison. Given that plots

were located across a number of soil types it was not practical to auger 12 holes to a depth of 2 m for each soil type.

The comparison of the direct measurements of EC with the EM38 readings are shown in **Table 3.42**.

Table 3.42 Comparison of EM38 readings and direct measurements of EC

Plot	EM38-horizontal	Avg EC for 25cm & 50cm sample	EM38-h as % of EC
3	107	243	44
4	228	913	25
5	239	2945	8
6	172	1206	14
7	170	260	65
8	181	415	44
9	188	176	107
10	224	838	27
11	189	858	22
12	47	31	150
13	15	10	155
15	129	920	14
16	126	91	139
17	138	255	54
18	287	574	50
19	342	2521	14
20	118	628	19
21	886	5021	18
22	662	8447	8
23	168	2350	7
24	143	1035	14
25	112	983	11
26	57	39	144
27	82	330	25
28	252	758	33
29	313	351	89
30	2	35	6
32	219	19	1152
33	110	377	29
34	180	466	39
35	271	1026	26
36	277	1758	16
37	318	1731	18
38	169	676	25
42	205	496	41
43	143	172	83
44	157	369	43
45	328	1569	21

5.0 Discussion

5.1 Methodology

5.1.1 Tree Height

As a result of the recommendations made in the 2004 report relating to tree heights; trees less than 4m only were measured for height, reducing field time and data inaccuracies.

Measuring the growth rates of juvenile trees still provides useful information for managing water levels within Lake Toolibin as the height of seedlings when the lake fills is critical to their survival. It would be reasonable to assume that seedlings totally submerged for a significant time would die; therefore information regarding growth rates will be useful for manipulating water levels within the lake.

A previous recommendation was that the heights of seedlings are to be measured until they reach a nominal height. Clarification needs to be made about exactly what this height is before they are deemed to be 'mature', tagged and allocated into height classes. Permanently tagging immature trees can be problematic as they can outgrow them which can be damaging to the individual. As a result it was recommended that a method of tagging recently mature trees to minimise damage be devised. This was done prior to the 2009 monitoring period in conjunction with the Department of Environment and Conservation (DEC). It was decided that seedlings over 4m should be permanently tagged and classified as mature trees. The method of tagging used was determined by the size of the seedling. Loose wiring was fixed around the stem to reduce the chance of ringbarking the tree if substantial stem diameter growth was to occur before the next monitoring period. These newly tagged seedlings should be carefully monitored to ensure wiring does not restrict growth.

5.1.2 Diameter at Breast Height

From the 2004 report it was suggested that measuring tree diameters required approximately 25 percent of the field time for this project. In addition to being time ineffective, it was not clear if this data was going to be analysed or for what purpose. These measurements were retained for the 2009 survey and should be retained as part of the monitoring methods. DBH is a good way of tracking growth and vigour of trees, and can also permit size class analysis of the populations if required. Size class data can give valuable information on stand dynamics (study of changes in tree stand structure over time, including behaviour during and after disturbances), which can be useful in management planning.

5.1.3 Vigour

Vigour Scale

The vigour scale by Ladd (1996) was originally designed for eucalypts and is essentially subjective, however it does seem to produce reasonably consistent vigour class assessments by different assessors and is appropriate for the project, provided it is only used for analysis in terms of vigour classes (healthy, stressed and dead) as the exact numerical value produced by different assessors using the condition scale is variable and therefore analysis should not be undertaken using these values within the vigour classes.

It was also found that recording the number of dead individuals became problematic over time as some had fallen over, some remained standing and some could not be found due to decomposition. It is a recommendation that all dead trees are removed from the analysis and data representation.

Vigour trends

By removing dead trees from the data analysis it reduces the inconsistencies in the data collection over time. The data through the years appears to be comparable but assessing long term trends can be compromised through inaccuracies in data collection as well as from changes in the position and the number of plots being measured and whether previously dead trees have continued to be included.

Resolving these inconsistencies within the dataset is outside the scope of this project and is a project in its own right. But an attempt to streamline the results and minimise the discrepancies in the data was undertaken by removing any dead trees from the data set. They were still recorded during the field assessment but removed for presentation in the report. It is recommended that dead trees be removed from the dataset if they have been recorded as dead for two monitoring periods. This may help develop a consistent method of recording dead trees.

The analysis of trends provided below is based on the portion of the dataset that includes plots that have been measured from 1998 to 2009. Only percentages of healthy and stressed trees are presented.

5.1.4 Salinity Data

The recommendation that soil samples at each plot were taken at 25 cm and 50 cm depths for validation of the EM38 horizontal readings has been adopted for the 2009 assessment. Vertical readings require comparison of samples up to 2 m below the surface and this cannot be practicably obtained with a hand auger due to soil compaction, the damage it causes and time constraints.

Overall the EM38 horizontal readings provided a good indication of the salinity levels across the study area given the overall agreement between the EM38 readings and the direct EC measurements determined from laboratory testing. No comparison was made with the vertical EM38 readings as there were no soil samples taken for analysis of direct EC measurements to validate the results. There were some discrepancies at some of the sites with the EM38 grossly overestimating the EC levels. Overall 19 of the 38 plots showed the salinity class of the EM38 horizontal readings to be higher than the salinity class of the direct EC measurements (from **Table 3.2**).

The plots with the largest discrepancies included:

- Plots 7, 9 and 44 which were calculated to be very saline according to the EM38 horizontal measurements, however, from the results of the direct EC measurements they were measured as only slightly saline or less.
- Plots 29 and 32 were recorded as extremely saline by the EM38 however the direct EC measurement showed them as only slightly saline or non-saline as well.

According to Bennett *et al* (1995) soil factors such as temperature, moisture, soil salinity and clay content can have an effect on EM38 EC readings and seem to have a greater influence when EC levels are low, which could explain these discrepancies. It may also be difficult to obtain reliable calibrations between the EM38 and topsoil (less than 0.25 m deep) salinities because of seasonal fluctuations and the spatial variability of the salinity levels in this zone (Bennett, George & Ryder 1995). To resolve this would require a minimum of 12 soil samples from across each of the plots, which was previously recommended against due to the disturbance it would cause to the sites.

Although there are discrepancies between the EM38 EC measurements and the direct EC measurements from the soil samples the results are still useful when determining changes in salinity across the study area as the discrepancies can be explained. The sampling regime for soil salinities should be reviewed and include:

- Adequate time allowed to ensure the one soil sample is taken to the depth of 50 cm at each site and not just from the topsoil.
- EM38 Vertical readings are no longer required.
- Make note of soil type at each site (e.g. clay, loam, sand etc) as this may help explain any discrepancies.
- Make note of soil temperature, try to take samples from a shaded area.
- Make note of recent rainfall prior to sampling.

From the EM38 results it appears that salinity levels have decreased within the northern section of the Dulbining Nature Reserve (plots 15, 16 and 17) and from the northern part of Lake Toolibin (plots 3, 11, 34 and 38). Areas where salinity has increased were in the southern part of Lake Toolibin (plots 28, 35 and 42) these results are presented on **Map 2**.

5.1.5 Percentage Cover for Overstorey

In previous years the monitoring brief has stated that percentage cover for each overstorey species be estimated at 100 points across the 20 x 20 m plots (i.e. at 2 m intervals). No data for this was presented in the 2002 report and it was deemed in 2004 that this method was both time consuming and less accurate than making a single estimate of the percentage cover of each overstorey species in each plot. In 2009 an estimate of the overall percentage cover for each species within the whole plot was measured, results are presented in **Appendix 5**.

5.2 Vegetation Trends

During the field assessment in 2009, the data recorded was able to be compared to previous monitoring data as it was made available. Access to the previous dataset enables the data collectors to ensure the consistency of data collection within any individual plot over time. It is therefore a continued recommendation that for future monitoring, raw data from previous years be made available to the data collectors to ensure data at individual plots is collected consistently. In order to achieve this, all raw data available in excel format has been culminated and supplied to the DEC.

The purpose of the monitoring program is to measure changes in vegetation over time. From the 2004 and 2006 report it was established that assessing the long term trends is somewhat compromised due to inconsistencies in the data collection over time, which has resulted from changes in the position and number of plots being measured and whether previously dead trees have continued to be included in the datasets for the plots.

Given the difficulties in using the existing dataset it was recommended that the monitoring program be reviewed and long term trends only be measured and displayed from a date at which all data is being collected in a consistent manner. This report still displays all the years from 1977 and includes the latest data from the plots established in 2009 to allow for comparison of monitoring periods in previous reports. However dead trees will be removed from the long term trends data presentation to minimise the discrepancies and inaccuracies from the data collected. The analysis of the monitoring program still requires a review to determine from which date data will be represented.

5.2.1 Terrestrial Vegetation

Generally the overall trend in the vigour of key terrestrial tree species has not changed since 1998. The condition and vigour of *E. salmonophloia* remains stable as does *E. loxophleba*, *E. wandoo* and *Allocasuarina huegeliana*. Two *Banksia prionotes* individuals were recorded as dead within plot 13 during the 2009 survey which were healthy in 2006, and there was no evidence of seedling regeneration. *Banksia prionotes* is a fire-sensitive species with a lignotuber and therefore cannot regenerate vegetatively after being burnt in a bushfire and relies on seed for regeneration. Without fire, seeds might not germinate,

however, the timing of a fire is also critical as the highest rate of seedling establishment occurs when seed is released during late summer/autumn and followed soon by late autumn/winter rains (Cowling & Lamont 1985).

The *Eucalyptus* seedlings found in plots 7, 28 and 33 were identified as *Eucalyptus loxophleba*. The *E. loxophleba - A. acuminata* woodlands and the *Melaleuca* and *Acacia* plots showed a slight decline in crown health (**Map 3**). The salinity class at these plots has improved over time, however it appears that vegetation health is still declining (**Map 2** and **Map 3**). This could be due to water regimes and rainfall amounts rather than increase in salinity.

The following figures show the vigour trend of individual species across all monitoring plots.

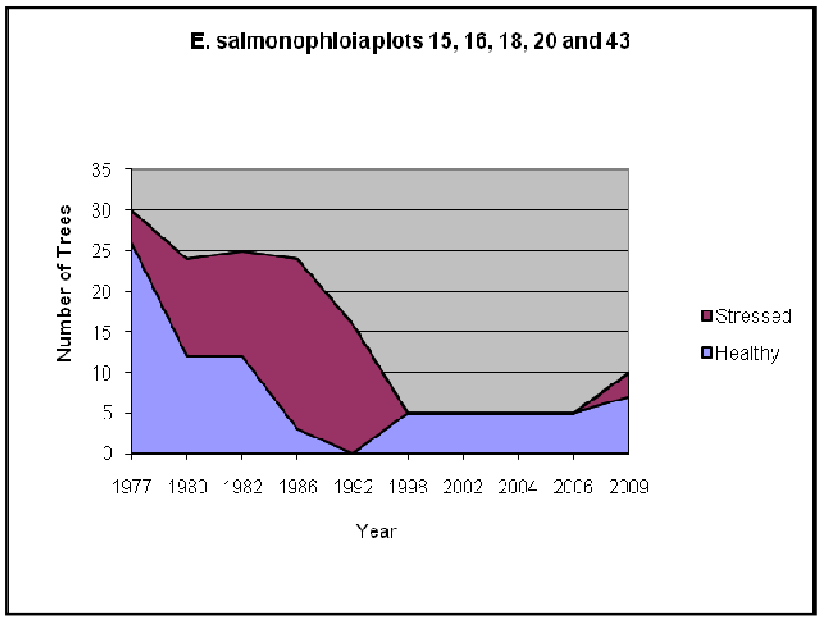


Figure 4.1: Trend in vigour for all E. salmonophloia trees within the study area

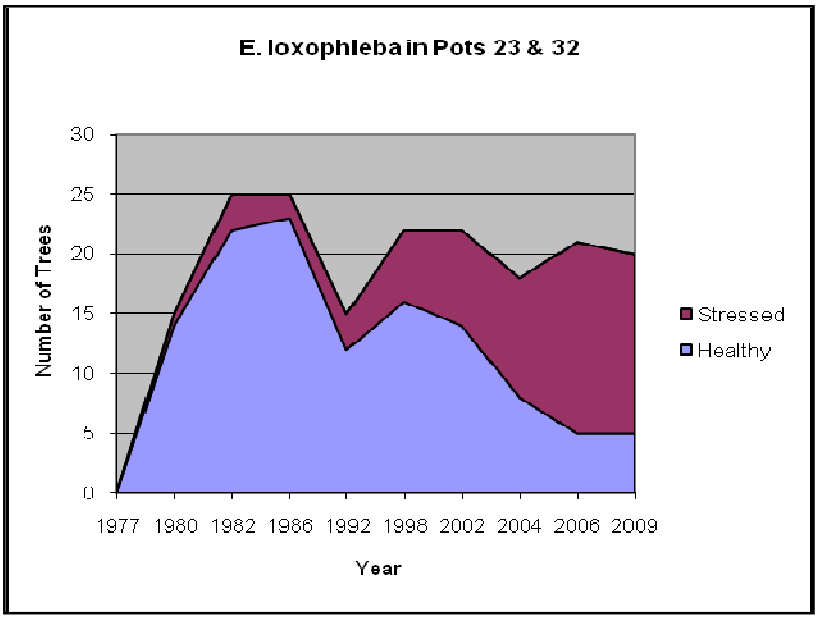


Figure 4.2: Trend in vigour for all E. loxophleba trees within the study area

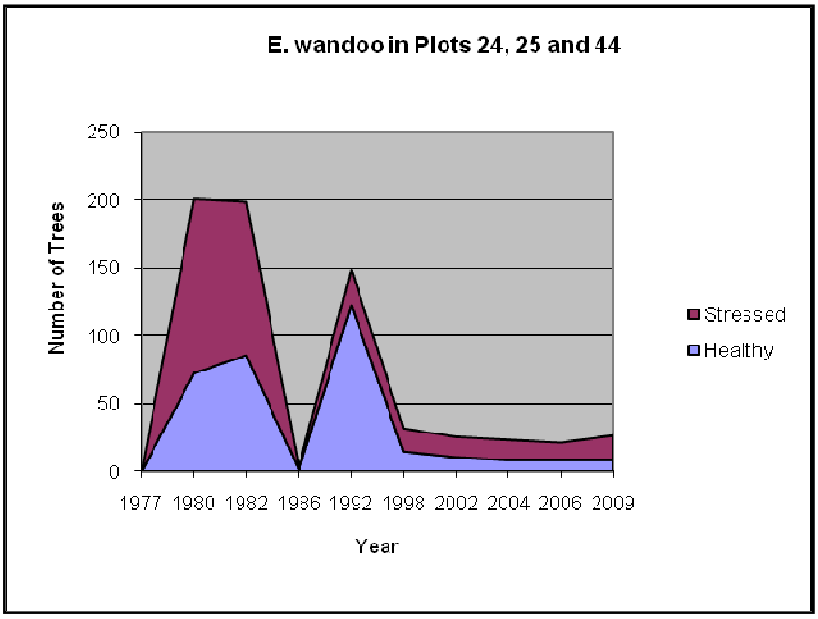


Figure 4.3: Trend in vigour for all E. wandoo trees within the study area

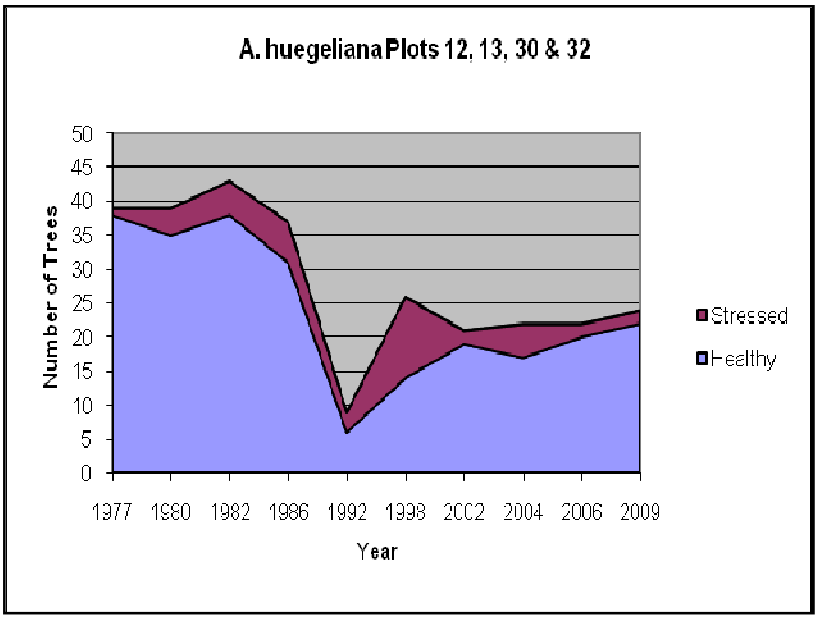


Figure 4.4: Trend in vigour for all A. huegeliana trees within the study area

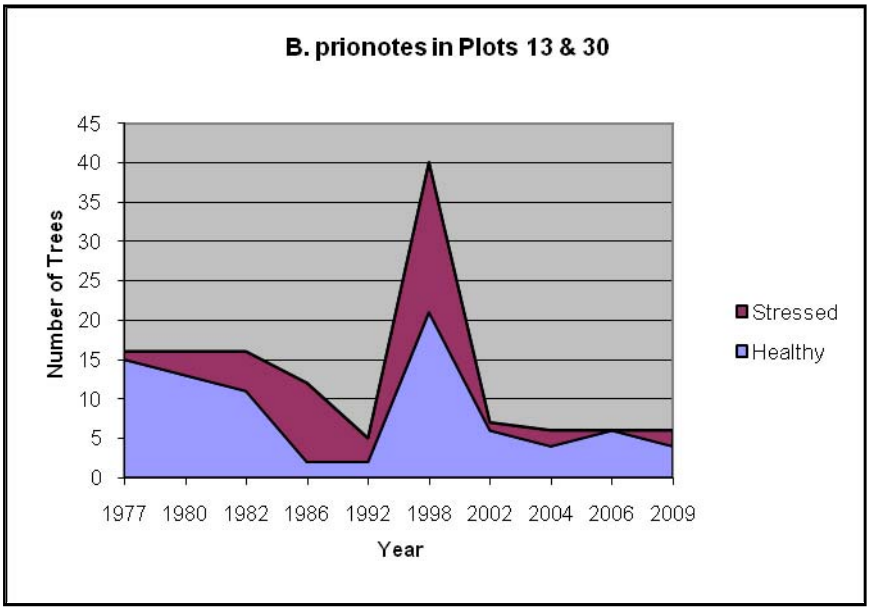


Figure 4.5: Trend in vigour for all B. prionotes trees within the study area

The figures above imply that data from all plots began in 1977, however in:

- Figure 4.1 only Plot 18 was monitored in 1977, Plot 23 was first monitored in 1980, Plot 32 was first monitored in 1983 and Plot 43 was first monitored in 2009
- Figure 4.3 Plots 23,24 and 25 were first monitored in 1980 and Plot 44 was first monitored in 2009
- Figure 4.4 Plots 12 and 13 were monitored in 1977, Plot 32 was first monitored in 1983 and Plot 30 first monitored in 1998
- Figure 4.5 only Plot 13 was monitored in 1977, Plot 30 was first monitored in 1998

As shown above, comparison of actual numbers within vigour class overtime is not legitimate if data from plots established at later dates has been added into the graphs beginning from 1977. When a new plot is established and the data is added to previous trend graphs, it can appear that there has been a dramatic increase in the number and vigour of a species which results in a misrepresentation of the overall trend.

Therefore it is recommended that review of the trend data should start from 2002 as this is the earliest date with the most consistent data. It would be preferable to start from 2000 however, only the plots established in 2000 were monitored that year and therefore does not represent the whole dataset.

5.2.2 Wetland Vegetation

Casuarina Obesa

The data in Figure 4.6 represents the actual number of *C. obesa* within Lake Toolibin showing the plots monitored since 1977 and includes the plots established in 2000 and 2009. The overall number of healthy *C. obesa* trees has remained stable across the whole site since 2004.

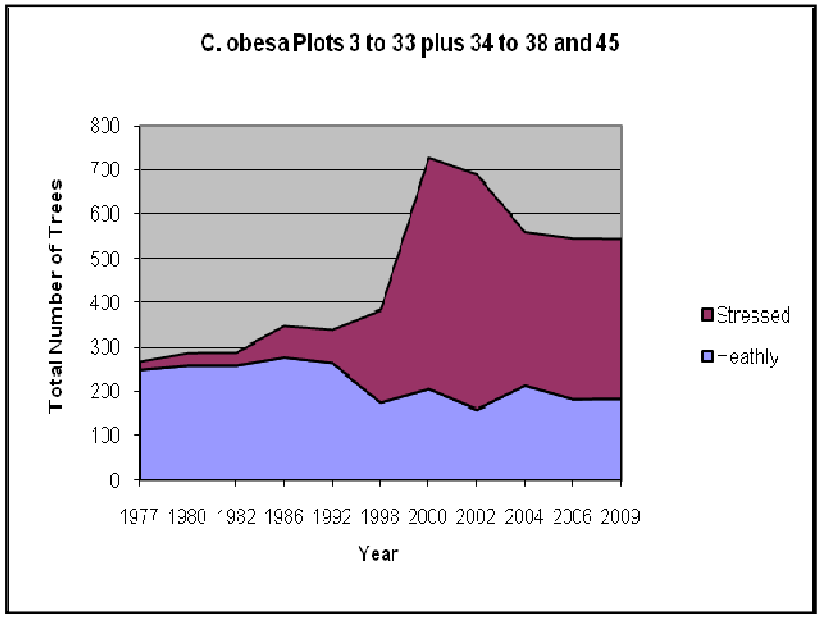


Figure 4.6: Trend in vigour for all C. obesa a trees within the Lake Toolibin monitoring plots

The trend of reducing vigour since 2002 is likely to be the result of rainfall patterns rather than the effects of increased salinity. From 2004 to 2009 Toolibin Lake received below average rainfall compared to the abnormally high rainfall which was received in 2003 (**Figure 4.7**) which would have accounted for the improved health of species within the 2004 monitoring period.

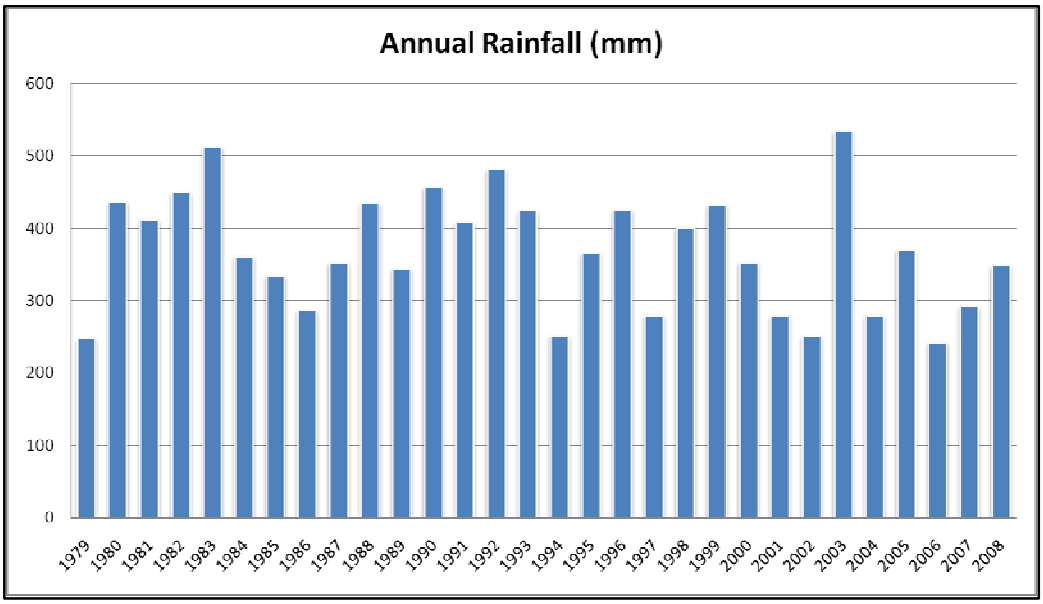


Figure 4.7: Annual Rainfall for Lake Toolibin Area 1979 - 2008

It is likely that a significant portion of the stress recorded in the *C. obesa* trees monitored in 2002 had been induced by three successive years of below average rain and the improvement in species health in 2004 was due to the above average rainfall in 2003, which allowed some stressed trees to recover. However, it appears that a significant portion of these trees have now died or are becoming increasingly stressed again. This trend appears to support investigations reported by Ogden and Froend (2002) at Toolibin Lake that showed both mature trees and seedlings of *C. obesa* and *M. strobophylla* are very dependent on rainfall to surface soils. The above rainfall chart only goes back to 1979, these last 25 years have been noted as being much dryer than the previous 25 years, which averaged closer to 450 mm/year (Lacey 2007).

Melaleuca strobophylla

The mature *Melaleuca strobophylla* population has declined almost continuously since 1977 and this trend has continued over the last two years, as shown in **Figure 4.8**. Of the original 111 tagged live trees assessed in 1977 only 29 remained in 2002, 18 in 2004, 10 in 2006 and five in 2009. Of the surviving trees in 2009 only two were healthy, with five found dead.

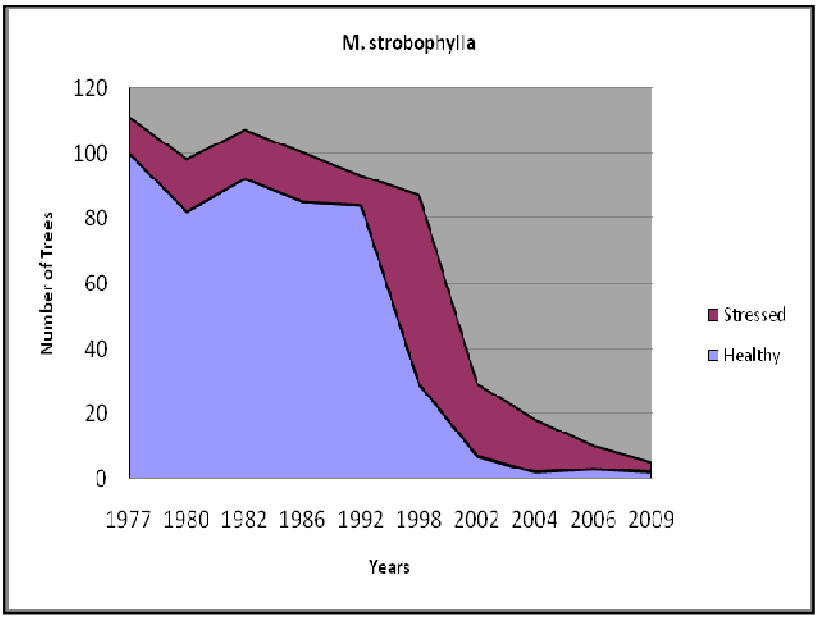


Figure 4.8: Trend in vigour for all M. strobophylla trees within the Lake Toolibin monitoring plots

This continued decline is not necessarily caused by continuing increases in salinity as most plots have not shown significant increases in salinity levels over the past two years, and there was evidence of *Melaleuca strobophylla* seedling growth at all the plots where it was previously recorded.

5.2.3 Understorey

The changes to the understorey plant communities since 2006 were minimal at most plots, the presence of *Atriplex semibaccata* and *Maireana brevifolia* increased slightly while *Angianthus tomentosus* was found at more plots but in less abundance and *Goodenia viscida* was also recorded at the same plots (7 and 33) but in higher abundance. The most significant change was the presence of *Mesembryanthemum nodiflorum* (Slender Ice plant), a weed species which has not been previously observed within the study area. This species is thought to be an indicator of increasing salinity, however since Lake Toolibin and surrounding Reserves are already saline it is assumed that it has been brought onto the site through other means. This species is a prolific seeder, does not respond well to herbicide applications and is rarely utilised by grazing fauna. It was recorded from 11 plots (10, 11, 17, 18, 19, 29, 32, 34, 37, 38 and 45) ranging from the centre of the lake to the plots at the northern end of the Dulbining Reserve (**Appendix 2**)

Grazing pressures on seedlings and establishing understorey species such as *Maireana brevifoli*a is of concern. Previously recorded *Casuarina obesa* seedlings were found dead or with minimal growth since 2006. Fencing trials to allow seedling establishment by preventing access by grazing fauna have previously been undertaken, and is recommended to continue to allow better survival rates of seedlings. The presence of grassy weeds was also noted to be more abundant across most of the areas surrounding Lake Toolibin.

6.0 Recommendations

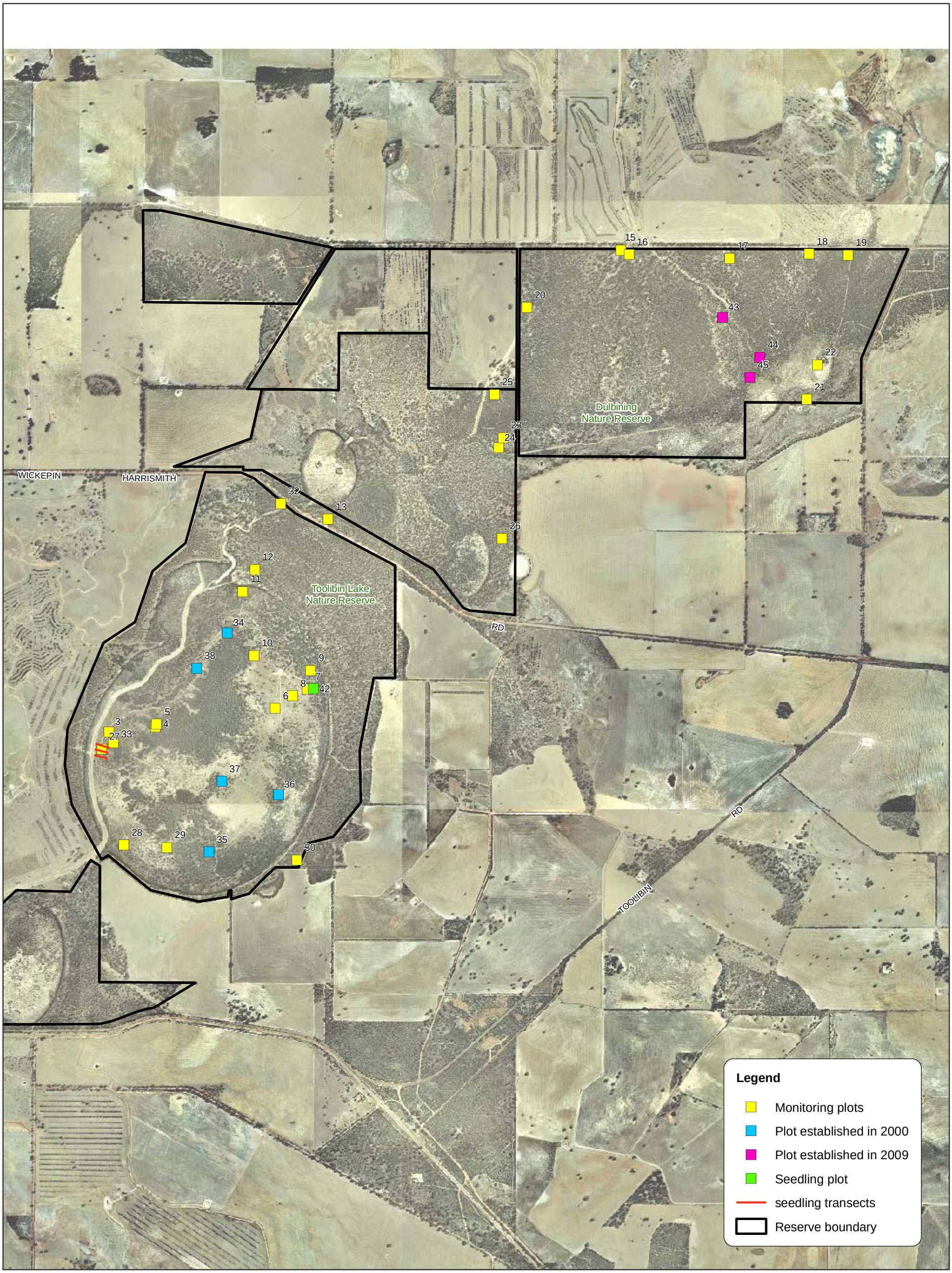
It is recommended that:

1. The heights of seedlings are measured until they reach a nominal height of 4 metres. When they reach this height they are deemed to be 'mature' and then allocated to height classes as well as numbered and tagged with loose wiring to minimise damage to still growing trees.
2. The protocol for tagging recently matured trees to minimise damage to still growing individuals is to loosely fix wiring around the stem to allow for growth.
3. Newly 'mature' and tagged trees should be closely monitored during assessment and the wiring changed to continually allow for further growth
4. A single estimate of the percentage cover of each overstorey species in each plot continues.
5. All dead trees are removed from the data set if they have been recorded as dead for two monitoring periods.
6. All dead trees are to be removed from analysis and data representation.
7. Previous raw data is made available to the data collectors to enable consistent data collection at individual plots and ease of data analysis.
8. The monitoring program is reviewed and long term trends start from 2002 as this is the earliest date with the most consistent data.
9. Review the vegetation descriptions for each of the plots (still include original description).
10. Soil samples to continue to be taken at 25 and 50 cm depths only for validation of the EM38 horizontal readings.
11. EM38 vertical readings are no longer required to be taken in the field due to lack of calibration from soil samples.
12. The sampling regime for soil salinities should be reviewed to allow adequate time in the field to ensure the one soil sample is taken to the depth of 50 cm at each site and not just from the topsoil.
13. At each plot notes of soil type (e.g. clay, loam, sand etc), soil temperature, recent rain/soil moisture should be taken to help explain any discrepancies in salinity data.
14. Re-establish the fencing trials to allow seedling establishment.
15. Enter all available data into one database, e.g. MS Access or Excel to easily compare trends and supply the dataset to consultant to make it easier to analyse the data.
16. Photo monitoring and general condition observations to be made every two years and comprehensive vegetation monitoring to occur every five years to allow sufficient time

to capture changes in the condition. This is to occur except after a flood event when monitoring should occur the subsequent year to monitor the survivability of species.

17. Re-establish seedling transect lines and place fence droppers at five metre intervals to improve accuracy of data collection.

7.0 Maps



Imagery (DEC, 2001)

Vegetation monitoring of Lake Toolibin and Reserves

Map 1

Location of monitoring plots

May 2009

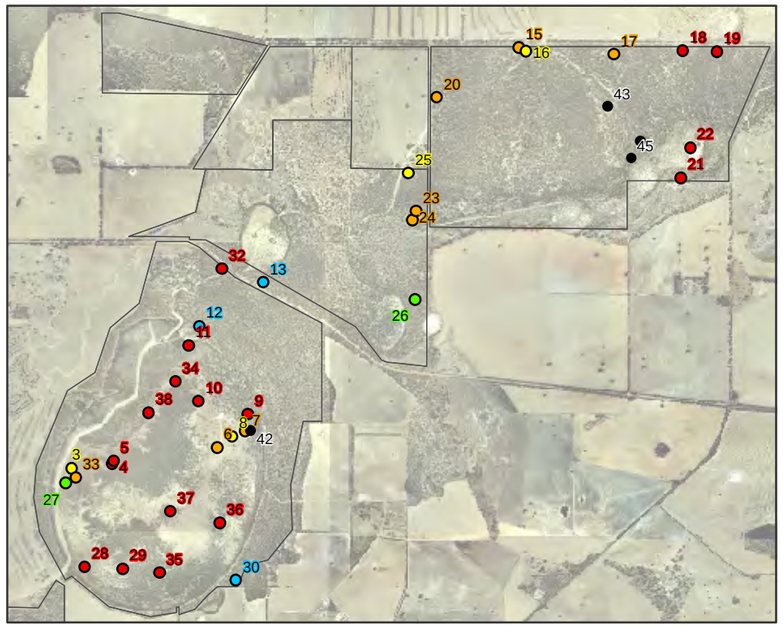
prepared for DEPARTMENT OF ENVIRONMENT AND CONSERVATION

0 0.2 0.4 0.6 0.8 1 Kilometers

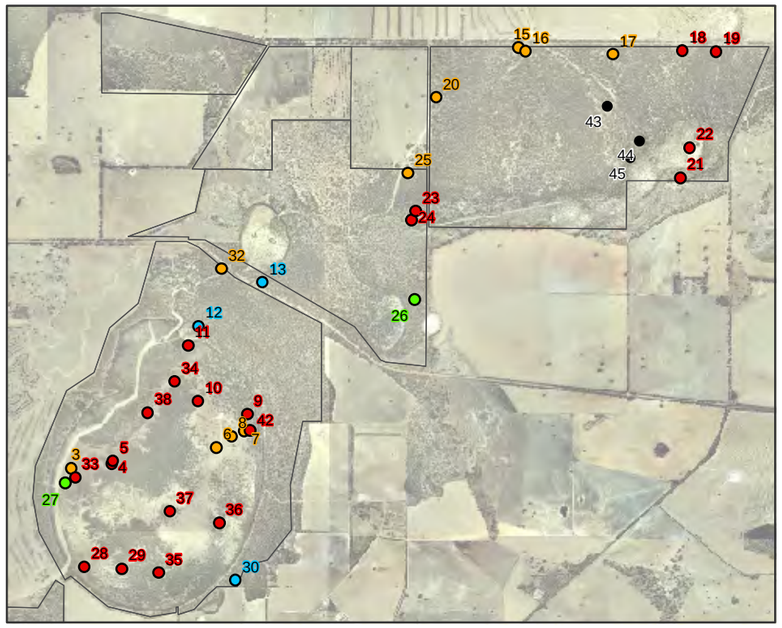
1:25,000 @ A3

Project No. 2193-08

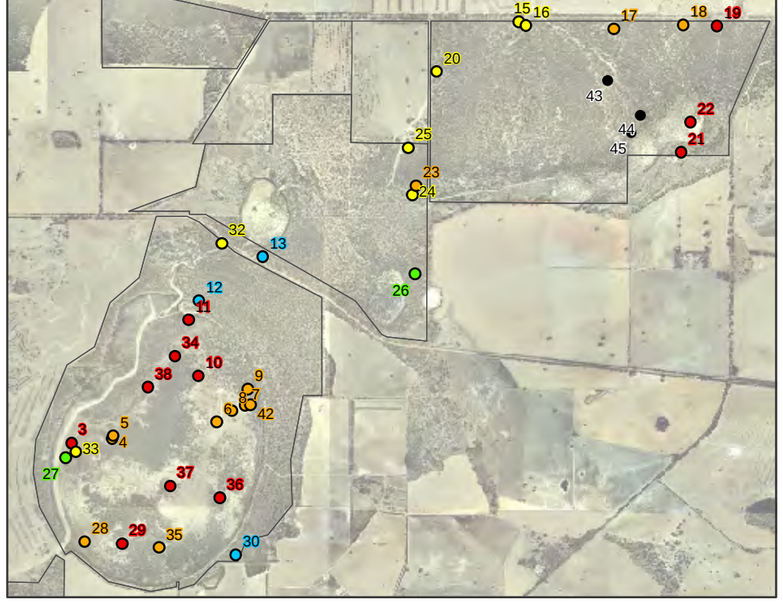
ecoscape



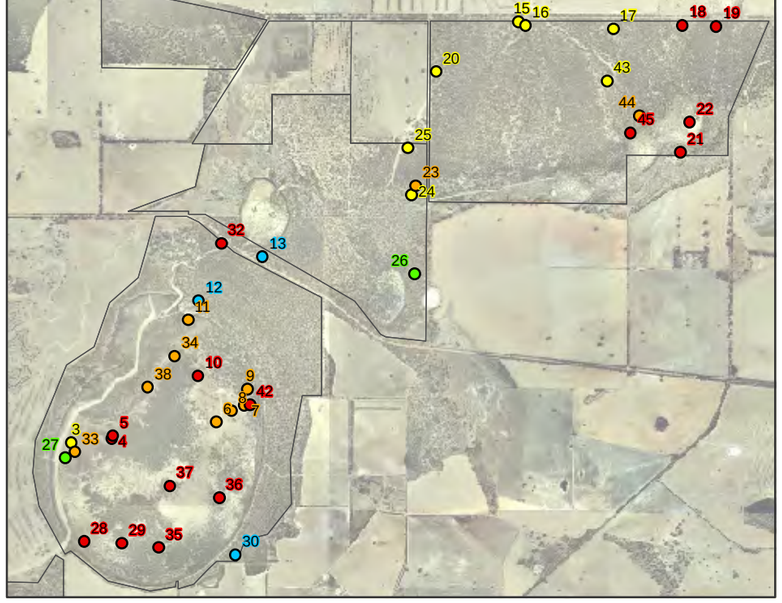
2002



2004



2006



2009

Legend

Salinity class (Bennett, George & Ryder, 1995)

- Extremely
- Very
- Moderately
- Slightly
- Non-Saline
- no data
- Reserve boundary

Vegetation monitoring of Lake Toolibin and Reserves

Map 2

Salinity Trends: 2002-2009

May 2009

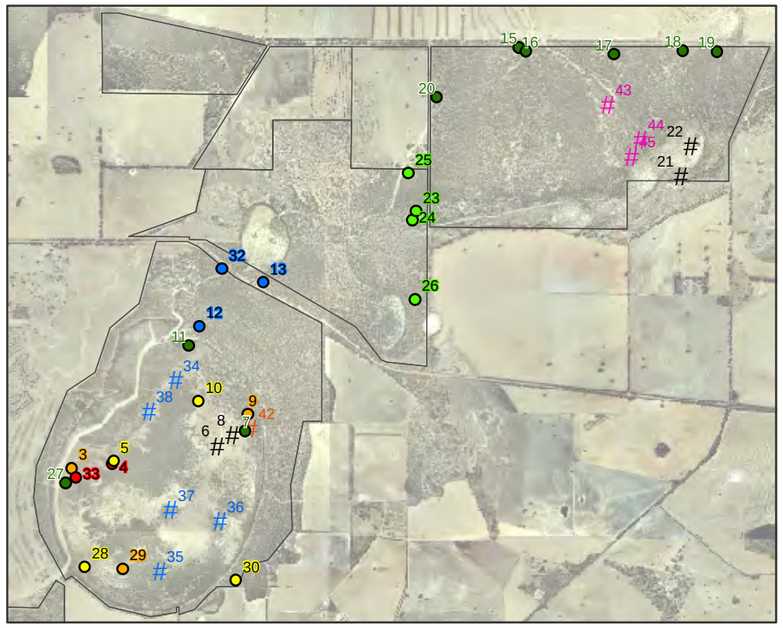
prepared for DEPARTMENT OF ENVIRONMENT AND CONSERVATION

0 0.6 1.2 1.8 2.4 3 Kilometers

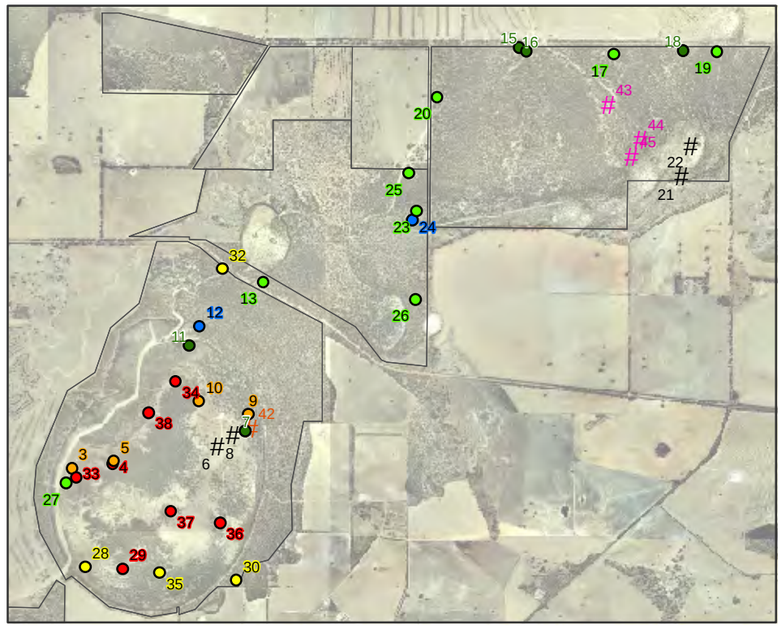
1:50,000 @ A3

Project No. 2193-08

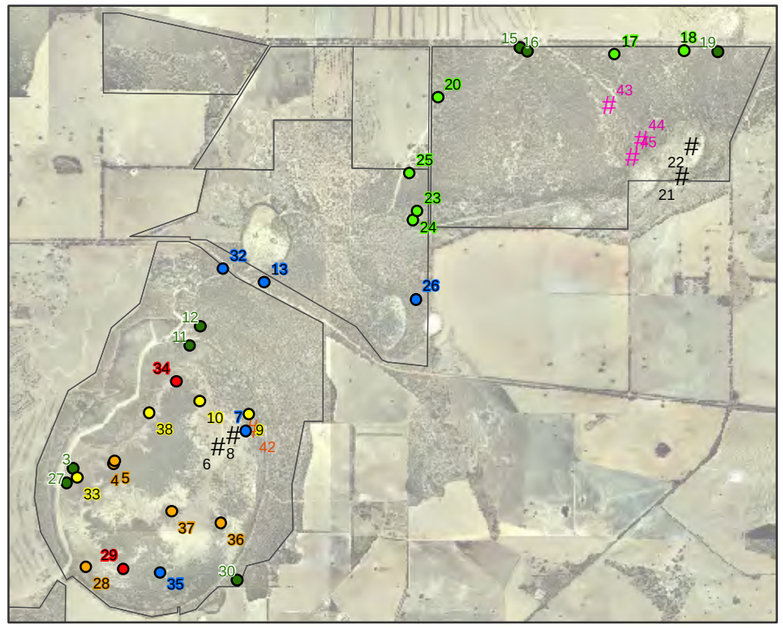
ecoscape



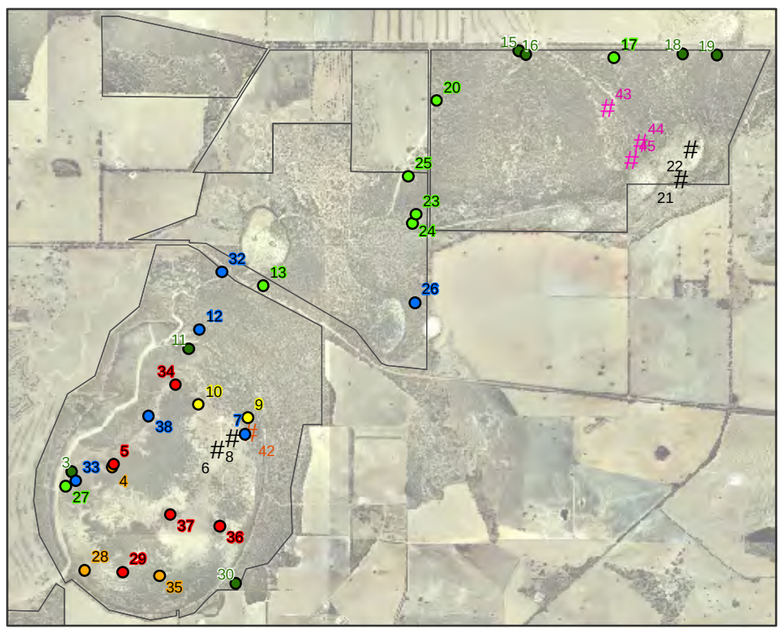
1998



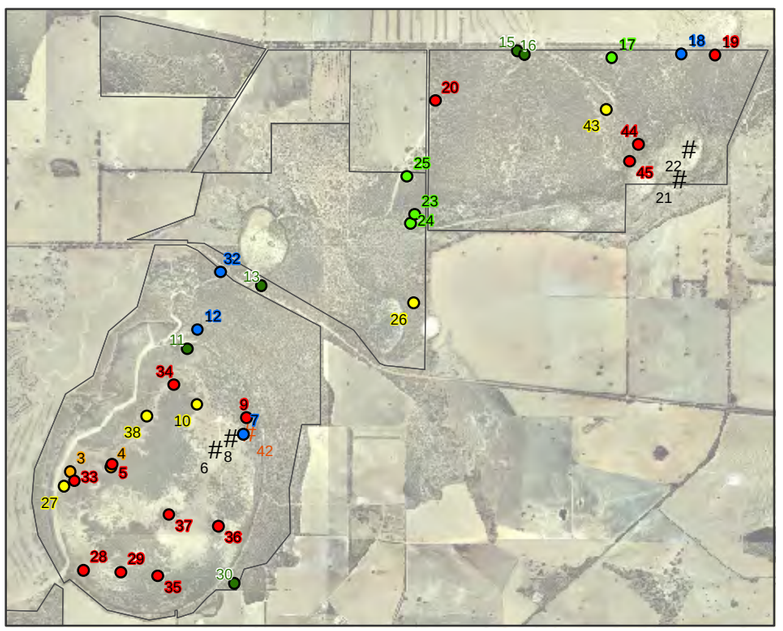
2002



2004



2006



2009

Legend

Vegetation stress class

- 0.0%
- 0.1% - 20.0%
- 20.1% - 40.0%
- 40.1% - 60.0%
- 60.1% - 80.0%
- 80.1% - 100.0%
- # no trees
- # seedling plot
- # plot established in 2000
- # plot established in 2009
- Reserve boundary

Vegetation monitoring of Lake Toolibin and Reserves

Map 3

Vegetation Vigour Trends: 1998-2009

May 2009

prepared for DEPARTMENT OF ENVIRONMENT AND CONSERVATION

0 0.6 1.2 1.8 2.4 3 Kilometers

1:50,000 @ A3

Project No. 2193-08

ecoscape

References

Bennett, D, George, R & Ryder, A (1995), *Soil salinity assessment using the EM38: Field operating instructions and data interpretation*, Department of Agriculture Western Australia,, Perth.

Cowling, RM & Lamont, BB (1985), 'Seed release in Banksia: the role of wet-dry cycles', *Australian Journal of Ecology,* vol. 10, pp. 169-71.

Department of Agriculture and Food Western Australia (2006), *Salinity Measures, Units and Classes*, April-09, from http://www.agric.wa.gov.au/environment/land/salinity/measurement/salinity_levels_for_revegetation.htm

Froend, R, Pettit, N & Ogden, G (1998), *Vegetation Monitoring of Toolibin Lake and Reserves: November 1998*, Unpublished report prepared for the Department of Conservation and Land Management, Perth.

Hunt, N & Gilkes, B (1992), *Farm Monitoring Handbook*, University of Western Australia, Perth.

Lacey, P (2007), ed. NJ Randall, Perth, p. Email.

Ladd, P (1996), *Ecology/Ecological Principles – Unit Manual*.

Ogden, G & Froend, R (2002), *Vegetation Monitoring of Toolibin Lake and Surrounding Reserves, 2002*, Unpublished report for the Department of Conservation and Land Management, Narrogin by Edith Cowan University, Perth.

Appendix One: Overstorey Data

Vegetation Monitoring of lake Toolibin and Reserves

Plot No.	Tag No.	Subplot	Species	2009 DBH (cm) or #	2009 Ht (m)	2009 Crown Health
		A	*C. obesa*		3.14	1H
3	**182**	A	*C. obesa*	25.8		10
3		B	*C. obesa*		0.6-1.2	1 Grazed, 1H
3	**183**	C	*C. obesa*	17.3		15
3		C	*C. obesa*		0.5-0.75	6 grazed
3	**184**	D	*C. obesa*	32.6		11
3		D	*C. obesa*		0.3-0.8	grazed
3		E	*C. obesa*		0.1-0.5	grazed
4		A	*C. obesa*		0.35	grazed
4		A	*M. strobophylla*		0.65, 0.75, 0.25	3H
4	**185**	B	*C. obesa*	15		8
4	**187**	B	*C. obesa*	12.7	0.4, 0.4	3
4		B	*C. obesa*		0.55, 0.8, 0.8	grazed
4		B	*M. strobophylla*		0.2, 0.3, 0.42	3H
4	**186**	C	*C. obesa*	17.1		11
4	**188**	C	*C. obesa*			
4	**194**	C	*C. obesa*	19.1		11
4	**197**	C	*C. obesa*	15.5, 15		13
4	**198**	C	*C. obesa*			
4		C	*M. strobophylla*			
4	**200**	D	*C. obesa*	15.2		10
4	**201**	D	*C. obesa*			
4	**202**	D	*C. obesa*			
4	**203**	D	*C. obesa*			
4		D	*C. obesa*		0.6	H
4		D	*M. strobophylla*			
4	**205**	E	*C. obesa*	11.7		13
4		E	*M. strobophylla*		0.3-1.91	25 H
4		E	*C. obesa*			
5	**209**	A	*C. obesa*	11.1	0.2-1.64	6
5	**210**	A	*C. obesa*	21.5		10
5		A	*M. strobophylla*			12H
5	**212**	B	*M. strobophylla*			
5	**213**	B	*C. obesa*			
5	**214**	B	*C. obesa*	6.5, 6.7, 8.6		12
5	**215**	B	*C. obesa*			12
5	**216**	B	*C. obesa*	6.7, 3.8, 3.5, 5.6		10
5	**217**	B	*C. obesa*	6.5		12
5	**218**	B	*M. strobophylla*			
5	**220**	B	*C. obesa*	5.5, 5.1		14
5	**224**	B	*C. obesa*	17.4		14
5	**225**	B	*C. obesa*	19.7, 16, 19.2		7

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
5	**400**	B	*C. obesa*	5.2		10
5		B	*M. strobophylla*		1-2.21	7H
5		B	*C. obesa*		1	1H
5	**226**	C	*C. obesa*	5.3		8
5	**227**	C	*C. obesa*	7.4		8
5	**228**	C	*C. obesa*	4.6		5
5	**229**	C	*C. obesa*	9		8
5	**230**	C	*C. obesa*	4.8		5
5	**231**	C	*C. obesa*	7		5
5	**232**	C	*M. strobophylla*			
5	**233**	C	*C. obesa*	4.1		5
5	**234**	C	*M. strobophylla*			
5	**235**	C	*M. strobophylla*			
5	**236**	C	*C. obesa*			
5	**238**	C	*C. obesa*	3.7		4
5	**239**	C	*C. obesa*	5.3		5
5	**242**	C	*C. obesa*	3.7		8
5	**243**	C	*C. obesa*	5.3		9
5	**244**	C	*M. strobophylla*			
5	**245**	C	*C. obesa*	10.5		9
5	**248**	C	*M. strobophylla*			
5	**249**	C	*M. strobophylla*			
5	**250**	C	*C. obesa*	8.7		
5	**251**	C	*M. strobophylla*			
5	**252**	C	*C. obesa*	7.6		11
5	**253**	C	*C. obesa*	3.1		11
5	**254**	C	*M. strobophylla*			
5	**255**	C	*C. obesa*	6.4		12
5	**256**	C	*C. obesa*	6.8		12
5	**257**	C	*C. obesa*	7.4		12
5	**258**	C	*M. strobophylla*			
5	**259**	C	*M. strobophylla*		1-1.1	2H, 1D
5	**260**	D	*C. obesa*	6.4, 5.5		10
5	**261**	D	*C. obesa*	4.4		5
5	**262**	D	*C. obesa*	3.1		4
5	**263**	D	*C. obesa*	5.4		5
5	**264**	D	*M. strobophylla*			
5	**265**	D	*C. obesa*	8		3
5	**267**	D	*C. obesa*	3.4		6
5	**268**	D	*C. obesa*	5.8		9
5	**269**	D	*C. obesa*	4.8		5
5	**270**	D	*C. obesa*	3.1		5
5	**271**	D	*C. obesa*	4.7		3
5	**272**	D	*C. obesa*			
5	**274**	D	*C. obesa*			
5	**275**	D	*M. strobophylla*			
5	**276**	D	*C. obesa*			
5	**277**	D	*M. strobophylla*			
5	**283**	D	*C. obesa*	2.6		5
5	**284**	D	*C. obesa*			
5	**285**	D	*C. obesa*	3.7		9
5	**286**	D	*C. obesa*			
5	**289**	D	*C. obesa*	5.6		10

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
5	**290**	D	*C. obesa*	5.7		9
5	**291**	D	*C. obesa*	5.3, 5.5, 8, 5.3, 6.3, 4.6, 6.7		11
5	**292**	D	*C. obesa*	4.5		11
5	**295**	D	*C. obesa*			3
5	**305**	D	*C. obesa*	4		6
5	**306**	D	*C. obesa*	6.2		7
5	**307**	D	*C. obesa*	6.1		7
5	**309**	D	*C. obesa*	7		12
5	**310**	D	*C. obesa*	5.1, 4.58		12
5	**312**	D	*M. strobophylla*			
5	**313**	D	*M. strobophylla*			
5	**315**	D	*C. obesa*	7.1		3
5	**317**	D	*C. obesa*	4.9		6
5	**318**	D	*M. strobophylla*			
5	**320**	D	*C. obesa*	5.3		7
5	**321**	D	*M. strobophylla*			
5	**322**	D	*C. obesa*	4.3		5
5	**323**	D	*C. obesa*	6		3
5	**324**	D	*C. obesa*	6.3, 3.3, 2.2		3
5	**379**	D	*M. strobophylla*			
5	**380**	D	*M. strobophylla*			
5	**381**	D	*C. obesa*	4.6		5
5	**401**	D	*C. obesa?*	4.7		3
5	**327**	E	*C. obesa*	3.7		3
5	**328**	E	*C. obesa*	5.2, 4.8		8
5	**329**	E	*C. obesa*	5.5		3
5	**330**	E	*C. obesa*	6.8, 8.7, 6.4		3
5	**332**	E	*C. obesa*	5.9, 6.5, 5.6		12
5	**334**	E	*C. obesa*	9.5		12
5	**336**	E	*C. obesa*			
5	**383**	E	*C. obesa*	6		9
5	**385**	E	*C. obesa*	5.3		9
5	**387**	E	*C. obesa*	5.4		9
5	**388**	E	*C. obesa*	4.1		9
5	**389**	E	*C. obesa*	5.2, 3		6
5	**390**	E	*C. obesa*	4.7		5
5	**391**	E	*C. obesa*	5.2, 4.5, 6.9, 2.5		6
5	**392**	E	*C. obesa*	4.2		3
5	**393**	E	*C. obesa*	4.1		3
5	**395**	E	*C. obesa*	5.1		8
5	**396**	E	*C. obesa*	5.9		10
5	**397**	E	*C. obesa*	5.2		10
5	**398**	E	*C. obesa*	2.9		3
6		A	all dead			
6		B	all dead			
6		C	all dead			
6		D	all dead			
6		E	all dead			
7	**101**	B	*C. obesa*	39.4, 23.8, 23.5		15
7		C	*Eucalyptus sp.*		1.42-3.94	24
7		D	*Eucalyptus sp.*			DEAD
7		D	*C.obesa*		0.5-1	
7	**102**	E	*C. obesa*	18.5, 14, 13.3		17

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
7	**103**	E	*C. obesa*	64.7		10
7	**104**	E	*C. obesa*	44.8		12
7		E	*C.obesa*		0.2-0.5	
8		A	all dead			
8		B	all dead			
8		C	all dead			
8		D	all dead			
8		E	all dead			
9	**105**	A	*C. obesa*	10.1		7
9	**106**	A	*C.obesa*	16.1		10
9	**107**	A	*C.obesa*	9.9		10
9	**108**	A	*C.obesa*	11.5		10
9	**109**	A	*C.obesa*	7.3		10
9	**110**	A	*C.obesa*	17.3, 10.6, 8.6		8
9	**111**	A	*C.obesa*	15.9		10
9	**112**	A	*C.obesa*	16.3		8
9	**113**	A	*C.obesa*	17.7		12
9	**114**	B	*C.obesa*	18.9		6
9	**115**	C	*C.obesa*	14.6, 10.2		8
9	**116**	C	*C.obesa*	5		5
9	**117**	C	*C.obesa*	7.2		7
9	**118**	C	*C.obesa*	4.4		4
9	**119**	C	*C.obesa*			
9	**120**	C	*C.obesa*	15.5, 13.3, 11.4		6
9	**121**	C	*C.obesa*			
9	**122**	C	*C.obesa*	14.5		9
9	**123**	C	*C.obesa*	18.5		4
9	**124**	C	*C.obesa*	6.8		9
9	**125**	C	*C.obesa*	14.4		10
9	**126**	C	*C.obesa*	10.7, 7.2, 3.9		6
9	**127**	D	*C.obesa*	11.6		7
9	**128**	D	*C.obesa*	13.8		7
9	**129**	D	*C.obesa*	12.5		8
9	**130**	D	*C.obesa*	3.2		3
9	**131**	D	*C.obesa*	8.8		6
9	**132**	D	*C.obesa*			
9	**133**	D	*C.obesa*			
9	**134**	D	*C.obesa*	13.9		10
9	**135**	D	*C.obesa*	5.9		4
9	**136**	D	*C.obesa*	14.4		8
9	**137**	D	*C.obesa*	13.8, 11.2, 9.6		11
9	**138**	D	*C.obesa*	19.4		7
9	**139**	E	*C.obesa*	12.5		9
9	**140**	E	*C.obesa*	19.8		7
9	**141**	E	*C.obesa*	3.2		5
9	**142**	E	*C.obesa*	5.5, 5.7		3
9	**143**	E	*C.obesa*	6.8		3
9	**145**	E	*C.obesa*	5.3		3
9	**146**	E	*C.obesa*	7.5		5
9	**147**	E	*C.obesa*	5.2		3
9	**148**	E	*C.obesa*	9		5
9	**149**	E	*C.obesa*	5.4		3
9	**150**	E	*C.obesa*	5.1, 4.4		3

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
9	**151**	E	*C.obesa*	5.8		5
9	**152**	E	*C.obesa*	6.9		5
9	**153**	E	*C.obesa*			
9	**154**	E	*C.obesa*	3.3, 3.7, 12.8		7
9	**155**	E	*C.obesa*	6.9		9
9	**158**	E	*C.obesa*	13.2		7
9	**159**	E	*C.obesa*	5.2, 4.9		3
9	**160**	E	*C.obesa*	10.1		7
9	**161**	E	*C.obesa*			
9	**162**	E	*C.obesa*			
9	**163**	E	*C.obesa*	12.1		9
9	**165**	E	*C.obesa*	12		6
9	**166**	E	*C.obesa*	14.8		7
9	**167**	E	*C.obesa*	6.4		3
9	**168**	E	*C.obesa*	5.5, 10.2		6
9	**169**	E	*C.obesa*			
9	**170**	E	*C.obesa*	8.8		9
9	**171**	E	*C.obesa*	8.8		5
9	**172**	E	*C.obesa*	9.8, 7		3
9	**173**	E	*C.obesa*	1.7, 3.9, 3.3		5
9	**174**	E	*C.obesa*	4.2		8
9	**175**	E	*C.obesa*	6.2		8
9	**176**	E	*C.obesa*	7.4, 11.2		7
9	**177**	E	*C.obesa*	18.9		7
9	**178**	E	*C.obesa*	11.4		11
9	**179**	E	*C.obesa*	13.3		8
9	**180**	E	*C.obesa*	5.9		3
9	**181**	E	*C.obesa*	10.6		4
9	**182**	E	*C.obesa*			
10		A	*x*			
10		B	*x*			
10		C	*x*			
10	**60**	D	*C. obesa*	16.4		3
10	**61**	D	*C. obesa*			
10	**62**	D	*M. strobophylla*	5.5, 7.6, 13.3		11
10	**63**	D	*C. obesa*	14.9		12
10	**64**	D	*C. obesa*			
10	**65**	D	*C. obesa*	13, 10.6		3
10	**66**	D	*C. obesa*			
10	**67**	D	*C. obesa*	14.9		12
10	**68**	D	*C. obesa*	12		12
10	**69**	D	*C. obesa*	11.5		10
10	**70**	D	*C. obesa*	12.3		12
10	**71**	D	*C. obesa*	18.9		14
10	**72**	E	*C. obesa*	9.8		6
10	**73**	E	*C. obesa*	9		8
10	**74**	E	*C. obesa*			
10	**76**	E	*M. strobophylla*			
10	**77**	E	*C. obesa*			
10	**78**	E	*C. obesa*	7.4		6
10	**79**	E	*C. obesa*	13.9, 14.8, 11		3
10	**80**	E	*C. obesa*	17.6		12
10	**81**	E	*C. obesa*			

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
10	**82**	E	*C. obesa*			
10	**83**	E	*C. obesa*			
10	**84**	E	*C. obesa*			
10	**85**	E	*C. obesa*	10.7, 4		7
10	**86**	E	*C. obesa*	13.9, 12.9		12
10	**87**	E	*C. obesa*	6.2		3
10	**88**	E	*C. obesa*	11.5		15
10	**89**	E	*C. obesa*			
10	**90**	E	*C. obesa*	11.8		12
10	**91**	E	*C. obesa*	16.8		15
11	**350**	A	*C. obesa*	16.7, 10.2, 13.9, 11.9, 17, 14.6, 16.4		13
11	**351**	A	*C. obesa*	21.5		15
11	**352**	C	*C. obesa*	23.2		17
11	**353**	D	*C. obesa*	21.4		15
11		D	*M. lateriflora*		2.05	
11	**354**	E	*C. obesa*	20.7		15
12	**335**	B	*E. loxophleba*	31.6		13
12	**337**	C	*A. acuminata*	14.2, 14.1, 8.4		17
12	**338**	D	*E. loxophleba*	32.2, 11.6, 5		12
12	**339**	D	*E. loxophleba*	18.7		11
12	**340**	D	*E. loxophleba*	43.6, 52.8		13
12	**342**	D	*E. loxophleba*	43.9		15
12	**345**	D	*A. acuminata*	17.6, 16.7		15
12		D	*A. acuminata*	5.7	1.95	
12	**341**	E	*A. acuminata*	12.3, 9.8		9
12	**343**	E	*E. loxophleba*	34.6, 36.6		12
12	**344**	E	*A. huegeliana*	10.8		7
12	**346**	E	*A. acuminata*	5.5		8
12	**347**	E	*A. acuminata*			13
12	**348**	E	*A. acuminata*	9.1		13
12	**349**	E	*A. acuminata*	10.8		8
13	**41**	A	*B. prionotes*	6.9, 2.3, 4.9, 3.8, 6.3, 6.2		17
13	**42**	A	*A. huegeliana*	2.7, 1.2, 8.3		20
13	**955**	A	*A. huegeliana*	5		20
13		A	*A. huegeliana*		1.75, 3.65	2H
13	**43**	B	*A. huegeliana*	4.8		12
13	**44**	B	*A. huegeliana*	4.9		12
13	**45**	B	*A. huegeliana*	6.1		14
13	**46**	B	*A. huegeliana*	4.1		14
13	**47**	B	*B. prionotes*	3.8, 5.6, 4.2, 3.9, 3.2, 2.2		17
13	**48**	B	*A. huegeliana*	6.6		14
13	**49**	B	*A. huegeliana*	11.1		14
13	**50**	B	*A. huegeliana*	27.4		11
13	**956**	B	*A. huegeliana*	6.1		14
13	**957**	B	*A. huegeliana*	3.7		13
13		B	*J. furcellata*		2.18	
13		B	*A. huegeliana*			
13	**51**	C	*B. prionotes*			
13	**52**	C	*A. huegeliana*	19.6		15
13	**53**	C	*A. huegeliana*	27.4		15

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
13	**54**	C	*A. huegeliana*	4.4		16
13	**958**	C	*B. prionotes*	3.6, 2.7		17
13		C	*A. huegeliana*		1.68-3.57	
13		C	*A. huegeliana*			
13	**55**	D	*A. huegeliana*	4.4		15
13	**56**	D	*A. huegeliana*	8.9		15
13	**959**	D	*A. huegeliana*	4.2		13
13		D	*J. furcellata*		1.84, 1	
13		D	*A. huegeliana*		1.93, 0.8, 3.83	
13	**57**	E	*B. prionotes*			
13	**58**	E	*A. huegeliana*	36.6		12
13	**59**	E	*A. huegeliana*	6.3		14
13			*J. furcellata*		0.5-3.11	2H, 3S
	960	C	*A. huegeliana*	3.6	5.3	
		A	*x*			
15	**1**	B	*E. salmonophloia*	30.6, 34		15
15	**2**	B	*E. salmonophloia*	17.6, 13.7		15
15	**3**	C	*E. salmonophloia*	30, 64.7		15
15		D	*x*			
15		E	*x*			
16		A	*x*			
16		B	*x*			
16	**4**	C	*E. salmonophloia*	32.4, 21.4		13
16	**5**	C	*E. salmonophloia*	32.5, 53.2		15
16		D	*x*			
16		E	*x*			
17		A	*M. acuminata*	2	2.94-3.1	2H
17		B	*M. acuminata*	3	3.4-3.46	3H
17		C	*M. acuminata*	4	3.36-4.7	3H, 1S
17		D	*M. acuminata*	6	2.8-5.2	6H
17		E	*M. acuminata*	6	1.8-4.4	4H, 2S
18		A	*M. acuminata*	6	2.5-3.13	5H, 1S
18		B	*M. acuminata*	3	2.5-3.1	1H, 2S
18		C	*M. acuminata*	4	1.45-3.1	2H, 2S
18			*M. acuminata*	3 seedlings	1-1.3	3H
18		D	*M. acuminata*	4	2.86-3.16	2H, 2S
18		D	*M. acuminata*	4 seedlings	1.1-2.13	4H
18		E	*M. acuminata*	9	2.6-3.6	6H, 3S
		B	*M. acuminata*		0.5	3H
			M. acuminata			
19		A	*M. lateriflora*	32	2.64-3.6	32S
19		B	*M. lateriflora*	30		30S
19		C	*M. lateriflora*	37		37S
19		D	*M. lateriflora*	32		32S
19		E	*M. lateriflora*	30		30S
20		A	*M. acuminata*	14	3.04-4.5	14SS
20		B	*M. acuminata*	15	2.27-3.96	15SS
20		C	*M. acuminata*	8	3.3-4.01	8SS
20		D	*M. acuminata*	8	3.3-3.7	8SS

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
20		E	*M. acuminata*	5	3-3.7	5SS
21		A	*x*			
21		B	*x*			
21		C	*x*			
21		D	*x*			
21		E	*x*			
22		A	*x*			
22		B	*x*			
22		C	*x*			
22		D	*x*			
22		E	*x*			
23		A	*M. acuminata*	82, 20%	1.3-2.7	78H, 4S
23		A	*M. lateriflora*	4, 10%	3.1-3.4	4H
23		B	*M. acuminata*	41, 20%	1.9-2.7	4H
23		B	*M. lateriflora*	2, 5%	3.5	2H
23	**27**	C	*E. loxophleba*	11.2, 10.9, 8.7		13
23	**28**	C	*E. loxophleba*	9.7, 10.9		11
23	**29**	C	*E. loxophleba*			
23		C	*M. acuminata*	25, 15%	1.5-2.85	25H
23	**30**	D	*E. loxophleba*			
23	**32**	D	*E. loxophleba*			Recent dead
23	**33**	D	*E. loxophleba*	5.6		9
23		D	*M. acuminata*	16, 10%	1.4-2.7	16H
23	**34**	E	*M. strobophylla*	6.8, 5.8, 3.1, 3.4, 4.8, 3.6, 6.2, 4.5		15
23	**35**	E	*E. loxophleba*			
23	**36**	E	*E. loxophleba*			
23	**37**	E	*E. loxophleba*			
23	**38**	E	*E. loxophleba*	7.8		6
23	**40**	E	*E. loxophleba*	9.6		11
23		E	*M. acuminata*	8, 5%	1.8-2.35	8H
23		E	*Hakea preissii*	1	1.42	1H
		A	*M. pauciflora*		1.6	1S
24	**532**	A	*E. wandoo*			
24		A	*M. acuminata*	16	1.3-2.3	13H, 3S, 4 dead
24		A	*M. lateriflora*	104, 60%	1.3-4	99H, 5d
24		B	*M. acuminata*	13, 5%	1.2-2.6	13H, 3S, 4 dead
24		B	*M. lateriflora*	34, 40%	1.9-2.8	34H
24		C	*M. acuminata*	0		All dead
24		C	*M. lateriflora*	47,45%	1.75-3.3	43H, 4S
24		D	*M. acuminata*	2	1.75-1.9	2H
24		D	*M. lateriflora*	14	1.95-3.3	11H, 3S
24	**533**	E	*E. loxophleba*	6, 5.1, 11.3, 6.9		11
24		E	*M. lateriflora*	18, 15%	1.6-3.6	12H, 6S
25	**534**	A	*E. wandoo*	7.3, 6		12
25	**535**	A	*E. wandoo*	5.7, 6.1		14
25	**536**	A	*E. wandoo*	2.5	2.6	4
25	**537**	A	*E. wandoo*			
25	**538**	A	*E. wandoo*	7.5	4.12	15
25		A	*M. acuminata*	100, 25%	0.9-2.5	100H
		A	*E. wandoo*		0.8	
25	**540**	B	*E. wandoo*	6.1		4

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
25	**542**	B	*E. wandoo*			
25	**543**	B	*E. wandoo*	3.3	2.3	14
25	**545**	B	*E. wandoo*	2.8	2.8	15
25	**546**	B	*E. wandoo*	2.6	1.82	15
25	**547**	B	*E. wandoo*	3.7	2.5	5
25	**548**	B	*E. wandoo*	4.3	2.1	4
25		B	*E. wandoo*	0		
25		B	*M. acuminata*	61, 10%	1.1-2.5	56H, 5S
25	**544**	C	*E. wandoo*	4.9		12
25	**549**	C	*E. wandoo*	5.6, 4.7	3.5	11
25	**550**	C	*E. wandoo*	2.7	2	3
25	**551**	C	*E. wandoo*	5.4, 4.8, 6.3, 4.6		12
25		C	*M. acuminata*	23, 10%	1.4-3.4	23H
25	**552**	D	*E. wandoo*	3.2		12
25	**554**	D	*E. wandoo*	1.9	2.25	3
25	**555**	D	*E. wandoo*	3.2	2.1	10
25	**556**	D	*E. wandoo*	2.9	2.2	10
25	**557**	D	*E. wandoo*		2.64	8
25	**558**	D	*E. wandoo*			
25		D	*E. wandoo*	52, 7%		
25		D	*M. acuminata*	5.4	0.9-2.68	52H
		D	*E. wandoo*		1-2.5	
25	**559**	E	*E. wandoo*			14
25	**560**	E	*E. wandoo*	5.9, 5.4		13
25	**562**	E	*E. wandoo*	4	2.95	3
25	**563**	E	*E. wandoo*	2.5	3.3	3
25		E	*M. acuminata*	42, 10%	1.1-2.9	42H
		E	*E. wandoo*		1.85	H
26	**8**	A	*A. acuminata*	12, 3.9, 8.9, 13.1		15
26	**9**	A	*A. acuminata*	3.5	4.22	11
26	**10**	A	*A. acuminata*	9.9, 4.6, 9.4, 7.6, 7.6, 7.2, 7.8, 6.2, 5.2, 3.7, 7.6, 4.3		15
26	**11**	A	*A. acuminata*	6.7, 3.5, 3.2		11
26	**12**	A	*A. acuminata*	11.9, 14.2		15
26	**13**	A	*A. acuminata*	5.2		11
26	**14**	A	*C. obesa*	15.2, 11.9, 15.2, 9.6, 16.8, 10.7, 15, 9.0		16
26	**15**	B	*A. acuminata*			
26	**16**	B	*A. acuminata*	11.2, 7.5, 8.7, 5, 11.9, 2.3, 12.9, 4.5, 2.4, 5.4, 8.3, 10.1, 7		17
26	**17**	B	*A. acuminata*			
26	**26**	B	*A. acuminata*	7.6		11
26	**18**	C	*A. acuminata*	5.2	4.1	19
26	**19**	C	*A. acuminata*	3.9, 2.3, 7.4, 5.4, 4.5, 2.7, 4.1, 4.7		15
26	**20**	D	*A. acuminata*	7.4, 7.4		7
26	**22**	E	*A. acuminata*	11, 8.2, 9.3, 6.3, 5.9, 7.6, 6.7, 11.6		13
26	**23**	E	*C. obesa*	30.4		16
26	**24**	E	*A. acuminata*	11.5		7
		D	*A. acuminata*		0.3	H

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
26	**25**	B	*A. acuminata*	4.9, 7.2, 5.6, 6.3, 8.9		11
27	**355**	A	*C. obesa*	29.6		13
27		A	*C. obesa*	311	0.2-3.3	
27	**356**	B	*C. obesa*	13.1, 32.6		15
27		B	*C. obesa*	202	0.2-2.95	
27	**357**	C	*C. obesa*	20.3		11
27	**358**	C	*C. obesa*	16.1, 12.9		9
27	**359**	C	*C. obesa*	17.9		10
27	**360**	C	*C. obesa*	12.2		9
27	**361**	C	*C. obesa*	13		9
27	**362**	C	*C. obesa*	10.9		9
27		C	*C. obesa*	161	0.2-2.95	
27	**363**	D	*C. obesa*	18, 11.5		14
27	**364**	D	*C. obesa*	14.4, 8.8, 5.9, 4.3		10
27		D	*C. obesa*	192	0.2-2.95	
27	**365**	E	*C. obesa*	22		13
27	**366**	E	*C. obesa*	16.5		15
27		E	*C. obesa*	181	0.2-2.95	
28	**367**	A	*C. obesa*	18.9		8
28	**368**	A	*C. obesa*	24.1		8
28	**369**	A	*C. obesa*	5.5, 5.8, 3.9, 4.8		8
28	**370**	A	*C. obesa*	5.7, 3.3		5
28	**371**	A	*C. obesa*			
28	**373**	A	*C. obesa*			
28	**374**	A	*C. obesa*	8		12
28	**375**	A	*C. obesa*	13.5		5
28	**376**	A	*C. obesa*	10.5		12
28	**377**	A	*C. obesa*	8.5		10
28	**378**	A	*C. obesa*	10.4		5
28	**400**	A	*C. obesa*	7.3		8
28		A	*C. obesa*		0.3	H
28	**401**	A	*C. obesa*	11.6		12
28	**403**	B	*C. obesa*	10.1, 8.2		8
28	**404**	B	*C. obesa*	6.8		5
28	**405**	B	*C. obesa*			
28	**406**	B	*C. obesa*	7.8		10
28	**407**	B	*C. obesa*			
28	**408**	B	*C. obesa*	2.6, 2.8, 2.8		10
28	**409**	B	*C. obesa*	4.2, 5.2		4
28	**410**	B	*C. obesa*			
28	**411**	B	*C. obesa*			
28	**412**	B	*M. strobophylla*	3.4, 4.5		9
28	**415**	B	*C. obesa*	9.3, 8		5
28	**416**	B	*C. obesa*	9.5, 5, 7.3		8
28	**417**	B	*C. obesa*	6.2		12
28		B	*C. obesa*		0.5	H
28		B	*Eucalyptus sp.*		1.5	1D, 1S
28	**418**	C	*C. obesa*	19		12
28	**419**	C	*C. obesa*	8.2		15
28	**420**	C	*C. obesa*	12.1		11
28	**421**	C	*C. obesa*	4.5		10
28	**422**	C	*C. obesa*	6.9		3
28	**423**	C	*C. obesa*	7.1		12

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
28	**424**	C	*C. obesa*	7		10
28	**426**	C	*C. obesa*	6.9		8
28	**427**	C	*C. obesa*	11.8		8
28		C	*M. strobophylla*		2.5	H
28		C	*Eucalyptus sp.*		1.64-2.17	1S, 1H
28	**425**	D	*C. obesa*	4.7		11
28	**429**	D	*C. obesa*	22.4		8
28	**430**	D	*C. obesa*	7.4, 7.5		10
28	**431**	D	*C. obesa*	8.3		12
28	**432**	D	*C. obesa*	7.5		12
28	**434**	D	*C. obesa*	4.1		12
28	**435**	D	*C. obesa*	6.7		13
28	**436**	D	*C. obesa*	5		11
28	**437**	D	*C. obesa*	8.3		8
28	**438**	D	*C. obesa*	3.1		6
28	**439**	D	*C. obesa*			
28	**440**	D	*C. obesa*	5.9		11
28	**441**	D	*C. obesa*	4.2		6
28	**442**	D	*C. obesa*			
28	**443**	D	*C. obesa*	3.9		11
28	**454**	D	*C. obesa*	7.8		
28	**455**	D	*C. obesa*			
28		D	*Eucalyptus sp.*		1.2	H
28	**444**	E	*C. obesa*	7.7		11
28	**445**	E	*C. obesa*	14.3		11
28	**446**	E	*C. obesa*	6.9		14
28	**447**	E	*C. obesa*			
28	**448**	E	*C. obesa*	9.5		11
28	**449**	E	*C. obesa*	5.1		11
28	**450**	E	*C. obesa*	5.1		6
28	**451**	E	*C. obesa*	5.1		6
28	**452**	E	*C. obesa*	5.2		11
		E	*C. obesa*		0.6	H
29	**456**	A	*C. obesa*			
29	**457**	A	*C. obesa*			
29	**458**	A	*C. obesa*	22.8, 19		5
29	**459**	B	*C. obesa*	27.5		7
29	**460**	B	*C. obesa*	16.7		12
29	**461**	B	*C. obesa*			
29	**462**	B	*C. obesa*			
29	**463**	C	*C. obesa*	23.2		7
29	**464**	C	*C. obesa*	18.9, 26.4, 25.8		6
29	**465**	D	*C. obesa*			
29	**466**	D	*C. obesa*			
29	**467**	D	*C. obesa*	19		6
29	**468**	E	*C. obesa*	13.5		5
29	**469**	E	*C. obesa*	23.1		5
29	**470**	E	*C. obesa*	16.4		6
29	**471**	E	*C. obesa*	19.8		6
29	**472**	E	*C. obesa*	20.5		7
29	**473**	E	*C. obesa*	20.1		7
30	**955**	A	*B. prionotes*		4.14	
30	**480**	B	*B. prionotes*			

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
		C	*J. furcellata*		0.3-2.5	7S
30	**503**	D	*B. prionotes*	6.8		15
30	**510**	E	*A. acuminata*			
30	**954**	E	*A. huegeliana*	14.1		21
		B	*J. furcellata*		1.3-1.89	
		D	*J. furcellata*		0.3-2.16	7SS
32	**71**	east bank	*C. obesa*	9.1		17
32	**72**	east bank	*C. obesa*			
32	**73**	east bank	*C. obesa*	11.4		17
32	**76**	east bank	*C. obesa*			
32	**80**	east bank	*C. obesa*			
32	**82**	east bank	*M. strobophylla*		3.7	14
32	**84**	east bank	*C. obesa*	15, 8.8		14
32	**85**	east bank	*C. obesa*	23.3		13
32	**86**	east bank	*H. preisii*		1.85	
32	**87**	east bank	*C. obesa*	23		16
32	**88**	east bank	*E. loxophleba*	17.4		9
32	**89**	east bank	*E. loxophleba*	14.1		11
32	**90**	east bank	*C. obesa*	12.4, 10.7		16
32	**91**	east bank	*M. lateriflora*	8.6, 7.7		17
32	**92**	east bank	*M. lateriflora*	7.4, 10.3, 9.8		13
32	**97**	east bank	*E. loxophleba*	8.7		3
32	**98**	east bank	*E. loxophleba*	11.9, 10.6		10
32	**100**	east bank	*A. acuminata*	21.4		11
32	**103**	east bank	*E. loxophleba*	32.2		14
32	**104**	east bank	*E. loxophleba*	35.1		12
32	**105**	east bank	*A. acuminata*	23.3		3
32	**106**	east bank	*E. loxophleba*	19.3, 14.3, 13		7
32	**107**	east bank	*A. acuminata*	22		11
32	**109**	east bank	*E. loxophleba*	9.8		3
32	**111**	east bank	*C. obesa*	4.8		15
32	**112**	east bank	*C. obesa*	4.2	3.6	15
32	**113**	east bank	*C. obesa*	4.3		15
33		east bank	*H. preissii*		1.8	H
32	**114**	east bank	*C. obesa*	3.2	3.7	15
32	**115**	east bank	*C. obesa*			
32	**116**	east bank	*C. obesa*	3	2.8	15
32	**117**	east bank	*C. obesa*	4.3, 1.5	3.8	13
32	**118**	east bank	*C. obesa*	3.3	3.8	15
32	**119**	east bank	*C. obesa*	3.5	2.5	15
32	**120**	east bank	*C. obesa*	4.2	74	13
32	**121**	east bank	*C. obesa*	2.4		3
32	**122**	east bank	*C. obesa*	3.1		3
32	**123**	east bank	*C. obesa*	2.5		3
32	**124**	east bank	*C. obesa*	3.7	74	15
32	**125**	east bank	*C. obesa*			
32	**126**	east bank	*C. obesa*			
32	**127**	east bank	*M. lateriflora*	9	3	23
32	**128**	east bank	*M. lateriflora*	8.8		13
32	**129**	east bank	*A. acuminata*	7.7		17
32	**130**	east bank	*A. huegeliana*	7.2		14
32		east bank	*M. lateriflora*			
		east bank	*A. acuminata*		1.0, 1.25	2H

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
32	**110**	east bank	*Hakea preissii*	7.6		15
32	**1**	west bank	*E. loxophleba*	14, 16.4		13
32	**5**	west bank	*E. loxophleba*	26.1, 32.3, 32.7, 15.8		12
32	**7**	west bank	*C. obesa*	14.7		16
32	**8**	west bank	*C. obesa*	7.9		10
32	**9**	west bank	*C. obesa*	13		16
32	**10**	west bank	*C. obesa*	9.6		14
32	**12**	west bank	*C. obesa*	14.5		14
32	**22**	west bank	*C. obesa*	28.4		15
32	**24**	west bank	*C. obesa*	23		17
32	**30**	west bank	*C. obesa*	28.6		17
32	**36**	west bank	*E. loxophleba*	31.8, 24.7		13
32	**42**	west bank	*C. obesa*	20.2		15
32	**46**	west bank	*C. obesa*	8.9		12
32	**47**	west bank	*C. obesa*	7.3		11
32	**50**	west bank	*C. obesa*	10.3, 12.1		14
32	**51**	west bank	*C. obesa*	9.7		10
32	**52**	west bank	*C. obesa*	8.6		9
32	**53**	west bank	*C. obesa*	9.5		14
32	**54**	west bank	*C. obesa*	12.5		10
32	**55**	west bank	*M. strobophylla*	3.3, 5.1	3.1	13
32	**64**	west bank	*C. obesa*	13.2		16
32	**66**	west bank	*C. obesa*	19		14
32	**68**	west bank	*C. obesa*	11.8		14
32	**69**	west bank	*C. obesa*	10.5		14
32	**70**	west bank	*C. obesa*	16.2		11
32	**133**	west bank	*M. strobophylla*	2.6, 1.8, 1.6	3	11
32	**134**	west bank	*C. obesa*	9.8, 6.9		18
32	**132**	west bank	*C. obesa*	4.9		10
32	**131**	west bank	*M. strobophylla*	3.4	3.5	11
		west bank	*M. strobophylla*		1.85	H
			M. strobophylla		3.1	H
33	**222**	fallen	*C. obesa*			
33	**200**		*C. obesa*	16.6		3
33	**202**		*C. obesa*	16.6, 13.8		12
33	**205**		*C. obesa*	18.9		14
33	**206**		*C. obesa*	22.2		7
33	**212**		*C. obesa*	19.2, 16.7		5
33	**214**		*C. obesa*			
33	**215**		*C. obesa*	14.5		9
33	**223**		*C. obesa*			
33	**232**		*C. obesa*	17.2		9
33	**233**		*C. obesa*	18		10
33	**234**		*C. obesa*	15.2, 13.9, 16.3		9
33	**235**		*C. obesa*	21.8, 16.2		10
33	**237**		*C. obesa*	18.2		8
33	**241**		*C. obesa*	9.2		3
33	**245**		*C. obesa*			
33	**246**		*C. obesa*	13.4		7
33	**247**		*C. obesa*	22.2		7
33	**248**		*C. obesa*	12.8, 11.5		9
33	**249**		*C. obesa*	19.6, 14.1		9
33	**250**		*C. obesa*	18, 12.6, 14.3		9

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
33	**251**		*C. obesa*	14.3		8
33	**255**		*C. obesa*	17.5		12
33	**256**		*C. obesa*	15		12
33	**997**		*C. obesa*	12.6		9
33	**996?**		*C. obesa*	13.4		9
			Eucalyptus sp		3.38	H
			C. obesa		0.5-1.75	1H, 6 grazed
34	**470**	A	*C. obesa*	9.5, 6.8		6
34	**471**	A	*C. obesa*			
34	**472**	A	*C. obesa*	8.7		5
34	**473**	A	*C. obesa*			
34	**474**	A	*C. obesa*			
34	**475**	A	*C. obesa*			
34	**476**	B	*C. obesa*			
34	**477**	B	*C. obesa*	5.5		11
34	**478**	B	*M. strobophylla*			
34	**479**	B	*C. obesa*			
34	**480**	B	*C. obesa*			
34	**481**	B	*C. obesa*			
34	**482**	B	*C. obesa*	6.3		9
34	**483**	B	*C. obesa*			
34	**484**	B	*C. obesa*			
34	**485**	B	*C. obesa*	6.6		3
34	**486**	B	*C. obesa*	9.8		
34	**487**	B	*C. obesa*	4.6		3
34	**488**	B	*C. obesa*			
34	**489**	B	*C. obesa*			
34	**490**	B	*C. obesa*			
34	**491**	B	*C. obesa*			
34	**492**	B	*M. strobophylla*			
34	**493**	B	*C. obesa*	5.3		3
34	**494**	B	*C. obesa*			
34	**495**	B	*C. obesa*	10.9		13
34	**496**	B	*C. obesa*	7.2		
34	**497**	B	*C. obesa*			
34	**498**	B	*C. obesa*	DEAD		
34	**499**	B	*C. obesa*			
34	**501**	B	*C. obesa*	10.5		12
34	**502**	B	*C. obesa*			
34	**503**	B	*C. obesa*			
34	**504**	B	*C. obesa*			
34	**505**	B	*C. obesa*			
34	**506**	B	*C. obesa*	7.5		8
34	**507**	B	*C. obesa*	9.4		8
34	**508**	B	*C. obesa*	4		8
34	**509**	B	*C. obesa*	9		8
34	**510**	B	*C. obesa*	8.1		8
34	**511**	B	*C. obesa*	7.3, 7.1, 5.6		3
34	**512**	B	*C. obesa*			
34	**513**	B	*C. obesa*			
34	**514**	B	*C. obesa*			
34	**515**	B	*C. obesa*			
34	**516**	B	*C. obesa*			

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
34	**517**	B	*C. obesa*			
34	**518**	C	*C. obesa*	9		3
34	**519**	C	*C. obesa*			
34	**520**	C	*C. obesa*			
34	**521**	C	*C. obesa*	3.3, 3.9		3
34	**522**	C	*C. obesa*	5.5		3
34	**523**	C	*C. obesa*	3.8		3
34	**524**	C	*C. obesa*	7.5, 4.4		3
34	**525**	C	*C. obesa*	3.7, 8, 2.8		3
34	**526**	C	*C. obesa*			
34	**527**	C	*C. obesa*	3	2.95	3
34	**528**	C	*C. obesa*			
34	**529**	C	*C. obesa*	4		3
34	**530**	C	*C. obesa*	3.7		3
34	**531**	C	*C. obesa*	6		3
34	**532**	C	*C. obesa*	2.8		3
34	**533**	C	*C. obesa*	14.5		11
34	**534**	C	*C. obesa*	6.9		7
34	**535**	C	*C. obesa*	4.5		3
34	**536**	C	*C. obesa*	5.3		3
34	**538**	C	*C. obesa*	2.3	3	3
34	**539**	C	*C. obesa*	4.9		3
34	**540**	C	*C. obesa*	6.4		11
34	**541**	C	*C. obesa*	4.5		8
34	**542**	C	*C. obesa*			
34	**543**	C	*C. obesa*	6.3		8
34	**544**	C	*C. obesa*			
34	**545**	C	*C. obesa*			
34	**546**	C	*C. obesa*			
34	**547**	C	*C. obesa*	5.7		3
34	**548**	C	*C. obesa*	6.3		8
34	**549**	C	*C. obesa*			
34	**550**	C	*C. obesa*			
34	**551**	C	*C. obesa*	7.5		5
34	**552**	C	*C. obesa*			
34	**553**	C	*C. obesa*	4.9		5
34	**554**	C	*C. obesa*			
34	**555**	C	*C. obesa*			
34	**559**	D	*C. obesa*	9		9
34	**560**	D	*C. obesa*	4.2		9
34	**562**	D	*C. obesa*	4.5		5
34	**563**	D	*C. obesa*	6.3		7
34	**564**	D	*C. obesa*			
34	**565**	D	*C. obesa*	4.5		3
34	**566**	D	*C. obesa*	8		7
34	**567**	D	*C. obesa*	6.3		6
34	**568**	D	*C. obesa*	6.7		7
34	**569**	D	*C. obesa*	6.5		3
34	**570**	D	*C. obesa*	3.3		3
34	**571**	D	*C. obesa*	4.1		3
34	**572**	D	*C. obesa*	4.3		8
34	**573**	D	*C. obesa*	4.7		3
34	**574**	D	*C. obesa*	5.2		5

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
34	**575**	D	*C. obesa*	4.4		8
34	**576**	D	*C. obesa*			
34	**577**	D	*C. obesa*	7		3
34	**578**	D	*C. obesa*	5.5		9
34	**580**	D	*C. obesa*	6.6, 5.6		7
34	**581**	D	*C. obesa*	5.4		3
34	**583**	D	*C. obesa*	6, 4.8		5
34	**584**	D	*C. obesa*	4.6		5
34	**585**	D	*C. obesa*			
34	**587**	D	*C. obesa*	4		3
34	**588**	D	*C. obesa*	5.3		3
34	**589**	D	*C. obesa*	4.9		11
34	**590**	D	*C. obesa*	4.4		3
34	**591**	D	*C. obesa*	3.5		3
34	**592**	D	*C. obesa*	10.8		
34	**593**	D	*C. obesa*	10.9		7
34	**594**	D	*C. obesa*			
34	**595**	D	*C. obesa*			
34	**596**	D	*C. obesa*			
34	**597**	D	*C. obesa*			
34	**598**	D	*C. obesa*	7.5		3
34	**599**	D	*C. obesa*			
34	**600**	D	*C. obesa*			
34	**601**	D	*C. obesa*			
34	**602**	D	*C. obesa*	9		10
34	**603**	D	*C. obesa*			
34	**604**	D	*C. obesa*			
34	**605**	D	*C. obesa*	5.5		3
34	**606**	D	*C. obesa*	10.5		11
34	**609**	E	*C. obesa*	6.7		6
34	**610**	E	*C. obesa*	4.9		5
34	**611**	E	*C. obesa*			
34	**612**	E	*C. obesa*			
34	**613**	E	*C. obesa*	6.2, 6.9		3
34	**614**	E	*C. obesa*	7.3		3
34	**615**	E	*C. obesa*	4.1		3
34	**616**	E	*C. obesa*	5.4		3
34	**617**	E	*C. obesa*	4.8		3
34	**618**	E	*C. obesa*			
34	**619**	E	*C. obesa*			
34	**620**	E	*C. obesa*	4		4
34	**621**	E	*C. obesa*	3.8		3
34	**622**	E	*C. obesa*	4.5		3
34	**623**	E	*C. obesa*	4.5		5
34	**624**	E	*C. obesa*	4		4
34	**625**	E	*C. obesa*	5.1		3
34	**626**	E	*C. obesa*	3.6		3
34	**627**	E	*C. obesa*	5.7		5
34	**628**	E	*C. obesa*	5.2		5
34	**629**	E	*C. obesa*	5.4		3
34	**630**	E	*C. obesa*	5.6		6
34	**631**	E	*C. obesa*	5.3		12
34	**632**	E	*C. obesa*	4.1		9

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
34	**633**	E	*C. obesa*			
34	**634**	E	*C. obesa*	3.8		8
34	**635**	E	*C. obesa*	4.4		3
34	**636**	E	*C. obesa*			
34	**637**	E	*C. obesa*	5.5		3
34	**638**	E	*C. obesa*	5.9		3
34	**640**	E	*C. obesa*	5.4		9
34	**641**	E	*C. obesa*	2.9		3
34	**642**	E	*C. obesa*	8.2		11
34	**643**	E	*C. obesa*	4.4		5
34	**644**	E	*C. obesa*	4.4		9
34	**645**	E	*C. obesa*	4.5		9
34	**646**	E	*C. obesa*	7		9
34	**648**	E	*C. obesa*	5.2		3
34	**649**	E	*C. obesa*	3.9		3
34	**651**	E	*C. obesa*	3.9		10
34	**652**	E	*C. obesa*	4.4		3
34	**653**	E	*C. obesa*	3.4		3
34	**654**	E	*C. obesa*	3.9		3
34	**655**	E	*C. obesa*			
34	**656**	E	*C. obesa*			
34	**657**	E	*C. obesa*	9.3		8
34	**658**	E	*C. obesa*			
34	**659**	E	*C. obesa*	4.6		3
35	**273**	A	*C. obesa*	7.1		4
35	**274**	A	*C. obesa*	24.7		8
35	**275**	A	*C. obesa*	19.3, 13.1		8
35	**276**	A	*C. obesa*	16.4		11
35	**277**	B	*C. obesa*	26.1		12
35	**278**	B	*C. obesa*	30.1		12
35	**279**	B	*C. obesa*			
35	**280**	B	*C. obesa*	22.7		8
35	**281**	B	*C. obesa*	15.2		4
35	**282**	C	*C. obesa*	19.1		9
35	**283**	C	*C. obesa*	20.5		8
35	**284**	C	*C. obesa*	17.8		11
35	**285**	C	*C. obesa*	24.9, 18		6
35	**286**	C	*C. obesa*	18.8		11
35	**299**	C	*C. obesa*	10.5		9
35	**287**	D	*C. obesa*	33.2		11
35	**288**	D	*C. obesa*	27.8		7
35	**289**	D	*C. obesa*	18		11
35	**290**	D	*C. obesa*	20		12
35	**292**	D	*C. obesa*	27.2		10
35	**293**	D	*C. obesa*	16.6		11
35	**294**	D	*C. obesa*	40.1		11
35	**295**	D	*C. obesa*	17.2		9
35	**300**	D	*C. obesa*	20.8		11
35	**296**	E	*C. obesa*	23.7		12
35	**297**	E	*C. obesa*	30.7		9
35	**298**	E	*C. obesa*	19		7
		B	*C. obesa*		0.2	H
36	**337**	A	*M. strobophylla*			

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
36	**338**	A	*C. obesa*			
36	**339**	A	*C. obesa*			
36	**340**	A	*C. obesa*			
36	**341**	A	*M. strobophylla*			
36	**342**	A	*M. strobophylla*			
36	**345**	A	*C. obesa*			
36	**346**	B	*C. obesa*			
36	**347**	B	*C. obesa*	14.4		15
36	**348**	B	*C. obesa*			
36	**349**	B	*C. obesa*			
36	**350**	B	*C. obesa*	13.6		11
36	**352**	C	*C. obesa*			
36	**355**	C	*M. strobophylla*			
36	**358**	C	*C. obesa*			
36	**359**	C	*C. obesa*			
36	**361**	C	*C. obesa*	7		3
36	**362**	C	*C. obesa*	9		6
36	**363**	C	*C. obesa*			
36	**365**	C	*C. obesa*			
36	**366**	C	*C. obesa*			
36	**367**	C	*C. obesa*	4.8		3
36	**368**	C	*C. obesa*	6.9		4
36	**369**	C	*C. obesa*	6.2		5
36	**370**	C	*C. obesa*	5.5		5
36	**371**	C	*C. obesa*	5.1		3
36	**372**	C	*M. strobophylla*	4.5		7
36	**373**	C	*M. strobophylla*			
36	**374**	C	*M. strobophylla*			
36	**375**	C	*M. strobophylla*	5.8, 4.5		7
36	**376**	C	*C. obesa*			
36	**377**	C	*C. obesa*			
36	**379**	C	*C. obesa*			
36	**380**	C	*C. obesa*			
36	**382**	C	*M. strobophylla*			
36	**383**	C	*C. obesa*	8.3		3
36	**384**	C	*C. obesa*			
36	**388**	C	*C. obesa*			
36	**389**	C	*C. obesa*			
36	**390**	C	*M. strobophylla*			
36	**391**	C	*C. obesa*			
36	**392**	C	*C. obesa*	7		10
36	**393**	C	*C. obesa*	6		6
36	**395**	C	*C. obesa*	5.9, 11.2		8
36	**396**	C	*M. strobophylla*	9.7		
36	**397**	C	*C. obesa*	8.5		3
36	**398**	C	*C. obesa*	12.1		
36	**399**	C	*C. obesa*			4
36	**400**	C	*C. obesa*	7.1		4
36	**401**	C	*C. obesa*	12.6		8
36	**409**	C	*C. obesa*	10.2, 9.2		3
36	**404**	D	*C. obesa*	7.1		dead
36	**405**	D	*C. obesa*			3
36	**407**	D	*C. obesa*	9.1		

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
36	**408**	D	*C. obesa*			8
36	**411**	D	*C. obesa*	7		
36	**412**	D	*M. strobophylla*			
36	**413**	D	*C. obesa*			
36	**414**	D	*C. obesa*			
36	**415**	D	*C. obesa*	4.6		4
36	**417**	D	*C. obesa*	11		10
36	**418**	D	*M. strobophylla*			
36	**419**	D	*C. obesa*	6		3
36	**420**	D	*C. obesa*	6.6		3
36	**421**	D	*C. obesa*			
36	**422**	D	*C. obesa*			
36	**423**	D	*M. strobophylla*			
36	**424**	D	*C. obesa*	12.7		10
36	**425**	D	*C. obesa*			
36	**426**	D	*C. obesa*	13.6		4
36	**427**	D	*C. obesa*			
36	**428**	D	*C. obesa*	10.9		4
36	**429**	E	*M. strobophylla*			
36	**430**	E	*C. obesa*			
36	**431**	E	*M. strobophylla*			
36		C	*M. strobophylla*		0.1-0.5	4H
36	**432**	E	*M. strobophylla*			
36	**433**	E	*C. obesa*			
36	**434**	E	*M. strobophylla*			
36	**435**	E	*M. strobophylla*			
36	**436**	E	*C. obesa*	12.2		9
36	**437**	E	*C. obesa*			
36	**438**	E	*C. obesa*	8.6		3
36	**439**	E	*M. strobophylla*			
36	**440**	D	*C. obesa??*	3.3		3
36	**441**	D	*C. obesa??*	4.3		6
36	**442**	D	*C. obesa??*	3.7		3
37	**301**	A	*C. obesa*			
37	**302**	A	*C. obesa*			
37	**303**	A	*C. obesa*	12.1		3
37	**304**	A	*C. obesa*	12.3		8
37	**305**	A	*C. obesa*			
37	**306**	A	*C. obesa*	13.8		6
37	**307**	A	*C. obesa*	9.3		3
37	**308**	A	*C. obesa*			
37	**309**	A	*C. obesa*			
37	**310**	A	*C. obesa*	9.3		3
37	**311**	A	*C. obesa*			
37	**312**	A	*C. obesa*	14.6		6
37	**313**	A	*C. obesa*	11.5		8
37	**314**	A	*C. obesa*	15.9		9
37	**315**	A	*C. obesa*	25.5		9
37	**316**	B	*C. obesa*	9.5, 17.4, 14.2, 21.2		13
37	**317**	C	*C. obesa*			
37	**318**	C	*C. obesa*			
37	**319**	C	*C. obesa*			
37	**320**	C	*C. obesa*			

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
37	**321**	C	*C. obesa*			
37	**322**	C	*C. obesa*	15.1, 10.3		3
37	**323**	C	*C. obesa*			
37	**324**	C	*C. obesa*			
37	**325**	C	*C. obesa*			
37	**326**	C	*C. obesa*	21.2		6
37	**327**	D	*C. obesa*	18.4		3
37	**328**	D	*C. obesa*	12 ,6		7
37	**329**	D	*C. obesa*	9.9		8
37	**330**	D	*C. obesa*	13.9		9
37	**331**	D	*C. obesa*	10.8, 4.1		5
37	**332**	D	*C. obesa*			
37	**333**	D	*C. obesa*	13.2		3
37	**334**	D	*C. obesa*	18.6		6
37	**335**	E	*C. obesa*	19.5		4
37	**336**	E	*C. obesa*	20.1, 17.3		10
38	**440**	A	*C. obesa*	12.3		15
38	**441**	A	*C. obesa*	17.1		15
38	**442**	A	*C. obesa*	18.2		13
38	**443**	A	*C. obesa*	14.4		13
38	**444**	A	*C. obesa*	14.3		13
38	**445**	A	*C. obesa*	7.7		15
38	**446**	A	*C. obesa*	6.1		7
38	**447**	B	*C. obesa*	16.6		13
38	**448**	B	*C. obesa*	11.3, 8.6, 8.1		15
38	**449**	B	*C. obesa*	13.4		15
38	**450**	B	*C. obesa*	13.3		9
38	**451**	B	*C. obesa*	9		8
38	**452**	B	*C. obesa*	12.9		11
38	**453**	B	*C. obesa*	12		11
38	**454**	B	*C. obesa*	14.8, 9.2		11
38	**455**	C	*C. obesa*	11.3		10
38	**456**	C	*C. obesa*	13.2, 12.6		10
38	**457**	C	*C. obesa*	14.6		10
38	**458**	C	*C. obesa*	15.4		10
38	**459**	C	*C. obesa*	8.2		11
38	**460**	D	*C. obesa*	18.4, 23		15
38	**461**	D	*C. obesa*	8.9		11
38	**462**	D	*C. obesa*	18.4		7
38	**463**	D	*C. obesa*			
38	**464**	D	*C. obesa*	18		5
38	**465**	D	*C. obesa*	13		17
38	**466**	D	*C. obesa*			
38	**467**	E	*C. obesa*			
38	**468**	E	*C. obesa*			
42		A	*C obesa*			
42		A	*M strobophylla*		1.2-4.16	53H
42		B	*C obesa*			
42		B	*M strobophylla*		1.1-3.96	32H
42		C	*C obesa*			
42		C	*M strobophylla*		0.7-3.68	18H
42		D	*C obesa*			
42		D	*M strobophylla*		1-3.82	105H, 1S

Plot	Tag	Subplot	Species	2009	2009 Ht (m)	2009
42		E	*C obesa*			
42		E	*M strobophylla*		0.5-3.6	124H, 3D
43		A				
43	**1**	B	*E. salmon*	43.3		13
43	**2**	B	*E. salmon*	38.9, 21.6		13
43		B	*M. acuminata*		2.89	H
43	**3**	C	*E. salmon*	27.6		6
43	**4**	C	*E. salmon*	32.4		11
43	**5**	D	*E. salmon*	34.1		6
43		E	*M. acuminata*		2.9-4.4	11H, 1S
43		E	*E. salmon*	6.4	5.2	
44		A	*M. pauciflora*		1.3-2.61	2H
44		A	*M. acuminata*		2.3-3.6	2H
44		B	*M. acuminata*		2.5-3.6	2H, 1S
44	**6**	B	*E. wandoo*	52.8		4
44		C	*M. acuminata*		2.7-2.9	2H
44	**7**	C	*E. wandoo*	12.6		9
44		D	*M. acuminata*		1.3-3.4	5H
44		E	*M. acuminata*		1.9-3.9	7H
44	**8**	E	*E. wandoo*	41.7		4
44	**9**	E	*Hakea preissii*	9.5, 9.2	5.4	11
44	**10**	E	*E. wandoo*	16.4		7
44	**11**	E	*E. wandoo*	14.5		3
45		A	*M. lateriflora*		4.66	1S
45		A	*M. acuminata*		1.6-1.64	2H
45	**12**	B	*C. obesa*	16.4		6
45		B	*M. lateriflora*		1.67-3.15	6H
45		C	*M. lateriflora*		5.35	6S
45		D	*M. lateriflora*		1.86-2.02	1S, 1H
45		E	*M. pauciflora*		1.3-1.9	4H
45		E	*M. lateriflora*		1.6-3.3	7H, 2S

Appendix Two: Understorey Data

Vegetation Monitoring of lake Toolibin and Reserves

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
Plot 3					
A	***Tecticornia lepidosperma***				All Dead
	Atriplex semibaccata	1	0.5	0.1	
	Maireana brevifolia				
	Angianthus tomentosus		2	0.2	
B	***Tecticornia lepidosperma***				
	Angianthus tomentosus		5	0.3	
	Maireana brevifolia				
C	***Tecticornia lepidosperma***				
	Angianthus tomentosus		25	0.4	
	Maireana brevifolia				
D	***Tecticornia lepidosperma***				
	Angianthus tomentosus		2	0.3	
	Maireana brevifolia	1	100%	0.3m	
E	***Tecticornia lepidosperma***				
	Maireana brevifolia	-	-	-	
	Casuarina obesa	1	1	0.5	
	Atriplex semibaccata	3	5	0.1	New
Plot 4					
A	***Atriplex semibaccata***	-	-	-	
	Tecticornia lepidosperma	5	45	0.7	
B	***Tecticornia lepidosperma***	1	25	0.7	
	Atriplex semibaccata	1	0.1	0.2	
C	***Tecticornia lepidosperma***	5	5	0.6	
	Atriplex semibaccata		5	0.3	
	Maireana brevifolia	1	0.1	0.3	
D	***Tecticornia lepidosperma***	1	2	0.5	
	Maireana brevifolia	1	1	0.5	
E	***Tecticornia lepidosperma***	1	1	0.5	
	Atriplex semibaccata				
	Maireana brevifolia	1	2	0.7	
Plot 5	***plot went from SE to NE***				
A	***Atriplex semibaccata***	6	5	0.1	
	Tecticornia lepidosperma	-	-	-	Recently Dead
B	***Tecticornia lepidosperma***	2	5	0.5	
	Atriplex semibaccata	1	0.5	0.1	
C	***Atriplex semibaccata***	-	-	-	
	Tecticornia lepidosperma	-	-	-	
	Tecticornia indica	-	-	-	
D	***Tecticornia lepidosperma***	2	1	0.5	Recently Dead
	Tecticornia indica	-	-	-	New
	Atriplex semibaccata	1	0.1	0.2	Recently Dead
E	***Tecticornia lepidosperma***		5	0.7	

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
	Atriplex semibaccata		0.1	0.1	Recently Dead
	Maireana brevifolia		3	0.5	
			3	0.2	New
Plot 6					
A	***Atriplex semibaccata***	-	-	-	
	Wilsonia rotundifolia		30	0.1	
	Angianthus tomentosus		2	0.2	New
	Tecticornia lepidosperma	-	-	-	Recently Dead
B	***Maireana brevifolia***	-	-	-	grassy weeds
	Wilsonia rotundifolia		50	0.1	
	Angianthus tomentosus	-	-	-	New
C	***Atriplex semibaccata***	-	-	-	
	Tecticornia lepidosperma	-	-	-	Recently Dead
	Wilsonia rotundifolia		50	0.1	
	Angianthus tomentosus	-	-	-	
D	***Atriplex semibaccata***	-	-	-	
	Tecticornia lepidosperma	-	-	-	Recently Dead
	Angianthus tomentosus	-	-	-	New
	Wilsonia rotundifolia		50	0.1	
E	***Atriplex semibaccata***	1	0.1	0.7	Very Stressed
	Wilsonia rotundifolia		70	0.1	
	Maireana brevifolia	-	-	-	
	Angianthus tomentosus		2	0.25	New
Plot 7					
A	***Maireana brevifolia***	-	-	-	Recently Dead
	Goodenia viscida		10	0.5	
	Atriplex semibaccata	-	-	-	Recently Dead
	Wilsonia rotundifolia	-	-	-	Recently Dead
	Angianthus tomentosus		5	0.1	New
B	***Tecticornia lepidosperma***	-	-	-	
	Maireana brevifolia	-	-	-	
	Wilsonia rotundifolia				Recently Dead
	Atriplex semibaccata				Recently Dead
	Angianthus tomentosus		2	0.1	New
	Goodenia viscida		10	0.5	
	Goodenia viscida				New
C	***Wilsonia rotundifolia***				
	Atriplex semibaccata				Recently Dead
	Maireana brevifolia	2	2	0.3	Recently Dead
	Angianthus tomentosus		5	0.1	New
	Goodenia viscida		2	0.5	New
D	***Tecticornia lepidosperma***	2	5	0.5	
	Maireana brevifolia	3	7	0.3	Recently Dead
	Wilsonia rotundifolia				Recently Dead
	Atriplex semibaccata				Recently Dead
	Angianthus tomentosus		1	0.1	New
E	***Tecticornia lepidosperma***		3	0.5	
	Maireana brevifolia	2	1	0.3	Recently Dead
	Atriplex semibaccata				Recently Dead
	Wilsonia rotundifolia				Recently Dead
	Goodenia viscida		5	0.5	

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
Plot 8					
A	***Casuarina obesa***				grazed - died
	Maireana brevifolia				Recently Dead
	Wilsonia rotundifolia		10	0.1	
	Angianthus tomentosus		50	0.3	New
B	***Wilsonia rotundifolia***		10	0.1	
	Angianthus tomentosus		60	0.3	New
C	***Tecticornia lepidosperma***				Recently Dead
	Wilsonia rotundifolia		5	0.1	
	Angianthus tomentosus		80	0.3	New
D	***Wilsonia rotundifolia***		5	0.1	
	Angianthus tomentosus		50	0.3	New
E	***Wilsonia rotundifolia***		5	0.1	
	Angianthus tomentosus		50	0.3	New
Plot 9					
A	***x***				Casuarina trees look sicker. More epicormic growth and are dying back.
B	***x***				
C	***x***				
D	***x***				
E	***x***				
Plot 10					
A	***Tecticornia lepidosperma***				
	Atriplex semibaccata				
	Maireana brevifolia				Recently Dead
	Wilsonia rotundifolia		50	0.1	
	Angianthus tomentosus		2	0.3	New
B	***Tecticornia lepidosperma***				
	Maireana brevifolia				Recently Dead
	Atriplex semibaccata		1	0.2	
	Wilsonia rotundifolia		10	0.1	Recently Dead
	Angianthus tomentosus		5	0.3	New
C	***Tecticornia pergranulata***	3	10	0.6	
	Tecticornia lepidosperma	1	0.1	0.5	
	Atriplex semibaccata		20	0.3	Stressed
	Wilsonia rotundifolia		10	0.1	Recently Dead
D	***Tecticornia lepidosperma***		20	0.7	
	Tecticornia pergranulata	1	5	0.5	
	Atriplex semibaccata		20	0.3	
	Tecticornia indica	2	5	0.5	
	Wilsonia rotundifolia				
	Mesembryanthemum nodiflora		10	0.1	
E	***Tecticornia lepidosperma***		10	0.5	
	Wilsonia rotundifolia				Recently Dead
	Maireana sp	1	0.5	0.2	
	Atriplex semibaccata		10	0.5	
	Maireana brevifolia	1	1	0.6	

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
Plot 11					
A	***Tecticornia lepidosperma***	16	25	0.6	
	Mesembryanthemum nodiflora		1		
	Atriplex semibaccata	1	1	0.2	
	Tecticornia indica				
B	***Tecticornia lepidosperma***	5	40	1.3	
	Atriplex semibaccata				
	Tecticornia indica	2	5	0.5	
C	***Tecticornia lepidosperma***	5	10	0.7	
	Tecticornia indica	3	5	0.5	
D	***Tecticornia lepidosperma***	7	15	0.7	
	Atriplex semibaccata	1	0.5	0.1	
	Tecticornia indica				
	Melaleuca lateriflora	1	2	2.05	New -moved to overstorey
E	***Tecticornia lepidosperma***	10			
	Tecticornia indica				
	Atriplex semibaccata	1	1	0.1	New -dying
Plot 12					
A	***Atriplex semibaccata***	0	0	0	New - dead
B	***Austrostipa compressa***	10	1		
C	***Atriplex semibaccata***	0	0	0	New - dead
D	***x***				
E	***Atriplex semibaccatta***	1	0.5	0.1	
A	***Austrostipa compressa***	15	1	0.30cm	New - sample taken
Plot 13					
A	***Lepidobolus preissianus***				
B	***Jacksonia furcellata***				Recently Dead
	Lepidobolus preissianus	24	10	0.3	
	Waitzia sp.		2	0.2	All through plot
C	***Melaleuca seriata***	1	1	0.5	
	Lepidobolus preissianus	11	5	0.3	
D	***Austrostipa elegantissima***		0.5	0.5	
	Lepidobolus preissianus	4	1	0.3	
E	***Lepidobolus preissianus***	10	1	0.3	Recently Dead
	Austrostipa elegantissima	4	1	0.5	
	Jacksonia furcellata	1	0.5	0.5	
	Neurachne alopecuroidea				Recently Dead
Plot 15					
A	***Austrostipa elegantissima***		1	0.3	
	Atriplex semibaccata				Recently Dead
	Daviesia debilior	3	1	0.6	
	Lomandra micrantha	3	1	0.3	
	Gahnia ancistrophylla	2	5	0.3	
B	***Gahnia ancistrophylla***	11	15	0.8	
	Daviesia debilior	2	5	0.5	
	Austrostipa elegantissima		2	0.5	
	Lomandra micrantha		2	0.3	
C	***Gahnia ancistrophylla***	2	5	0.5	

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
	Austrostipa elegantissima		2	0.8	
	Lomandra micrantha	1	1	0.3	
	Daviesia debilior	5	10	1	
D	***Daviesia debilior***	16	40	0.8	
	Atriplex semibaccata				Recently Dead
	Austrostipa elegantissima		1	0.4	
	Comesperma virgatum				Recently Dead
	Gahnia ancistrophylla		0.5	0.4	Recently Dead
E	***Austrostipa elegantissima***		1	0.5	
	Atriplex semibaccata				Recently Dead
	Daviesia debilior	9	15	0.6	
	Lomandra micrantha	4	1	0.4	
Plot 16					
A	***Gahnia trifida***	2	10	1	
	Lomandra micrantha	7	2	0.3	
	Dianella revoluta. divaricata				
	Atriplex semibaccata		0.5	0.3	
	Austrostipa compressa		0.5	0.3	
B	***Gahnia trifida***	2	2	1	
	Lomandra micrantha		1	0.3	
	Dodonaea viscosa	1	1	1.1	
	Austrostipa compressa		1	0.3	
C	***Gahnia trifida***	1	5	1	
	Lomandra micrantha	6	2	0.5	
	Dianella revoluta. divaricata		0.5	0.3	
	Austrostipa elegantissima				
	Neurachne alopecuroidea				
	Atriplex semibaccata				
D	***Lomandra micrantha***	2	0.5	0.3	
	AustroAustrodanthonia caespitosa		0.5	0.4	
	Atriplex semibaccata	2	1	0.3	
	Gahnia trifida	3	1	0.5	New
	Dianella revoluta. divaricata				New
E	***Gahnia ancistrophylla***				
	Lomandra micrantha	4	1	0.4	
	Austrodanthonia caespitosa	8	1	0.5	
	Atriplex semibaccata	1	0.5	0.1	
	Daviesia sp	2	10	1	
Plot 17					
A	***Gahnia ancistrophylla***	6	6	0.5	
B	***Gahnia ancistrophylla***	8	6	0.5	
	Lomandra micrantha	1	2	0.3	
C	***Gahnia ancistrophylla***	1	2	0.3	
	Atriplex semibaccata	6	1	0.2	
	Mesembryanthemum nodiflora		2	0.1	

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
D	***Atriplex semibaccata***	2	1	0.2	
	Mesembryanthemum nodiflora		6	0.3	
E	***Mesembryanthemum nodiflora***		2	0.1	
Plot 18					
A	***Atriplex semibaccata***	3	6	0.2	
	Maireana brevifolia	4	3	0.5	
	Mesembryanthemum nodiflora		5	0.1	
B	***Atriplex semibaccata***	1	2	0.2	
	Tecticornia indica	1	6	0.5	
	Maireana brevifolia	4	5	0.5	
	Mesembryanthemum nodiflora		2	0.1	
C	***Atriplex semibaccata***	7	6	0.2	
	Maireana brevifolia	2	3	0.5	
	Tecticornia indica	1	6	0.3	
D	***Gahnia ancistrophylla***	1	1	0.3	
	Melaleuca acuminata				
	Maireana brevifolia	1	0.5	0.2	
	Atriplex semibaccata	4	6	0.2	
	Tecticornia indica				
E	***Atriplex semibaccata***	2	2	0.2	
	Tecticornia indica	2	5	0.2	
	Maireana brevifolia	13	6	0.5	
	Gahnia trifida	1	10	0.8	
Plot 19					
A	***Atriplex semibaccata***	1	0.5	0.1	Recently Dead
	Tecticornia indica	2	6	0.3	
	Mesembryanthemum nodiflora		6	0.1	
B	***Atriplex semibaccata***				Recently Dead
	Tecticornia indica	1	4	0.5	Recently Dead
	Mesembryanthemum nodiflora		15	0.1	
C	***Atriplex semibaccata***				Recently Dead
	Tecticornia indica	1	6	0.5	
	Mesembryanthemum nodiflora		10	0.1	
D	***Atriplex semibaccata***				
	Tecticornia indica	1	2	0.3	New
	Mesembryanthemum nodiflora		10	0.1	
E	***Atriplex semibaccata***	1	2	0.1	
	Tecticornia indica	4	10	0.5	New
	Mesembryanthemum nodiflora		3	0.1	
Plot 20					
A	***Gahnia trifida***	9	20	1	some veldt grass

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
	Austrostipa elegantissima	4	1	0.5	grazed
	Atriplex semibaccata				Recently Dead
	Dianella revoluta. divaricata				
B	***Austrostipa elegantissima***		0.5	0.3	grazed
	Atriplex semibaccata				Recently Dead
C	***Austrostipa elegantissima***		1	0.8	grazed
D	***Austrostipa elegantissima***	10.1	10	1.1	
E	***Austrostipa elegantissima***	2	1	0.3	grazed
	Atriplex semibaccata	2	1	0.1	
Plot 21					
A	***Tecticornia pergranulata***	12	2	0.2	Recently Dead
	Tecticornia indica		40	0.3	
B	***Tecticornia pergranulata***	5	1	0.2	Recently Dead
	Tecticornia indica		15	0.3	
C	***Tecticornia pergranulata***	15	1	0.2	Recently Dead
	Tecticornia indica		10	0.3	
D	***Tecticornia lepidosperma***				Recently Dead
	Tecticornia indica		15	0.3	
E	***Tecticornia lepidosperma***				Recently Dead
	Tecticornia indica		5	0.3	
	Tecticornia pergranulata	5	1	0.2	
Plot 22					
A	***Tecticornia indica***	100	10	0.1	
	Tecticornia indica				
B	***Tecticornia indica***	60	5	0.1	
C	***Tecticornia indica***	50	10	0.2	
D	***Tecticornia indica***	50	15	0.3	
E	***Tecticornia indica***	27	5	0.3	
Plot 23	***Tag in SW corner plots run W-SE***				
A	***x***				
B	***x***				
C	***Atriplex semibaccata***	1	5	0.3	
D	***x***				
E	***Atriplex semibaccata***	1	2	0.3	
Plot 24					
A	***Dianella revoluta. divaricata***	1	0.5	0.8	
	Gahnia trifida				
	Lomandra micrantha	1	0.5	0.4	
B	***Lomandra micrantha***				
C	***x***				
D	***x***				
E	***x***				
Plot 25					
A	***Neurachne alopecuroidea***				

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
B	***Neurachne alopecuroidea***				
C	***Neurachne alopecuroidea***				
	Chorizandra enodis	1	0.1	0.2	
D	***Austrodanthonia caespitosa***				
	Neurachne alopecuroidea				
	Cryptandra sp				
E	***Lepidosperma tenue***	1	1	0.2	
	Ptilotus manglesii				
	Neurachne alopecuroidea	1	0.1	0.2	
	Cryptandra sp				
Plot 26					
A	***Waitzia***		20		
B	***Waitzia***		40		Presence of Waitzia
C	***Waitzia***		60		Flowers dying off
D	***Waitzia***		30		
E	***Waitzia***		50		
Plot 27					
A	***x***				
B	***x***				
C	***x***				
D	***x***				
E	***x***				
Plot 28					
A	***Maireana brevifolia***	2	5	0.7	
	Tecticornia lepidosperma	1	1	0.5	
	Atriplex semibaccata	2	1	0.3	Recently Dead
B	***Tecticornia lepidosperma***	5	20	0.7	
	Maireana brevifolia	10	10	0.8	
	Atriplex semibaccata				
	Tecticornia indica	1	1	0.6	
C	***Tecticornia lepidosperma***				Recently Dead
	Atriplex semibaccata				Recently Dead
	Maireana brevifolia	8	10	1.1	
D	***Tecticornia lepidosperma***				
	Maireana brevifolia	9	10	1.1	
	Atriplex semibaccata				Recently Dead
E	***Tecticornia lepidosperma***	1	2	0.5	
	Maireana brevifolia	12	10	1.2	
	Atriplex semibaccata				Recently Dead
Plot 29					
A	***Maireana brevifolia***				
	Atriplex semibaccata	1	0.1	0.2	
	Angianthus tomentosus	1	0.5	0.2	
	Mesembryanthemum nodiflora		1	0.3	
B	***Tecticornia lepidosperma***	2	5	0.8	

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
	Atriplex semibaccata				New
	Angianthus tomentosus	4	0.5	0.3	
	Mesembryanthemum nodiflora		5	0.2	
C	***Tecticornia lepidosperma***	2	2	0.6	
	Mesembryanthemum nodiflora		1	0.3	
D	***Tecticornia lepidosperma***	1	0.5	0.3	
	Atriplex semibaccata	2	1	0.2	Recently Dead
	Mesembryanthemum nodiflora		1	0.2	
E	***Atriplex semibaccata***				Recently Dead
	Tecticornia lepidosperma				Recently Dead
	Mesembryanthemum nodiflora		5	0.3	
Plot 30					
A	***x***				
B	***Lomandra rupestris***	2	5	0.4	Very weedy site - veldt grass 80%
C	***Lomandra rupestris***	3	10	0.6	
D	***Lomandra rupestris***	1	3	0.6	
E	***Lomandra rupestris***	1	2	0.5	Recently Dead
	Austrostipa compressa				Very weedy
Plot 31					
A	***Lomandra rupestris***				
	Neurachne alopecuroidea				
	Austrostipa elegantissima				
B	***Lomandra rupestris***				
	Neurachne alopecuroidea				
	Dianella revoluta. divaricata				
C	***Dianella revoluta. divaricata***				
	Lepidobolus preissiana				
	Neurachne alopecuroidea				
D	***Lomandra rupestris***				
	Neurachne alopecuroidea				
	Austrostipa elegantissima				
E	***Lomandra rupestris***				
	Neurachne alopecuroidea				
Plot 32 (RF1)					
Whole Plot	***Tecticornia indica***		5	0.5	
	Tecticornia lepidosperma		10	0.8	a lot have dieback
	Dianella revoluta. divaricata		0.5	0.8	
	Hakea preissii		1	2.5	
	Gahnia trifida				
	Lomandra micrantha		2	0.5	
	Austrostipa compressa		2	0.8	
	Carpobrotus sp				New

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
	Mesembryanthemum nodiflora		0.1	0.1	
	Maireana brevifolia		0.5	1	New
	Waitzia sp.		10	0.2	
	Maireana sp		0.5	0.3	
Plot 33 (RF4)					
Whole Plot	***Tecticornia lepidosperma***				
	Maireana brevifolia		2	1	Recently Dead
	Goodenia viscida		3	0.5	New
	Angianthus tomentosus		80	0.3	
Plot 34					
A	***Tecticornia lepidosperma***	2	1	0.5	
B	***Tecticornia lepidosperma***		30	0.6	A lot of Avena grass, although dead
C	***Tecticornia lepidosperma***		40	0.8	
	Tecticornia indica		2	0.5	
	Mesembryanthemum nodiflora		2	0.3	
D	***Tecticornia lepidosperma***		20	0.6	
	Atriplex semibaccata				Recently Dead
E	***Tecticornia lepidosperma***		15	0.5	
	Atriplex semibaccata	1	1	0.5	New
	Maireana brevifolia	2	1	0.7	New
Plot 35					
A	***x***				
B	***Carpobrotus sp.***				
	Atriplex semibaccata	1	0.1	0.1	
	Tecticornia lepidosperma	1	1	0.5	
	Maireana brevifolia	1	0.5	0.1	
C	***Carpobrotus sp.***				Recently Dead
	Maireana sp				Specimen taken
	Atriplex semibaccata	1	0.5	0.1	Recently Dead
	Maireana brevifolia	2	5	0.7	New
D	***Carpobrotus sp.***				Recently Dead
	Atriplex semibaccata				Recently Dead
E	***Carpobrotus sp.***				Recently Dead
	Tecticornia lepidosperma	1	0.5	0.5	
	Austrostipa compressa	12	1	0.7	
	Maireana brevifolia	2	1	0.6	
Plot 36					
A	***Tecticornia lepidosperma***		25	0.6	
	Atriplex semibaccata				Recently Dead
B	***Tecticornia lepidosperma***				Recently Dead
	Tecticornia pergranulata	1	1	0.5	Recently Dead
	Atriplex semibaccata				New
C	***Tecticornia lepidosperma***				Recently Dead
	Tecticornia pergranulata		20	0.8	
	Melaleuca ?pauciflora			1.2	

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
D	***Tecticornia lepidosperma***		20	0.8	
	Atriplex semibaccata				Recently Dead
E	***Tecticornia lepidosperma***	1	0.5	0.5	Recently Dead
	Tecticornia pergranulata		5	0.5	
	Carpobrotus sp.				Recently Dead
	Atriplex semibaccata	2	2	0.1	
			5	0.3	
Plot 37					
A	***Tecticornia lepidosperma***	8	5	0.4	Recently Dead
	Tecticornia pergranulata	7	5	0.5	
	Mesembryanthemum nodiflora		10	0.1	
	Atriplex semibaccata		5	0.1	Recently Dead
B	***Tecticornia lepidosperma***		1	0.2	Recently Dead
	Tecticornia pergranulata		2	0.4	
	Atriplex semibaccata		5	0.2	Recently Dead
C	***Tecticornia lepidosperma***	6	5	0.4	Recently Dead
	Tecticornia pergranulata		7	0.6	
	Mesembryanthemum nodiflora		80	0.1	
	Atriplex semibaccata				Recently Dead
D	***Tecticornia lepidosperma***		20	0.5	
	Atriplex semibaccata				Recently Dead
	Tecticornia pergranulata	4	1	0.3	
	Mesembryanthemum nodiflora	50		0.1	
E	***Tecticornia lepidosperma***	6	1	0.4	Recently Dead
	Tecticornia pergranulata		7	0.5	
	Mesembryanthemum nodiflora		5	0.1	
	Atriplex semibaccata		5	0.2	Recently Dead
	Wilsonia sp.		2	0.1	
Plot 38					
A	***Tecticornia lepidosperma***	0	0	0	Recently Dead
	Atriplex semibaccata	5	0.5	0.1	Recently Dead
B	***Tecticornia lepidosperma***	1	1	0.25	
	Atriplex semibaccata	2	0.1	0.1	Recently Dead
	Mesembryanthemum nodiflora		0.2	0.05	
C	***Tecticornia lepidosperma***	2	0.5	0.3	
	Atriplex semibaccata	2	0.1	0.1	
	Mesembryanthemum nodiflora		0.1	0.05	
D	***Tecticornia lepidosperma***	5	10	0.7	A lot had died
	Atriplex semibaccata				Recently Dead
	Mesembryanthemum nodiflora		0.2	0.05	
E	***Tecticornia lepidosperma***	2	1	0.3	
	Atriplex semibaccata				Recently Dead
	Casuarina obesa seedling	1	0.1	0.2	Grazed

	Species	2009 Number	2009 % Cover	2009 Ht (m)	Comments
Plot 43					
A	***Lomandra micrantha***	11	10	0.5	Sample taken
B	***Lepidosperma sp***	2	10	0.6	
	Dodonaea sp.	1	1	0.3	Sample taken
	Desmocladus lateriticus		2	0.1	
	Lomandra micrantha	9	15	0.8	Sample taken
C	***Astroloma sp?***	1	5	0.5	Sample taken
	Acacia leptopetala	1	5	0.6	
	Lomandra micrantha	12	10	0.6	
D	***Lepidosperma sp***	2	5		Sample taken
	Acacia lasiocarpa var sedifolia	1	15		
E	***Lomandra micrantha***	4	5	0.4	Sample taken
	Gahnia trifida	5	20	0.8	
Plot 44					
A	-	-	-	-	Nothing
B	-	-	-	-	Nothing
C	-	-	-	-	Very hard crust
D	-	-	-	-	Small gullies where water flows in pools
E	-	-	-	-	
Plot 45					
A	***Tecticornia indica***	2	5	0.5	
	Maireana sp		2	0.1	Sample taken
B	***Tecticornia indica***	1	5	0.3	
	Atriplex semibaccata		7	0.2	Weed
	Mesembryanthemum nodiflora				
	Tecticornia lepidosperma	1	2	0.3	
C	***Tecticornia indica***	4	15	0.3	
	Tecticornia lepidosperma	5	10	0.5	
D	***Tecticornia indica***	2	1	0.2	
	Tecticornia lepidosperma	3	5	0.4	
E	***Atriplex semibaccata***	3	5	0.2	
	Tecticornia lepidosperma	3	5	0.5	
	Tecticornia indica		10	0.5	

Appendix Three: Salinity Data

Vegetation Monitoring of lake Toolibin and Reserves

Plot 3 - 2009

EM38 Distance (m)	Distance Across (m)					
	0		10		20	
	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	158	107	179	106	237	176
4	167	107	167	112	210	139
8	162	105	140	101	241	177
12	125	80	118	69	187	125
16	107	59	116	71	185	132
20	110	64	128	84	169	119

Plot 4

EM38 Distance (m)	Distance Across (m)					
	0		10		20	
	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	335	242	362	242	379	211
4	376	269	300	191	382	293
8	392	245	378	229	396	253
12	352	235	337	223	360	238
16	365	220	292	193	366	240
20	300	172	320	205	340	196

Plot 5 - 2009

EM38 Distance (m)	Distance Across (m)					
	0		10		20	
	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	355	236	374	273	370	252
4	379	244	378	261	395	272
8	321	230	345	220	375	243
12	358	217	378	278	346	236
16	388	273	332	211	328	204
20	315	186	313	211	367	252

Plot 6 - 2009

EM38 Distance (m)	Distance Across (m)					
	0		10		20	
	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	304	187	277	172	299	178
4	312	190	277	168	294	172
8	289	176	275	165	278	172
12	252	151	260	157	288	175
16	249	152	276	168	291	183
20	298	174	292	178	308	184

Plot 7 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	268	170	260	174	261	162
4	274	185	324	222	269	174
8	306	196	348	247	258	164
12	293	178	268	164	209	132
16	277	172	226	164	171	110
20	275	170	266	160	170	110

Plot 8 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	299	192	296	179	283	175
4	286	180	317	199	294	193
8	291	179	362	187	311	193
12	306	198	289	183	288	176
16	299	189	278	174	274	166
20	272	167	268	169	265	162

Plot 9 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	289	181	312	183	269	184
4	298	166	313	203	265	166
8	304	192	312	214	281	173
12	274	166	326	212	295	173
16	280	177	373	242	310	205
20	284	194	347	202	264	152

Plot 10 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	305	184	353	226	382	259
4	309	194	313	197	340	237
8	359	222	340	230	366	247
12	371	254	327	208	369	233
16	404	255	329	208	349	219
20	353	228	334	208	342	219

Plot 11 - 2009 after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	191.5	190.9	192.9	191.5	190.8	187.6
4	190.3	184.7	192.8	192.2	192	191.6
8	192.1	190.1	192.8	191.2	192.5	193.1

12	190	184	191	188.5	191.8	192.6
16	189.6	184.1	191.8	187.1	192.3	191.6
20	189.5	185.8	192.7	190.5	192.2	193

Plot 12 - 2009 1000's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	98.6	60.5	95.3	52.8	105.9	60.1
4	102.5	58.9	90	50.9	104.6	58.2
8	97.1	56.8	87.5	48.1	79.2	45.5
12	93.8	52.9	87.4	48.1	71.8	38.5
16	74.1	41.2	69.6	39.3	57	32.2
20	63.1	36.7	55.8	31.5	45.9	25.1

Plot 13 - 2009 1000's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	22.4	20.4	30.3	16.8	32.6	18
4	27.1	11.5	28	15.2	31.3	17.1
8	26.4	14.4	27.2	14.9	28.7	15.8
12	25.9	14.5	26.7	15.1	27.2	15.1
16	26.1	14	27.7	14.8	27.3	15.3
20	26.4	14.7	26.6	14.7	27.4	15.8

Plot 15 - 2009 1000's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	174	125	167	134	208	150
4	141	115	163	118	174	131
8	129	100	135	74	161	107
12	174	120	179	125	161	106
16	211	157	225	164	179	124
20	222	185	206	149	186	141

Plot 16 - 2009 1000's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	142	100	139	89	196	142
4	153	130	124	87	189	148
8	161	104	127	87	160	115
12	145	107	176	130	191	139
16	166	141	190	190	198	154
20	162	123	164	124	197	160

Plot 17 - 1000's-after rain

2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	166	112	201	130	267	252
4	183	120	214	140	266	171
8	237	175	174	115	198	134
12	252	177	186	128	173	110
16	194	126	189	127	189	122
20	176	119	175	110	170	110

Plot 18 - 2009 100's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	291	212	341	270	326	257
4	233	266	338	261	330	259
8	363	309	346	288	327	257
12	403	324	361	301	318	248
16	374	342	376	290	356	293
20	395	333	379	335	343	317

Plot 19 - 2009 1000's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	448	334	528	394	415	301
4	511	398	536	407	430	285
8	435	297	494	327	454	292
12	471	312	479	310	470	319
16	446	284	470	371	441	307
20	568	456	494	364	506	405

Plot 20 - 2009 1000's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	175	108	159	99	186	146
4	174	171	151	92	170	109
8	166	107	160	119	198	146
12	151	94	170	110	157	106
16	161	105	161	107	173	124
20	200	145	146	98	190	135

Plot 21 - 2009 1000's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal

0	524	662	614	580	942	1084
4	590	640	626	811	1022	1235
8	682	707	603	790	1079	1077
12	708	836	631	656	1065	924
16	802	892	686	784	931	1297
20	695	814	829	835	1024	1325

Plot 22 - 2009 1000's-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	793	755	729	640	682	599
4	819	677	741	725	745	618
8	761	713	688	591	752	574
12	803	761	690	629	661	579
16	718	704	706	715	675	589
20	706	694	683	659	754	694

Plot 23 - 2009 NB: subplots run E-W instead of N-S, thus reading were taken from NW (0,0) to SW (0,20). Calibration site at (10,0). 1000's

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	261	179	233	150	255	165
4	294	258	301	246	273	197
8	295	243	226	167	227	180
12	236	191	220	140	213	143
16	201	143	169	108	209	132
20	217	157	165	101	193	124

Plot 24 - 2009 NB: tagged on the NE post. 1000's

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	235	160	223	141	181	105
4	213	153	253	176	208	138
8	208	138	227	152	255	163
12	185	119	224	139	245	156
16	186	125	254	157	222	150
20	218	134	211	130	202	129

Plot 25 - 2009 1000's

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	177	119	160	101	152	96
4	164	103	172	114	160	108
8	170	106	188	139	177	111
12	172	104	172	100	170	102
16	180	135	165	122	177	99

20	200	145	165	112	162	105

Plot 26 - 2009 NB: x100 range used on EM38

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	87	47	100	55	127	73
4	87	47	106	60	125	73
8	85	45	110	62	123	72
12	82	45	106	60	117	67
16	79	42	97	57	118	68
20	72	38	97	55	107	60

Plot 27 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	108	69	127	88	135	85
4	115	73	132	89	131	82
8	106	70	128	88	146	90
12	113	72	144	100	142	93
16	111	68	143	95	131	82
20	111	70	134	84	119	72

Plot 28 - 2009 1000's

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	295	206	286	193	334	247
4	324	241	270	171	335	233
8	361	270	339	259	338	244
12	359	269	345	281	382	288
16	355	269	338	262	400	287
20	378	262	399	290	351	261

Plot 29 - 2009 1000's

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	443	318	426	307	441	316
4	472	341	430	287	401	303
8	430	313	419	288	405	269
12	448	333	389	304	420	301
16	449	333	426	321	428	308
20	467	346	449	324	417	314

Plot 30 - 2009 NB: x100 range used on EM38

EM38	Distance Across (m)					
	0		10		20	
Distance	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal

(m)						
0	4.5	0.04	8.2	1.4	12.9	6.1
4	3.4	-0.01	7.9	2.5	12.6	6
8	3.6	0	6.8	0.01	12.5	6
12	2.7	-0.06	5.3	1.3	12.1	6
16	2.2	-0.04	5.1	0.1	10.5	4.9
20	2.5	-0.04	4	0.04	10.2	4.8

Plot 32 (RF1) - 2009 100-after rain

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	154	90	110	63	69	37
4	174	104	188	114	75	41
8	195	119	226	139	116	69
12	265	159	327	216	148	80
16	306	201	387	274	225	135
20	406	279	459	342	247	149
24	522	402	474	349	371	259
28	510	406	459	327	447	340
33	421	295	401	296	267	377
37	600	535	544	456	411	332
41	355	231	431	336	465	369
45	395	260	342	255	544	448
49	320	238	259	189	488	345
53	225	157	217	159	396	296
57	190	126	175	119	181	121
61	120	77	136	85	189	125
65	111	65	99	56	178	117
	90	52	92	52	107	69
	82	47	81	45	99	58
	68	46	80	44	90	53

Plot 33 (RF4) - 2009

NB: (0,0) is at NW post, (40,0) is at NE post; (20,0) is at SW post and (20,40) is at SE post.

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	186	115	136	84	155	98
4	166	114	142	90	147	89
8	188	119	150	92	135	85
12	230	152	171	99	125	75
16	230	156	182	123	150	94
20	198	142	211	121	192	129
24	216	145	214	131	225	152
28	214	145	243	152	302	211
32	189	130	269	189	234	154
36	208	135	211	178	292	220
40	228	148	217	194	280	213

Plot 34 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	186.4	182.4	184.4	178.4	184.5	182
4	186.9	183.6	182.3	178.5	185.1	184.5
8	185.6	182.3	183.8	178	180.8	177
12	185	183.2	182.1	177.4	179.2	177.7
16	184.6	178.7	183.2	180.9	182.5	176.7
20	183.7	180.5	185.3	183.4	183.6	176.6

Plot 35

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	387	265	408	307	386	296
4	372	293	356	253	336	246
8	377	273	324	236	376	292
12	376	310	311	223	358	280
16	402	298	318	235	355	280
20	393	295	321	223	359	270

Plot 36 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	480	330	386	251	399	260
4	476	329	387	297	385	256
8	449	340	390	252	384	282
12	448	304	354	264	392	298
16	370	249	385	290	365	249
20	382	240	374	248	413	255

Plot 37 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	439	311	535	410	545	349
4	437	294	490	351	490	341
8	475	346	479	327	434	300
12	489	361	445	345	401	269
16	450	310	478	319	375	247
20	431	274	450	300	399	264

Plot 38 - 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	190.4	186.2	185.8	166.8	180.1	134.5
4	190.9	189.5	185.7	171.1	183.3	151.4
8	187.5	183.7	182.5	147.5	188.7	183.3

12	188.8	183.2	184.3	153.1	188.3	181.7
16	190.7	187.2	181.5	137.1	184.1	164.1
20	190.3	181.2	182.4	146.3	190.2	187.9

Plot T42 (seedling plot)2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	275	191	349	249	276	197
4	240	169	322	231	217	212
8	249	172	217	143	306	250
12	286	195	273	191	305	219
16	265	173	346	236	344	264
20	271	174	288	196	365	235

Plot 43 established 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	136	81	198	121	173	108
4	134	87	231	143	200	134
8	149	94	257	178	182	119
12	174	122	247	213	187	122
16	209	183	223	146	208	142
20	249	188	291	226	234	162

Plot 44 established 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	194	122	220	138	241	161
4	176	111	222	152	268	194
8	208	141	201	139	255	191
12	236	168	212	138	206	131
16	246	194	219	164	218	142
20	272	201	232	153	275	185

Plot 45 established 2009

EM38	Distance Across (m)					
	0		10		20	
Distance (m)	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
0	298	216	477	327	387	269
4	292	207	485	426	460	314
8	484	327	466	481	357	236
12	399	278	391	286	539	429
16	422	327	360	263	438	313
20	460	374	450	367	498	455

Appendix Four: Seedling Data

Vegetation Monitoring of lake Toolibin and Reserves

Plot 39	2009			
Distance (m)	Seedling #	Height (M)	EM38 (V)	EM38 (H)
0-5	5	0.5-4.6	158	98
5-10	6	0.5-4	160	95
10-15	16	2.6-4.5	144	91
15-20	19	0.5-5.6	122	73
20-25	16	2-5.3	105	52
25-30	12	0.5-5.1	121	75
30-35	8	0.4-5.5	124	74
35-40	18	1.6-4.6	104	64
40-45	46	0.6-4.2	90	57
45-50	16	0.5-3.2	94	56
50-55	0		127	78
55-60	0		158	93
60-65	0		164	109
65-70	1	1.7	151	90
70-75	2	0.3-0.5	148	90
75-80	1	2.27	144	92
80-85	4	0.4-1.8	127	80
85-90	6	0.3-3.6	134	80
90-95	0		155	91
95-100	1	0.75	169	108

Plot 40	2009			
Distance (m)	Seedling #	Height (M)	EM38 (V)	EM38 (H)
0-5	46	0.7-4.9	131	80
5-10	111	0.5-5.5	137	87
10-15	191	1-6.2	172	83
15-20	71	0.2-3.8	118	78
20-25	25	0.7-3.0	105	63
25-30	131	0.3-3.2	113	70
30-35	39	0.3-2.7	129	85
35-40	16	0.2-0.7	129	86
40-45	10	0.1-0.3	134	80
45-50	5	0.1-0.2	129	82
50-55	6	0.1-0.2	118	77
55-60	10	0.1-0.3	116	71
60-65	106	0.2-3.9	101	63
65-70	99	0.2-3.9	76	46
70-75	58	1-5.16	69	43
75-80	79	0.7-4.2	66	41
80-85	60	0.2-5.2	69	41
85-90	50	0.6-4.4	83	50
90-95	34	0.3-3.9	92	56
95-100	25	0.8-4.3	98	55

Plot 41	**2009**			
Distance (m)	**Seedling #**	**Height (M)**	**EM38 (V)**	**EM38 (H)**
0-5	11	0.4-5.3	90	58
5-10	19	0.3-8.1	109	73
10-15	34	0.25-5.3	103	68
15-20	36	0.3-6.3	99	59
20-25	41	0.3-5.5	106	64
25-30	82	0.5-5	102	58
30-35	73	0.6-4.3	101	63
35-40	104	0.5-5.1	84	51
40-45	216	0.6-4.7	83	57
45-50	126	0.4-4.4	120	71
50-55	181	0.4-4.4	145	83
55-60	292	0.6-3.4	159	97
60-65	412	0.5-3.2	165	96
65-70	437	0.3-2.55	195	124
70-75	318	0.3-2.2	184	110
75-80	243	0.5-2.1	198	124
80-85	100	0.5-2.3	208	126
85-90	45	0.5-2.9	233	151
90-95	15	1.1-2.5	300	193
95-100	7	0.2-2.7	283	180

Appendix Five:
Percentage Cover

Vegetation Monitoring of lake Toolibin and Reserves

Plot	*C obesa*		*M strobophylla*		*B prionotes*		*A huegeliana*		*E loxophleba*		*M lateriflora*		*M acuminata*		*A acuminata*		*J furcellata*		*E salmonophloia*		*E wandoo*	
3	2	5																				
4	10	10	0	5																		
5	20	20	1	1																		
6																						
7	15	20																				
8																						
9	50	45	0	1																		
10	10	15	2	1																		
11	10	12.5																				
12							1	1	30	30					15	10						
13					1	5	5	15									1	1				
15																			5	15	5	0
16																			5	15	5	0
17													20	30								
18													15	15								
19											45	30										
20													25	40								
21	0		0																			
22	0		0																			
23			1	1					3	1	10	5	40	15								
24									1	1	40	50	30	10							1	-
25													60	30							2	5
26	1	5													15	30						
27	5	20																				

Plot	*C obesa*		*M strobophylla*		*B prionotes*		*A huegeliana*		*E loxophleba*		*M lateriflora*		*M acuminata*		*A acuminata*		*J furcellata*		*E salmonophloia*		*E wandoo*	
28	20	25																				
29	6	10																				
30					1	1	1	3														
32	7	10	1	1			1	5	5	10	1	2			1	5						
33(RF4)	5	10																				
34	30	30																				
35	30	30																				
36		10	1	1																		
37	7	10																				
38	20	20																				
39																						
40																						
41																						
42																						
43												1		5						10		
44					1									10							10	
45		0.5			1							30		1								