VEGETATION MAPPING AND ASSESSMENT AT YENYENING LAKES NATURE RESERVE (RFQ 407 04/06)

DEC

Prepared by:

Ecoscape (Australia) Pty Ltd

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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
mail@ecoscape.com.au

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Ecoscape would like to thank the following people for their contributions to this report:

Jeff Richardson	Nature Conservation Officer	DEC, Great Southern District
Greg Durell	District Manager	DEC, Great Southern District
Wall Mills	Landholder	
Margaret Hall	Landholder	
Neville McLean	Landholder	
Trevor McLean	Landholder	

Summary

Vegetation Mapping and Assessment at Yenyening Lakes NR

The Department of Environment is presently coordinating a pre-feasibility project to assess the potential for establishing a drainage network in the southern Wheatbelt near Brookton. If the project is approved, it is possible the Yenyening Lakes Nature Reserve may be affected. Prior to this it is essential that the biological values of the reserve are fully collated and baseline information on vegetation condition is collected.

The vegetation map produced by Gunness for the Wildflower Society of Western Australia 2003 was digitised in ESRI ArcGis 9. Additional areas to the north-east and south-west of the reserve were also digitised. Vegetation boundaries were determined and polygons were attributed at association level.

In consultation with the DEC, 15 permanent quadrats and 11 relevé sites were established across the study area to characterise the vegetation. Comprehensive descriptions of the locations and vegetation classifications were made and the information entered into the DEC regional reserves database. Of the twenty vegetation associations, two were considered significant and vulnerable to changes in salinity or hydrological regimes. These were the Hopkinsia Sedgelands and the Perched Freshwater Lakes.

Five transects were established to provide baseline information on vegetation health. These were all located along the southern boundary of the lake system on the basis that greater opportunities were expected there to record trends in this area due its relative health and more pronounced topography (resulting in degradation spreading along transects more slowly).

A total of 93 plant taxa were recorded in the study area, of which 89 were native. Specimens for all taxa recorded were collected and supplied to the DEC. Two Declared Rare Flora and nine Priority taxa have been previously recorded within the study area. Opportunistic observations of *Ptilotus fasciculatus (DRF) and Hopkinsia anoectocolea* (P3) were made by Ecoscape and both of these species were considered vulnerable to changes in salinity or hydrological regimes on site.

In addition to historical clearing of perennial vegetation in the catchment, the other potential influences on salinity levels observed in the lake system were drains, groundwater extraction and the Qualandary Crossing gates.

Eight recommendations are made in regarding ongoing monitoring within the study area.

1.0 Introduction

Vegetation Mapping and Assessment at Yenyening Lakes NR

1.1 Background

The Department of Environment and Conservation (DEC) is presently coordinating a pre-feasibility project to assess the potential for establishing a drainage network in the locality of the Yenyening Lakes Nature Reserve (YLNR). As part of any assessment of a potential drainage network it is essential that the biological values of the reserve be fully collated and baseline information on vegetation condition collected. The DEC consequently commissioned Ecoscape to characterise the vegetation and gather baseline vegetation health data.

1.2 Study Area

The Yenyening Lakes are located on the boundary of the Brookton, Beverley and Quairading Shires about 25 kilometres east of the Brookton townsite.

The Yenyening Lakes Nature Reserve consists of two Nature Reserves (Numbers 31837 & 28088) covering an area of 3098 hectares. These two Nature Reserves are Class A Reserves with a Management Order in favour of the Conservation Commission. They are managed for the purpose of *Conservation of Flora and Fauna*. Although not listed as Wetlands of National Importance (Environment Australia 2001), the lakes have value for both conservation and recreational pursuits. The dune vegetation systems between the network of salt lakes and channels contain unique floristic communities, some retaining healthy vegetation.

1.3 Objectives

Ecoscape was commissioned by DEC to map and assess the condition of the vegetation communities in the reserve. The three principal objectives of this project were to:

1. Map the vegetation of the YLNR, this includes not only vegetation communities but also areas considered to have altered due to recent changes in water levels;
2. Conduct and report on a vascular plant survey of the YLNR; and
3. Establish and report on vegetation condition transects.

To meet these objectives, Ecoscape was required to:

1. undertake vegetation mapping on the basis of vegetation structure, floristics and degree of degradation;
2. establish quadrats to characterise mapped vegetation unit; and
3. establish transects to monitor vegetation health.

2.0 Method and Procedures

2.1 Data Collection Methods, and Attributes

Data were collected and attributed at one of three scales:

- Reserve;
- Mapped units within a reserve; and
- Survey sites.

Vegetation mapping was generally consistent with the methods of Muir (1977) and the collection of data required for the description of sites and the vegetation and soils present at each site generally followed the methods and coding of McDonald *et al.* (1998).

The mapping and data collection methods are detailed below.

2.1.1 Project Information

General information about the project was entered into the “Projects” table in the Access database, including:

- Project code (based on the Request For Tender number);
- Project name;
- Finish date;
- Project scale; and
- Project area.

2.1.2 Reserve Identification

The reserve being assessed as part of the project was entered into the “Project Reserves” table in the Access database.

2.1.3 Reserve Details

The following information was recorded for each reserve surveyed:

- Reserve number;
- Shire;
- CALM District Name and District Number;
- Locality or Reserve Name;
- Survey Date;
- Surveyor(s) name(s);
- The appropriate 1:25 000 or 1:50 000 Topographic Survey mapsheet name and number, recording more than one if necessary;
- The appropriate 1:250 000 Geology mapsheet name(s) and number(s), recording more than one if necessary;
- Nearest town, direction (one of 16 cardinal points) and distance (km),

- Whether any “Non-indigenous Cultural Heritage Site Recording Form(s)” had been completed for the reserve; and
- Whether any “Aboriginal Site Recording Form(s)” had been completed for the reserve.

2.1.4 Mapping Vegetation Units

Broad vegetation units within each reserve were initially identified and mapped from aerial photography.

Most vegetation boundaries were digitised at a scale of 1:2000 from the Yenyening Lakes Vegetation Map produced by Gunness (2003), which was scanned and then georeferenced in ArcGIS 9 using common points in the state cadastral database boundaries.

An additional area to the north-east was digitised on the basis of aerial interpretation by Ecoscape.

Vegetation boundaries interpreted by Ecoscape were mapped to a Level 1 standard as per (a) and (b) of Muir (1977, p. 22); but no soil profile was described as per (c). Vegetation units were characterised to the level of Association based upon the growth form, height, cover and floristics of the dominant species for all strata. Vegetation unit boundaries were interpreted from colour aerial photomosaics. In general, Muir mapped all vegetation at a scale of 1:25 000, meaning that only vegetation units exceeding approximately 75 metres in diameter or in the narrowest dimension will be mapped. In this project vegetation boundaries were interpreted at a scale of 1:10,000 and digitised at a scale of 1:2,000. Vegetation units of particular interest, such as in locations where narrow zones of degradation occur along drainage lines or vegetation on narrow lunettes, were mapped.

Areas of degraded vegetation were mapped and characterised in the same way, and reflected, for example, the loss of strata, loss or dominant species or changes in species composition to more salt-tolerant species.

A list of perennial plant species was recorded for each association on the basis of quadrats placed within them. A reliability diagram showing where survey traverses where located was produced as per Muir (1977), and is included on Maps 3-5.

Vegetation units that existed as a mosaic of two or more associations were mapped as one unit, and noted as such.

Areas composed largely of outcropping rock such as granite, or lakes and bare salt pans, were mapped as separate vegetation units.

The areas to which these methods were applied are shown in Map 1.

For each vegetation polygon mapped the following information was recorded in the ArcView attribute table (dbf):

- Unique polygon number;
- Reserve Number;

- The area of the polygon in hectares;
- A site (quadrat) identifier (each polygon is attributed with the quadrat number that corresponds to the vegetation type within that polygon, even though the quadrat may be physically located elsewhere. Each quadrat's attributes may therefore be associated with many separate vegetation polygons across many reserves);
- A Muir vegetation description;
- A McDonald vegetation name;
- A Beard vegetation code; and
- Comments.

For the most widespread or predominant type of any degraded vegetation recorded within each reserve a photograph was taken that showed the main characteristics of the degradation during the spring re-survey of October 17-18 2006.

2.2 Field Survey

2.2.1 Establishing Survey Sites

Timing

The winter survey was undertaken between June 6-11 and June 14-15, 2006, and the spring re-survey was undertaken on October 17-18 2006.

Location

Detailed information on vegetation floristics and structure was collected from a series of quadrats; vegetation health information was collected from transects.

A preliminary survey was undertaken by Ecoscape on May 25-26 2006 to determine (in consultation with DEC) the appropriate number and location of quadrats, and the number and length of transects to characterise the study area.

On this basis 15 quadrats and five transects were established.

Quadrats were placed within homogenous areas judged by the consultants to be characteristic of the vegetation unit at the selected location. Quadrats were placed to avoid vegetation boundaries and areas of local disturbance, such as roads, tracks and gravel pits.

Transects sites were chosen on the basis that they were representative of the vegetation communities and the physical characteristics of the Nature Reserve around flow channels.

Quadrat Size

The reference sites for vegetation descriptions consisted of a 10m x 10m (100 m^2) quadrat. If overstorey species existed, this quadrat was nested within a 20m x 20m (400 m^2) quadrat with a common north-west corner. Unless otherwise noted, only the north-west corner was marked.

Transect Lengths

Transects were located around the flow channels, ideally extending from near areas of inundation to a region above and clear of present and future inundation. Transect lengths varied from 140m to 200m and one (YT0604) was divided into 2 sections of 100m (one either side of a lunette).

The start of each transect (defined as closest to the major inundation) was pegged with a star picket and marked with a stainless steel tag stamped with a unique identifier. The end of the transect was also marked with a star picket (with the exception of YT0604). A GPS reading was taken at each end of each transect. A compass bearing was recorded along the length of the transect from the start point.

To aid in re-establishment, transects were pegged every 20 metres with galvanised fence spreaders.

Marking and Labelling

All quadrats and transects were labelled with a metal tag (stamped with a unique site identifier), attached to the steel star picket located in the common (north-west) corner.

The unique identifier consists of two letters followed by 4 numbers. The first letter indicates the project locality (Y for Yenyening), the second letter indicates site type (T for Transect or Q for Quadrat), then 2 digits each for year (06 for 2006), and Site number (e.g. YT0601 identified Yenyening Transect 2006, Site 01). The exception to this is Transect YT0604, which was divided into a and b (added to the end of the identifier).

A colour photograph of each quadrat was taken from the north-west corner looking in a south-easterly direction. The photograph shows the steel star picket at the common (north-west) corner in the foreground, and records the general appearance of the vegetation at the survey site.

Dense vegetation prevented the marking of quadrat YQ0608 on the north-west corner. The star picket there was instead placed at the south-east corner, and the photo direction was from the south-east corner towards the north-west corner.

2.2.2 Quadrat Data Collection

Quadrat data were recorded following the methodology of McDonald *et al* (1998). Page numbers below refer to page numbers in this reference.

Survey Site Description

The following information was collected or recorded for each quadrat site:

- Date;
- Name(s) of surveyor(s);
- Unique site identifier (two alpha characters and four digits);
- Reserve number;
- Location by GPS;
- An air photo reference, p 7 (excluding the marking of the air photo);

- Aspect, p 87;
- Elevation (means of evaluation of elevation and elevation value), pp 87-88;
- Disturbance of site, p 88;
- Surface gravels [2-60 mm] (abundance and lithology), pp 97-99;
- Surface stones and boulders [coarse fragments > 60 mm] (abundance and lithology), pp 97-99;
- Slope class, morphological type and landform element (refer to p19 "Short description of a landform element" for more details, in particular "…..the name of the landform element implies that other, unstated attributes have been observed or inferred." Also see the Key [Table 4], pp 26-29).
- A vegetation name;
- Evidence/no evidence of fire, and an estimate of the number of years (range) since the most recent fire;
- Percentage cover of plant litter; and
- Percentage cover of bare ground.

Vegetation Description

Vegetation data were collected in sufficient detail to enable the vegetation at each site to be described to "Sub-association" level (National Land and Water Resources Audit, 2000). This required that the dominant growth form, height and cover for up to 5 species be recorded for each layer/stratum (up to 5 layers/strata) with stratum defined using the NVIS stratum codes and description (Table 3, National Land and Water Resources Audit, 2000).

Vegetation Floristics

Up to five dominant vascular plant species identified to species and subspecies level (where possible) were recorded for each stratum within or overhanging the 100 m^2 quadrat. Dominant species were defined as the species that contributed the greatest biomass/cover abundance, or indicator/diagnostic species (not necessarily with the greatest biomass).

Any additional dominant plant species in the tallest stratum (up to a combined total of five) within or overhanging the 400 m^2 quadrat (not recorded from the 100 m^2 quadrat) were recorded and annotated as being from the 400 m^2 quadrat.

The stratum occupied by each of the species identified above was also recorded.

Vertical Structure

For each of the dominant/co-dominant species in the tallest stratum within the 400 m^2 quadrat, the following were calculated and recorded:

- Growth form, pp 64-66;
- Mean height, pp 66, 67 & 73; and
- Height class and name, pp 66-67.

For each of the dominant/co-dominant species in the other strata within the 100 m^2 quadrat, the following were calculated and recorded:

- Growth form, pp 64-66;
- Mean height, pp 66-67, 73; and

- Height class and name, pp 66-67.

Vegetation Cover

For the tallest stratum, the transect was used to record about 12 measurements of actual crown widths and gaps, irrespective of species, pp 68-70. This information was used to calculate and record the following, pp 68-70:

- Mean crown width and gap;
- Crown separation ratio;
- Crown cover class; and
- Percentage crown cover.

Where it was impractical to take 12 measurements of over-storey canopy widths and gaps, a smaller sample size was used. Where the over-storey trees were spaced at least 100 metres apart, an estimate of cover class was made. In this case the trees were considered as emergent, rather than as a stratum, and the next tallest stratum considered the over-storey.

For the remaining strata, the field criteria in Table 16, p 68 (McDonald *et al*., 1998) were used to estimate crown cover class and foliage cover percentage.

Vegetation Name

The primary vegetation name at each site was based on the Muir classification, with Beard and McDonald vegetation association codes also recorded.

2.2.3 Transect Data Collection

Tape measures were placed along the line of the transect, with zero at the start point of the transect. The vegetation density determined how far off the transect line were the plants to be included. Five metre distances were used for trees and shrubs in woodlands and shrublands along most transects except YT0601 and YT0602, where one metre was used where trees and shrubs were in closed forests and dense shrublands.

For each tree or shrub the following were recorded:

- Species name (and voucher number where relevant);
- Distance along the transect: the distance (in metres) from the start (the wetland end) of the transect;
- Distance off the transect: the distance (in metres) from the transect to the centre of the base of the plant;
- Direction: describing on which side of the transect each plant is located and given as compass meridians (North, East, South and West. Note these are not absolute directions but rather a guide to the side of the transect);
- Height of plant;
- For all Eucalypts, Santalums, Casuarinas and Allocasuarinas sampled, diameter-at-breast-height and percentage epicormic growth were also recorded;
- Percentage of canopy foliage alive (i.e. from 0% to 100%);
- Plant condition and age of impact using:
    - H-Healthy (healthy green and intact foliage)

- SS-Slightly Stressed (only slight foliage loss)
- S-Stressed (some loss of foliage and/or discolouration and browning of leaves
- VS- Very Stressed (substantial proportion of foliage brown, dying or lost)
- DR- Death recent (most upper branches still retained)
- DM- Death Moderate Age (some upper braches left)
- DO-Dead Old (death some time ago indicated by no upper branches left on stems)

The percent cover and health of herbaceous plants and groundcovers such as grasses, sedges, weeds and samphires was also included along the transect.

2.2.4 Other Reserve Uses/Values

The following values were recorded if observed opportunistically:

- Serious environmental weeds (e.g. *Ehrharta calycina*, *Watsonia* spp., *Freesia* spp., *Asparagus asparagoides*, *Acacia pycnantha*, *Lupinus cosentinii*, *Eragrostis curvula, Sparaxis bulbifera* and *Homeria flaccida);*
- Fauna of interest; and
- Declared Rare or Priority Flora.

The following values were not required to be recorded under this contract:

- Weed Intactness;
- Soil descriptions;
- Grazing;
- Direct Production;
- Commercially prospective species;
- Non-indigenous Cultural Heritage Site;
- Aboriginal Sites;
- Adjacent land uses; and
- Boundary Fencing.

2.3 Data Collection Standards

2.3.1 Plant Identification and Taxonomy

To ensure plant nomenclature was current, the most current version of MAX database was used to validate all plant names being entered in the Access database i.e. for quadrat sampling, and any DRF, Priority or significant environmental weeds.

Voucher specimens of any DRF/Priority flora, significant/unusual environmental weeds and all species recorded as dominant/co-dominant within each quadrat and transect will be lodged with the DEC's Narrogin District Office.

Voucher specimens were collected to DEC Herbarium standards. The field work was undertaken at two times of the year (including a spring survey of all the quadrats and transects) to ensure all annual species and perennials requiring fertile material for accurate identification are included in the plant inventories.

Specimens included fertile material (buds, flowers and fruit) where available. The MAX© Collecting Book was used to store all information relevant to the voucher specimens collected.

2.3.2 GPS

The Estimated Position Error (EPE) of any GPS position fixes was recorded as an indication of the number of metres error associated with the reading. Each location was recorded as MGA grid co-ordinates as Grid Zone (2 digits), Eastings (6 digits) and Northings (7 digits).

2.3.3 Metadata

For each spatial dataset used or generated, primary or derived, the following core metadata elements were provided, following the ANZLIC metadata guidelines:

- Title;
- Custodian;
- Description (abstract);
- Date currency;
- Access (stored data format);
- Projection;
- Datum;
- Data quality (lineage, positional accuracy, attribute accuracy, completeness);
- Metadata date; and
- A brief written summary about how it was created, any limitations, and any other information that would assist third parties to assess the dataset.

2.4 Mapping Standards

2.4.1 Maps & Digital Datasets

All map features were drawn or digitised in relation to each reserve's cadastral boundaries to ensure positional accuracy. Where features crossed or formed the boundary between two reserves, separate map features and database records were created for each reserve. All map features were mapped/digitised and attributed in such a way that their values can be queried for any single reserve, even if the same feature is common to two or more Crown reserves.

Vegetation units are provided as ESRI® ArcView® 3.2 shapefiles (polygon theme) with every polygon attributed with a unique polygon identifier, area (ha) and perimeter (m) values.

Locations of survey quadrats are ESRI® ArcView® 3.2 shapefiles (point theme), with each point being attributed with a unique identifier.

All themes are in stored in MGA 50.

All area, length and perimeter values are derived from ArcView queries using the XTools extension.

2.5 Data Structure

The Wheatbelt Region of DEC is developing a reserves database. Data from various projects, such as this contract, are being structured so as to easily integrate and combine into a larger system, elements of which already exist.

The following principles guided the collection and recording of field data, the structure of database tables, and the links required between the various databases:

- A Microsoft® Access 97® (or later) relational database will be the prime means of storing and querying all survey data;
- A single ESRI® ArcView® 3.1 or 3.2 project containing multiple themes will be the main interface through which spatial data will be queried;
- All photos are being stored digitally as jpeg files, and will be hotlinked to relevant ESRI® ArcView®) themes; and
- The MAX© database is being used to validate plant nomenclature, and the Collecting Book is being used to record the details of all voucher specimens.

2.6 Data Entry and Storage

2.6.1 MAX© Collecting Book System

Data for all voucher specimens were recorded and stored using the MAX© Collecting Book.

The MAX© database stores data in two separate output tables:

- A Collecting Book to store all voucher specimen details; and
- A Supplementary Master List, to be used where specimens are not identified.

Digital copies of these tables were supplied at the conclusion of the project.

The MAX© database was also be used to validate plant names being entered into the Access database.

2.6.2 Photographs

All photographic images were provided as jpeg images with a minimum resolution of 1024 x 1536 pixels.

3.0 Results

Vegetation Mapping and Assessment at Yenyening Lakes NR

3.1 Vegetation Description

3.2 Vegetation Associations

Photos of each of the quadrats and sites are shown in Appendix 1 and 3 respectively and the GPS locations for each of the quadrats and sites are listed in Appendix 4 (Tables A4.1 and A4.3 respectively).

The quadrats and reference sites established by Ecoscape that correspond to the vegetation units of Gunness (2003) are listed in Table 3.1.

Table 3.1: Vegetation mapping units and quadrat locations.

Number	Description	Quadrat	Extent (ha)
B	Bare lake bed	-	685.4
Bb	Braided lake bed (channels and sand rises)	-	727.9
Bf	Bare flats	-	8.0
Be	Lake beaches	-	40.3
1	Salmon Gum Open Forest (*Eucalyptus salmonophloia*)	YS0601	1.5
2	Swamp Sheoak Closed Forest over Juncus kraussii Sedgeland	YQ0602	8.4
3	Salt River Gum (*Eucalyptus sargentii* subsp. *sargentii*)	YQ0613	66.7
4	York Gum (*Eucalyptus loxophleba*) Low Open Woodland	YS0602	110.3
5	Wandoo, York Gum, Swamp Sheoak Low Open Woodland	YS0603	45.2
6	Rock Sheoak - Jam Open Low Woodland	YQ0614	101.7
7	Acorn Banksia (*Banksia prionotes*) Low Open Woodland	YQ0601	9.9
8	*Eucalyptus orthostemon* Very Open Shrub Mallee over mixed Melaleuca Shrublands	YQ0605	45.3
9	*Eucalyptus hypochlamydea* Open Shrub Mallee	YS0604	23.6
10	*Melaleuca atroviridis* Tall Shrubland over *Rhagodia drummondii* Low Open Shrubland	-	341.6
11a	Mixed Melaleuca Shrublands on slopes of sand rises	YQ0610	106.2
11b	Mixed Melaleuca Shrublands on flats	YS0605	144.0
12	*Scholtzia* sp. Yenyening lakes Shrubland	YS0606	7.9
13	Needle Tree (*Hakea preissii*) Tall Shrubland	YQ0615	8.8
14	*Melaleuca acuminata* subspecies *websteri* Closed Heath	YQ0606	0.7
15	Tamar (*Allocasuarina campestris*) Tall Open Shrubland	YQ0603	8.5
16	Samphire (*Halosarcia lepidosperma, Halosarcia leptoclada* subspecies *inclusa, H. halocnemoides*) Low Open Shrubland over Low Open Herbland with emergent *Melaleuca lateriflora* and *Melaleuca atroviridis*	YS0607	38.4
17	*Halosarcia indica subspecies bidens, Halosarcia lepidosperma, Frankenia pauciflora* Open Low Heath	YS0608	426.5
18	*Halosarcia pergranulata, Halosarcia halocnemoides* Low Shrubland	YS0609	200.3
19	*Hopkinsia anoectocolea* (Open) Sedgeland on white sand rises in drainage channels	YQ0607	0.9
20	Freshwater Perched Lake: *Baumea riparia, Juncus kraussii, Melaleuca brevifolia* Open Shrub	YQ0604 YQ0608	22.6
21	Closed (Tall) Shrublands (*Melaleuca thyoides*)	YS0610	3.4
	Closed (Tall) Shrublands (*Callistemon phoeniceus*)	YS0611	17.0
22	Herbland +/- *Halosarcia halocnemoides* Low Open Shrubland	-	7.9
-	Mosaics (combinations of above associations)		2388.4

In Table 3.1 the permanently marked quadrats are denoted as by the prefix YQ and relevé sites that were not permanently marked denoted by YS. Several vegetation units were not described by Ecoscape due to difficulties in accessing them after rain.

Quadrat descriptions are summarised in tabular form in Appendix 5.

3.2.1 Flora Inventories

Ecoscape recorded 94 plant taxa at quadrats and transects, compared to the 294 taxa recorded by Gunness (2003) throughout the study area collected during 3 field trips in July, September and October 2002, which she estimated to be approximately 70% of total number of taxa.

3.3 Vegetation Health

Baseline monitoring of vegetation health was undertaken through the establishment of five transects.

Photographs of the start points for each transect are in Appendix 2. GPS locations and descriptions of how to locate the sites are listed in Appendix 4. Brief descriptions of the vegetation along the transects are provided in Appendix 6.

3.3.1 Transect YT0601

Description

Transect YT0601 is aligned from an islet in a saltwater lake across water towards the freshwater seep upslope. The majority of the transect is relatively flat with the elevation increasing towards its end.

The majority (89%) of the 123 of the shrubs and trees along the transect were alive trees but the vegetation vigour declined with increasing proximity to the freshwater seep.

The vegetation associations along the transect are summarised in Table 3.2 below.

Table 3.2: Vegetation along Transect YT0601

Section	Vegetation unit	Mean Height Mean Foliage Cover	Vegetation Health and Comments
0-20m	Tall open shrubland of *Melaleuca thyoides, Melaleuca* sp. over tall sparse sedgeland of *Juncus kraussii*	1.0m 92% - 100%.	Vegetation generally appears healthy.
20-40m	Water		-
40-70m	Low open woodland of *Casuarina obesa* over tall closed sedgeland of *Juncus kraussii*	2.8m - 5.0m 83% - 100%.	Vegetation appears very healthy.
70-83m	Very tall closed shrubland of *Melaleuca thyoides*	3.6m 56%	*Melaleuca* shrubs densely populated, appear stressed.
83-140m	Tall open forest of *Casuarina obesa* over tall shrubland of mixed *Melaleuca brevifolia* over tall closed sedgeland of *Juncus kraussii*	4.3m - 9.9m (influenced by number of sheoaks) 35% - 61%.	The *Melaleuca* understorey was generally slightly stressed. Several dead trees and shrubs have died over the previous few years.

The variation of mean height of trees and shrubs along the transect, shown in Figure 3.1, reflects the presence or absence of an overstorey of *Casuarina obesa* and not the different age cohorts of plants along the transect.

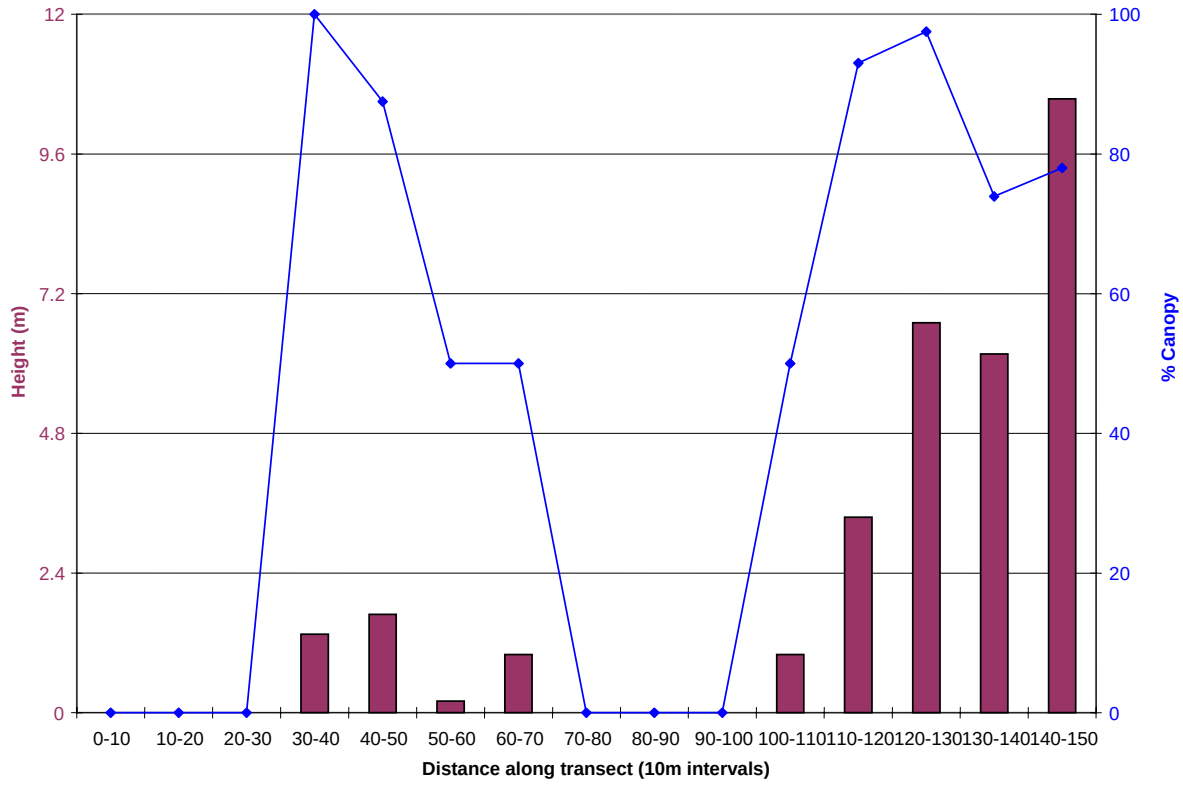


Figure 3.1: Mean height & canopy cover of live trees & shrubs along Transect YT0601

As shown in Table 3.3 the mean foliage cover of individual plants along the transect was 62% with the portion of live foliage generally low for the understorey species and high for the overstorey of *Casuarina obesa.*

Table 3.3: Tree and Shrub Vigour along Transect YT0601

Taxa	Mean foliage cover	healthy	stressed	dead	total
Casuarina obesa	71	26	51	4	81
Melaleuca brevifolia	39	3	16	4	23
Melaleuca brophyi	90	1	0	0	1
Melaleuca thyoides	39	3	10	5	18
Total plants		**33**	**77**	**13**	**123**
Mean total foliage	**62**				

Whilst Table 3.3 indicates that most of the trees and shrubs were stressed, the *Melaleuca brevifolia* appears to be under greater stress than the two more salt tolerant species, *Casuarina obesa* and *Melaleuca thyoides.*

As shown in Figure 3.2 the majority of the shrubs and trees were healthy from 0m to 70m and stressed from 7m to 140m. This may reflect a decrease in water emanating from the freshwater seep at the top end of the transect (at 140m) rather than saltwater incursion from the bottom end at 0m. This is consistent with the age of deaths at the lower end of the

transect being estimated as mostly *Old* and not reflecting any current changes in environmental variables but deaths upslope being more *Recent* and potentially indicating changes.

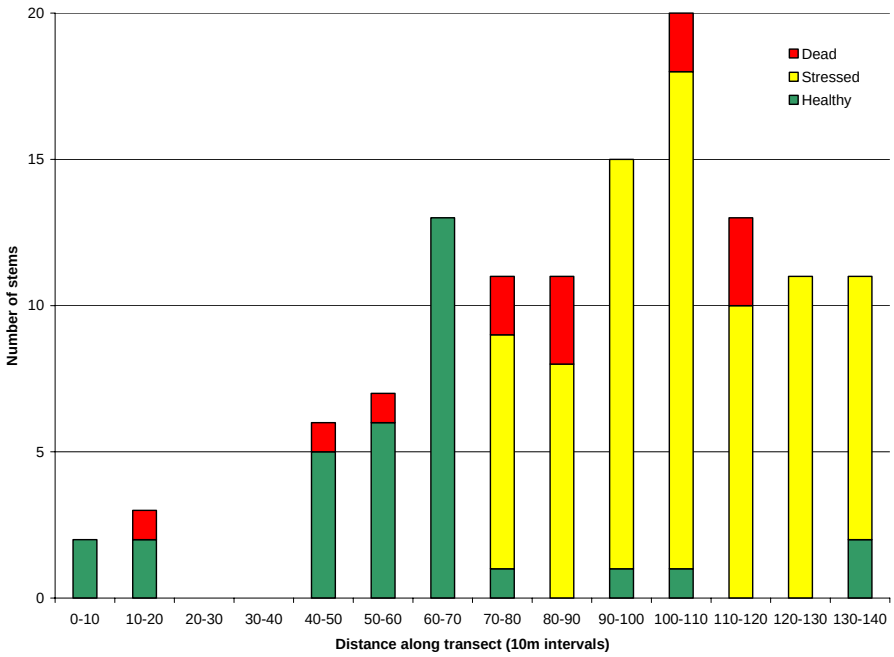


Figure 3.2: Healthy, Stressed and Dead stems along Transect YT0601

3.3.2 Transect YT0602

Description

Transect YT0602 starts in a saltwater lake and traverses up a very gentle incline through sedgeland, a *Melaleuca shrubland* and then into a *Casuarina obesa* forest. The vegetation along the transect is summarised in Table 3.4 below.

Table 3.4: Vegetation along Transect YT0602

Section	Vegetation unit	Mean Height Mean Foliage Cover	Vegetation Health and Comments
0-12m	Bare sand		
12-15m	Low open *Halosarcia ?indica* heath - tall closed sedgeland transition zone	1.0m - 1.7m 50% - 100%	Plants all appearing healthy.
15-100m	Emergent dwarf *Casuarina obesa* over tall closed sedgeland of *Juncus kraussii*	1.0m - 1.7m 50% - 100%	Vegetation was generally extremely healthy; however, the sedgeland developed more dead cover with distance from the lake. There were several *Melaleuca* shrubs and *Casuarina* saplings along the sedgeland, all appearing to be healthy. Dense patch of the weed *Dittrichia graveolens* at the 33m mark which was not observed elsewhere.
100-120m	Tall shrubland of *Melaleuca brophyi* and *Melaleuca acuminata* subsp. *websteri* over tall sedgeland of *Juncus kraussii*	1.0m - 3.4m 50% - 93%.	Shrubs were generally healthy, but the *Juncus* sedgeland below had only 50% live cover. Height and cover measurements increased as some sheoak trees were included.
120-150m	Tall closed forest of *Casuarina obesa* over a tall closed sedgeland of *Juncus kraussii*	6.7m - 10.0 98% - 73%.	The closed *Casuarina* forest was very densely populated and generally appeared slightly stressed. Mean tree heights increased towards the end of the transect.

Figure 3.3 indicates an increase in plant height along the transect. The increase in mean height along the transect reflects both the increasing number and increasing height of overstorey species. The few *Casuarina* and *Melaleuca* plants in the *Juncus* sedgeland (12-100m) are approximately 2m in height, this increased up to mean height of plants in the increased up to 3m towards *Melaleuca* shrubland (100-120m)and the mean height also increased in the *Casuarina* forest (120-140m) towards the end of the transect, from 7m to 10m.

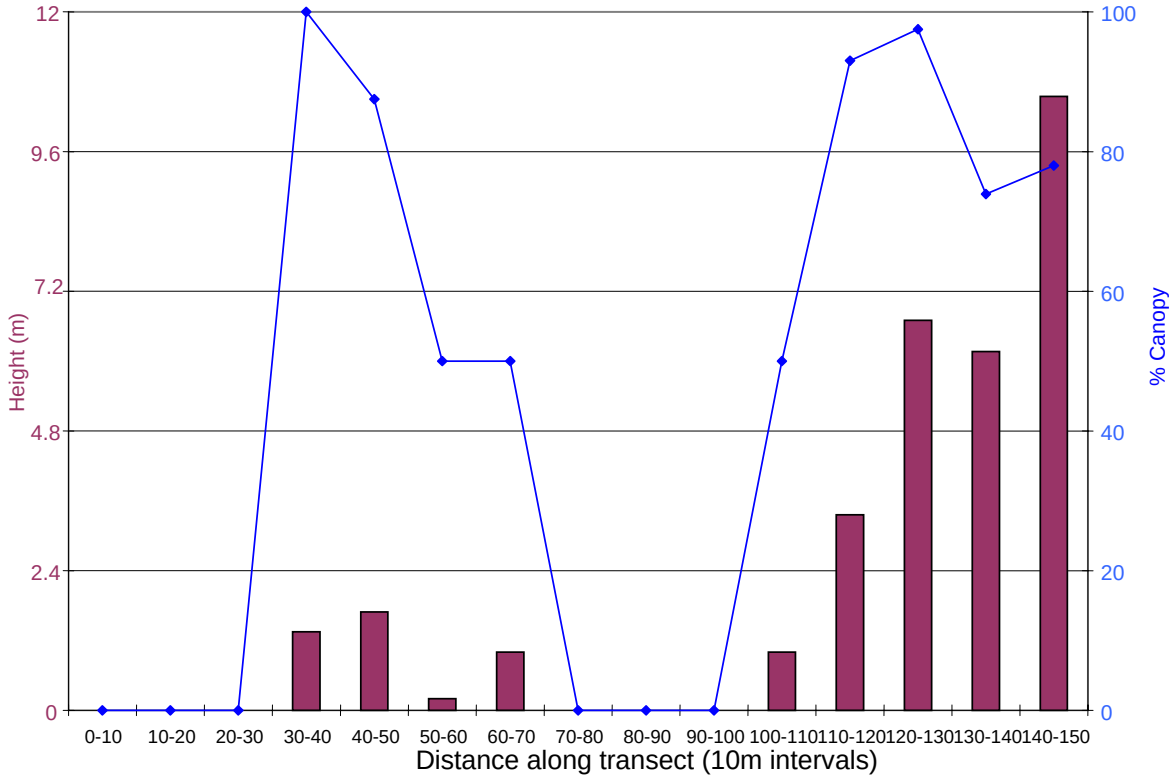


Figure 3.3: Mean height & canopy cover of live trees & shrubs along Transect YT0602

As indicated in Table 3.5, only 2% (one) of the trees and shrubs along YT0602 were dead, and with a mean foliage cover of 86% and more individuals were healthy than stressed.

Table 3.5: Tree and Shrub Vigour along Transect YT0602

Taxa	Mean foliage cover	healthy	stressed	dead	total
Casuarina obesa	85	26	15	0	41
Melaleuca acuminata ssp. *websteri*	86	4	1	0	5
Melaleuca brevifolia	100	2	0	1	3
Total plants		**32**	**16**	**1**	**49**
Mean total foliage	**86**				

Whilst stress levels amongst shrubs and trees were highest at the upper end of the transect closest to the freshwater seep (as at YT0601), shrubs and trees were probably lost from the lower end of the transect some time ago (shrubs that had died a considerable time ago occurred in the bare sand at the beginning of the transect). The quantitative stress levels of sedges and rushes was also not recorded along the transect, but it was noted that the vigour of the sedges was variable and increased from 15m to 100m from the start of the transect.

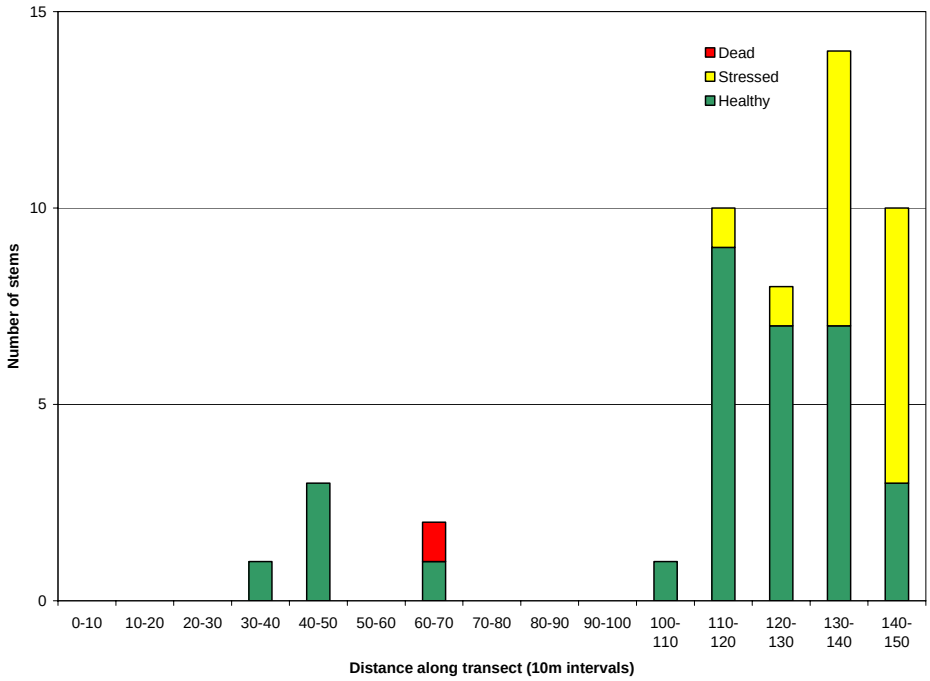


Figure 3.4: Healthy, Stressed and Dead stems along Transect YT0602

3.3.3 Transect YT0603

Description

Transect YT0603 traversed a *Melaleuca* shrubland on a flat between samphire and a *Eucalyptus wandoo* woodland with almost all plants either stressed or dead. The vegetation along the transect is summarised in Table 3.6 below.

Table 3.6: Vegetation along Transect YT0603

Section	Vegetation unit	Mean Height Mean Foliage Cover	Vegetation Health and Comments
0-22m	Tall closed shrubland of *Melaleuca uncinata*	2.2m - 4.0 27% - 40%	Vegetation was very stressed with many old dead shrubs.
22-30m	Low sparse sedgeland of *Gahnia* sp. over low open forbland *of Pogonolepis stricta*		No trees or shrubs were present. *Gahnia* sp. looking stressed.
30-45m	Tall shrubland of *Melaleuca uncinata*	2.2m - 4.0 m 27% - 40%	Vegetation was very stressed with many old dead shrubs.
45-90m	Sparse shrubland of *Melaleuca uncinata*	1.8m - 3.9m 23% - 80%	Vegetation was very stressed with several old dead shrubs.
90-135m	Tall open shrubland of *Melaleuca lateriticola* over low sedgeland of *Gahnia* sp.	1.6m - 3.0m 65 - 100%	Vegetation was stressed with many old dead shrubs.
135-155m	Tall sparse shrubland of *Hakea preissii* over low sedgeland of *Gahnia* sp.	1.6m - 1.7m 64% - 100%	All *Hakea preissii* plants were very healthy; however, two of the three *Melaleuca lateriticola* shrubs had died several years ago and the remaining shrub was very stressed. *Gahnia* sp. was slightly stressed.
155-180m	Tall open shrubland of *Melaleuca uncinata* over sparse chenopod shrubland of *Rhagodia drummondii*	0.9m - 2.5m 33% - 55%	Most plants generally appeared slightly stressed with some old dead plants.

The variation in the mean height of shrubs evident in Figure 3.5 was a result of variation in the height of Melaleuca uncinata along the transect, with the tallest individuals occurring between 30m and 45m.

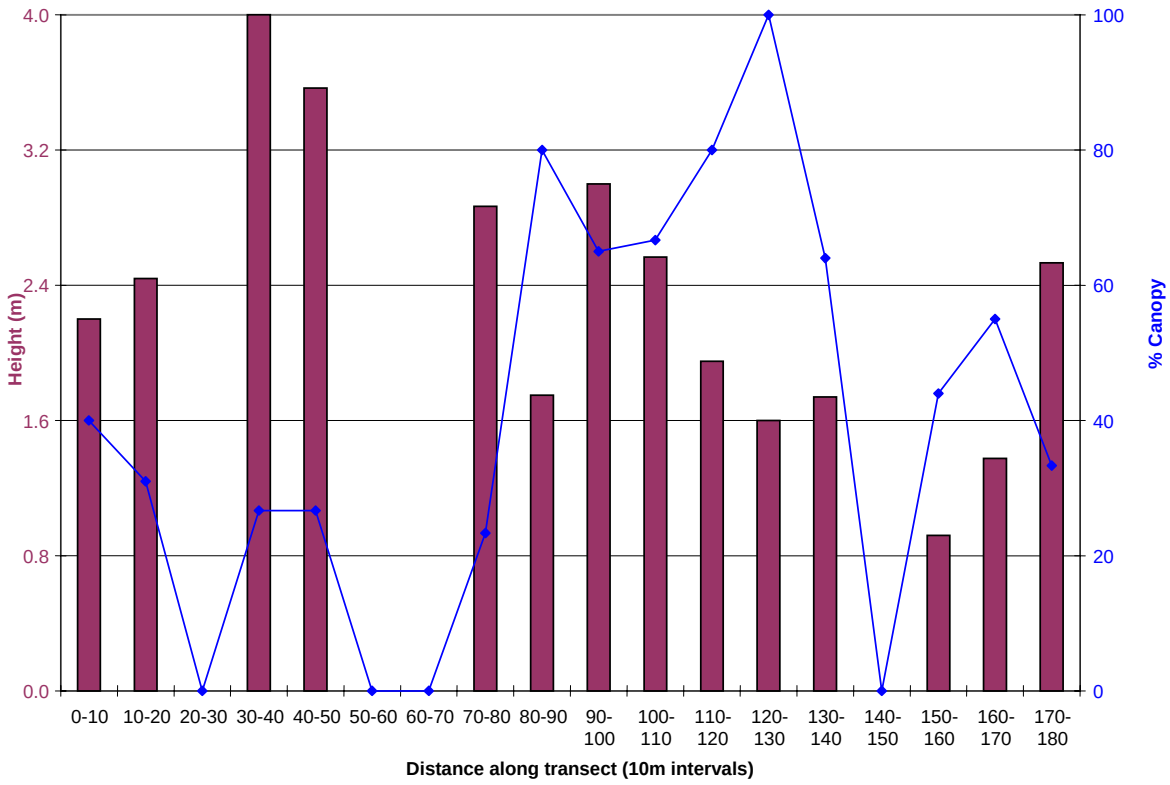


Figure 3.5: Mean height & canopy cover of live trees & shrubs along Transect YT0603

The transect was overall in poor health. Only 38 (61%) of the 62 trees and shrubs recorded were alive (Table 3.7, Figure 3.6). With the exception of *Hakea preissii* almost all plants were either stressed or dead.

Whilst the plants along the YT0603 transect had a mean foliage cover of 56%, this was largely due to the *Hakea preissii* retaining almost all its foliage. However, as this plant's leaves are needle-like and sclerophyllous in nature, hydrological stress is not expected to be as evident as for other shrub and trees species.

The one *Acacia acuminata* tree measured was very stressed and retained only 20% of its leaves. *Melaleuca latericola* and *Melaleuca uncinata* were also stressed, with only a third of their foliage remaining. The two *Melaleuca adnata* plants, which were both recorded at approximately 90m along the transect, were slightly stressed, retaining most of their foliage (Table 3.7, Figure 3.5).

Table 3.7: Tree and Shrub Vigour along Transect YT0603

Taxa	Mean foliage cover	healthy	stressed	dead	total
Acacia acuminata	20	0	1	0	1
Hakea preissii	99	10	1	0	11
Melaleuca adnata	80	0	2	0	2
Melaleuca lateriticola	38	0	5	8	13
Melaleuca uncinata	34	0	19	16	35
Total plants		**10**	**28**	**24**	**62**
Mean total foliage	**56**				

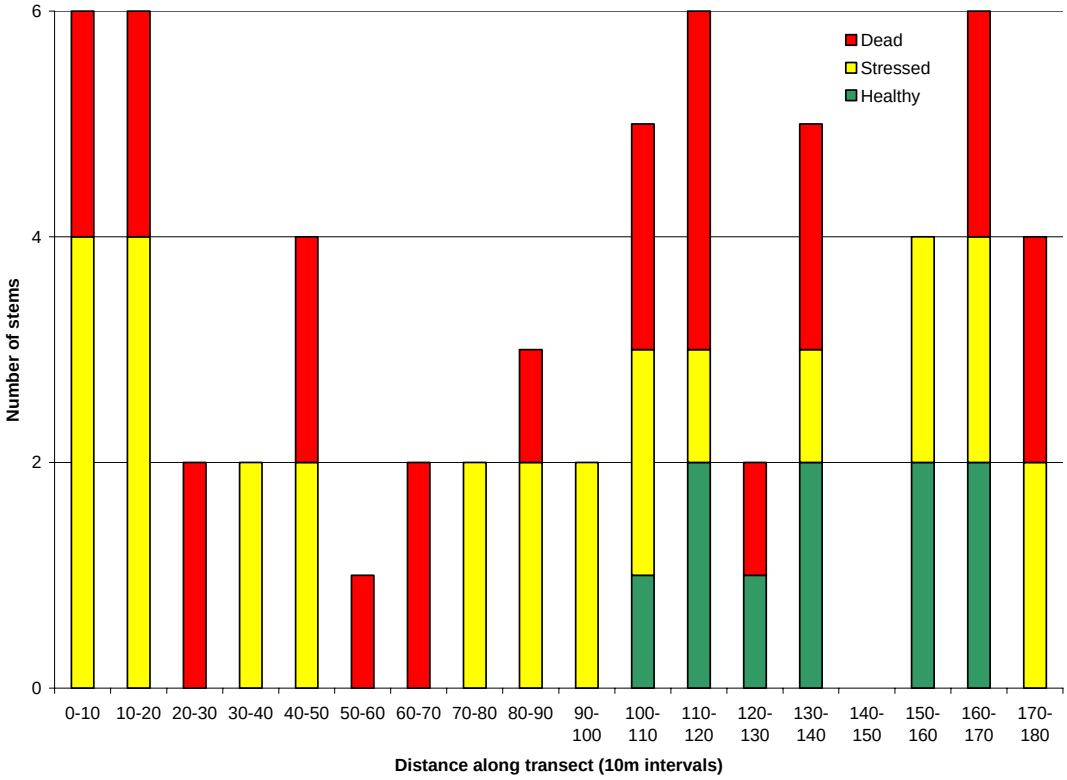


Figure 3.6: Healthy, Stressed and Dead stems along Transect YT0603

Almost all the deaths were old, with some deaths of *Moderate* age class in the second half of the transect (Appendix 7, Table A7.3).

3.3.4 Transect YT0604

Description

Transect YT0604 was divided into two sections (a and b), "a" on the western side of the lunette and "b" on the eastern side. Both sections start in samphire heath and terminate up a gentle slope.

Transect YT0604a

The vegetation along the western section "a" is summarised in Table 3.8 below.

Table 3.8: Vegetation along Transect YT0604a

Section	Vegetation unit	Mean Height Mean Foliage Cover	Vegetation Health and Comments
0-20m	Low samphire heath		Several woody plants present but had died many years ago. The samphires were very stressed at the beginning of the transect but became healthy after the 10m interval.
20-35m	Mixed tall open shrubland of *Melaleuca* sp.	1.8m 87%	Vegetation was overall sightly stressed.
35-50m	Emergent *Banksia prionotes* over tall shrubland of *Melaleuca* sp.	1.4 - 1.7m 52%	Plants were generally healthy. Some shrubs had died many years previously.
50-60m	Tall shrubland of *Regelia ciliata* over tall isolated *Dianella* sp. forbs	2.1m 46%.	Vegetation was slightly stressed.
60-100m	Tall open shrubland of *Leptospermum erubescens* over tall isolated *Lyginia imberbis* sedges and *Dianella* sp. forbs	1.0 - 1.8m 78 - 95%.	Plants were generally healthy. Many shrubs had died many years previously.

YT0604a had dead woody plants recorded throughout the entire transect (Figure 3.8).

The mean foliage cover of YT0604a was 71%. *Acacia acuminata* and *Grevillea eriostachya* were observed to be very healthy, having 100% foliage. *Eremaea pauciflora, Regelia ciliata* and the *Melaleuca* plants were slightly stressed, having on mean between 70% and 80% cover. *Leptospermum erubescens* plants were stressed with 48% foliage while the one *Banksia prionotes* tree recorded was very stressed, having only 10% foliage (Table 3.9, Figure 3.7).

Table 3.9: Tree and Shrub Vigour along Transect YT0604a

Taxa	Mean foliage cover	healthy	stressed	dead	total
Acacia saligna	100	1	0	0	1
Banksia prionotes	10	0	1	1	2
Eremaea pauciflora	92	1	1	0	2
Grevillea eriostachya	100	1	0	0	1
Leptospermum erubescens	19	0	4	7	11
Melaleuca	29	2	6	12	20
Regelia ciliata	41	3	7	8	18
Total plants		**8**	**19**	**28**	**55**
Mean total foliage	**71**				

Dead plants were common throughout the transect (Table 3.9, Figure 3.8). Only 27 (48%) of the 56 plants recorded were observed to be alive. Deaths were particularly severe in

Halosarcia heath (0-20m). Almost all deaths were of *Melaleuca* and *Leptospermum erubescens* shrubs and were determined to be old deaths (Appendix 7, Table A7.4).

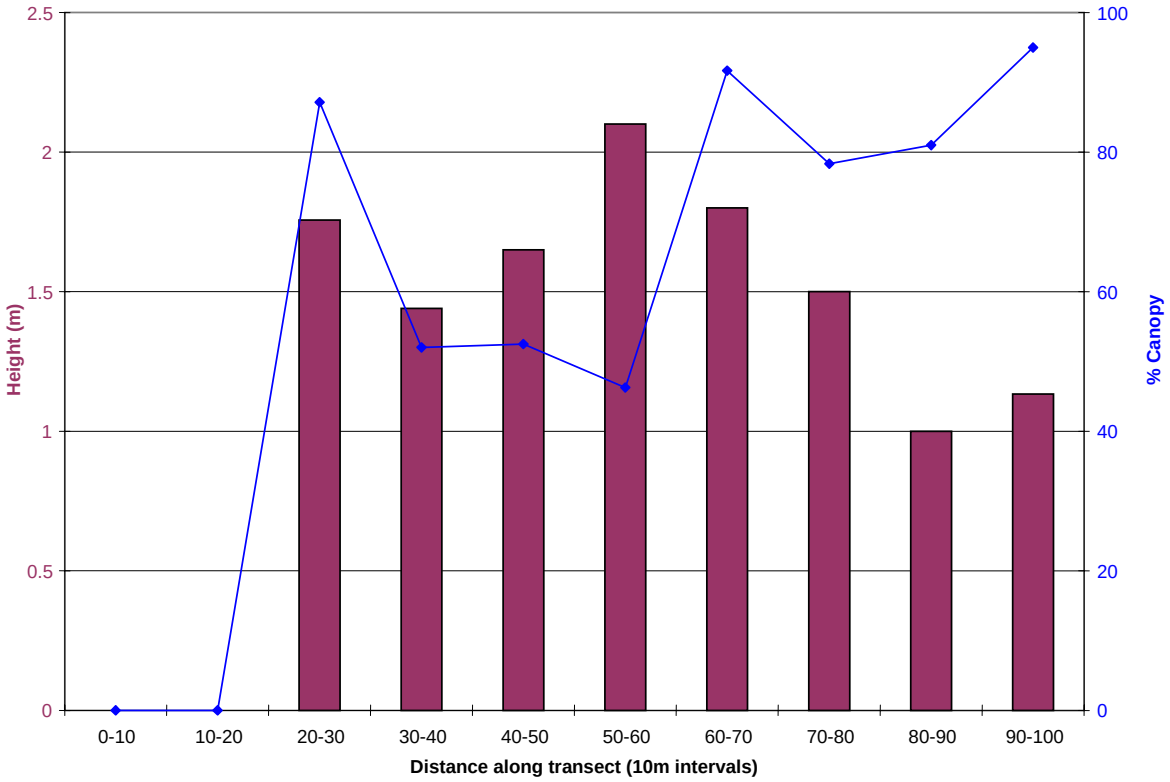


Figure 3.7: Mean height & canopy cover of live trees & shrubs along Transect YT0604a

The majority of the death shown at the lower end of the transect in Figure 3.8 consisted of *Melaleuca ?brophyi* as a result of waterlogging and/or secondary salinisation.

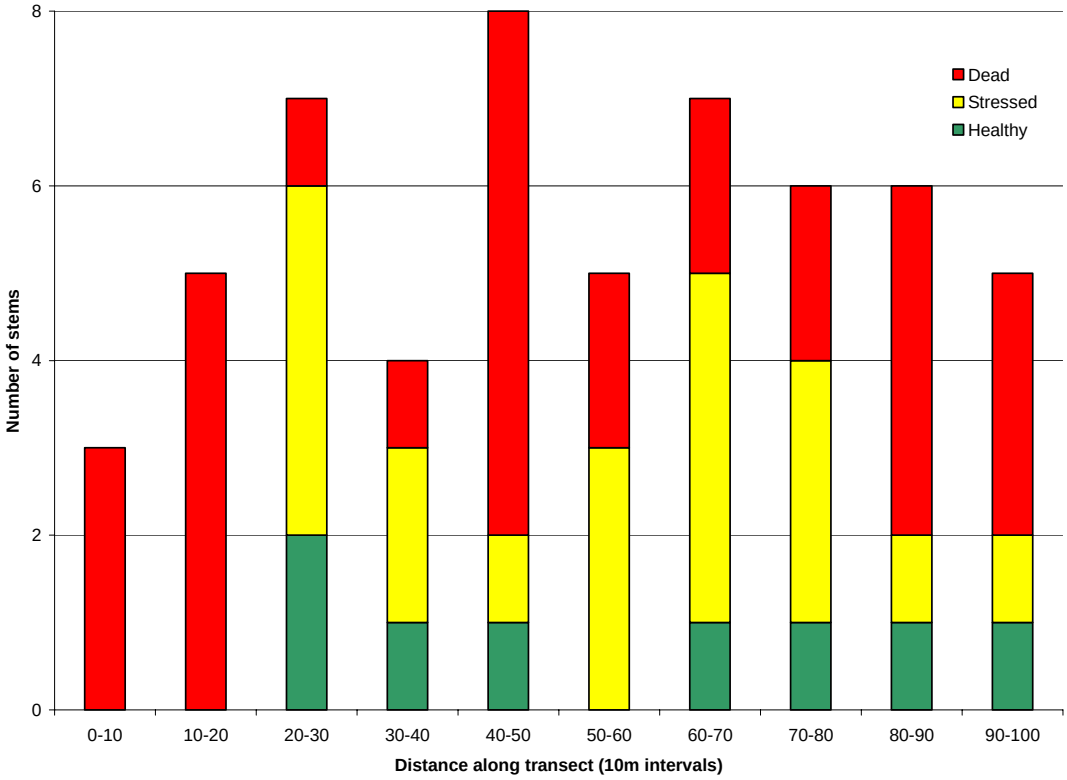


Figure 3.8: Healthy, Stressed and Dead stems along Transect YT0604a

The death at the upper end of the transect consists largely of *Leptospermum erubescens* that had died some considerable time ago. Populations of *Leptospermum erubescens* require periodic disturbance (e.g. a fire) in order to remain vigorous (Powell, 1990) and the decline of this species on this transect may be related to a lack of disturbance rather than salinity or waterlogging.

Transect YT0604b

The vegetation along the eastern section "b" is summarised in Table 3.10 below.

Table 3.10: Vegetation along Transect YT0604b

Section	Vegetation unit	Mean Height Mean Foliage Cover	Vegetation Health & Comments
0-20m	Low heath of *Halosarcia ?pergranulata*		Many old dead shrubs. Samphires dead near 0m but healthier from 8m onwards.
20-30m	Tall open shrubland of *Melaleuca* sp. over low grassland of weed *Pentaschistis airoides*	1.9m 90%.	Vegetation was slightly stressed. The weed *Pentaschistis airoides* was dominant, covering around 75% of the ground.
30-50m	Tall shrubland of *Regelia ciliata* over low isolated grassland of weed *Pentaschistis airoides*	2m 90%.	Vegetation was generally healthy. A few old dead shrubs were present. Weed species *Pentaschistis airoides* was observed with approximately 5% ground cover.
50-70m	Tall open shrubland of *Grevillea eriostachya* over a mid-high open shrubland of *Leptospermum erubescens*	0.8 - 1.0m 30 - 74%.	Vegetation was slightly stressed with few old dead trees and shrubs.
70-100m	Low open woodland of *Allocasuarina huegeliana* over low sparse chenopod shrubland of *Rhagodia drummondii* over low open forbland	1.6m at 70m 0.5m at 100m 49% at 70m 25% at 100m	Varied from stressed to healthy with six dead plants observed.

Overall, mean heights along the rest of the transect were less than 2m, as shown in Figure 3.9. Mean heights were approximately 2m in the *Melaleuca* and Regelia Shrublands, from 20m to 30m and 30m to 50m respectively.

The low mean height from 50m to 70m resulted from the sparseness of the *Grevillea eriostachya*. As the *Allocasuarina huegeliana* overstorey thinned from 70m to 100m there was an associated decrease in mean height from approximately 1.6m to 0.5m (Figure 3.9).

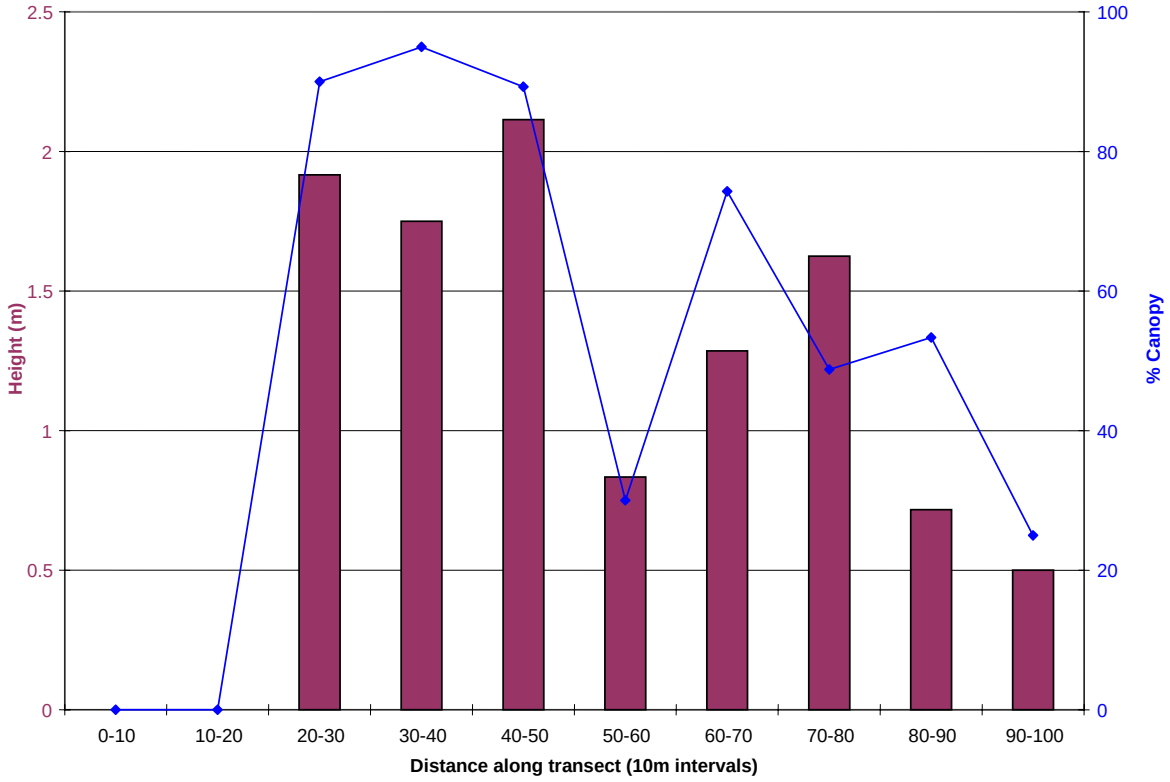


Figure 3.9 Mean height & canopy cover of live trees & shrubs along Transect YT0604b

Whilst only 17 (42%) of the 40 woody plants observed were alive on Transect YT0604b, most deaths were considered old with some more "Moderate Age" Deaths (some upper braches left) of *Allocasuarina huegeliana* in the woodland (Appendix 7, Table A7.5).

The mean foliage cover of YT0604b was greater than YT0604a at 92%. *Grevillea paniculata*, *Eucalyptus capillosa* subsp. *polyclada* and *Allocasuarina huegeliana* had retained all or almost all their foliage. *Grevillea eriostachya, Regelia ciliata* and the *Melaleuca* plants were slightly stressed, having approximately 90% of their foliage (Table 3.11, Figure 3.9).

Table 3.11: Tree and Shrub Vigour along Transect YT0604b

Taxa	Mean foliage cover	healthy	stressed	dead	total
Acacia saligna	0	0	0	1	1
Allocasuarina campestris	98	2	0	8	10
Eucalyptus capillosa ssp. *polyclada*	95	1	0	0	1
Grevillea eriostachya	100	1	0	2	3
Hakea paniculata	100	3	0	0	3
Melaleuca ?brophyi	36	2	3	7	12
Regelia ciliata	90	4	1	0	5
Total plants		**13**	**4**	**18**	**35**
Mean total foliage	**92**				

The majority of the death shown at the lower end of the transect in Figure 3.10 consisted of *Melaleuca ?brophyi* as a result of waterlogging and/or secondary salinisation.

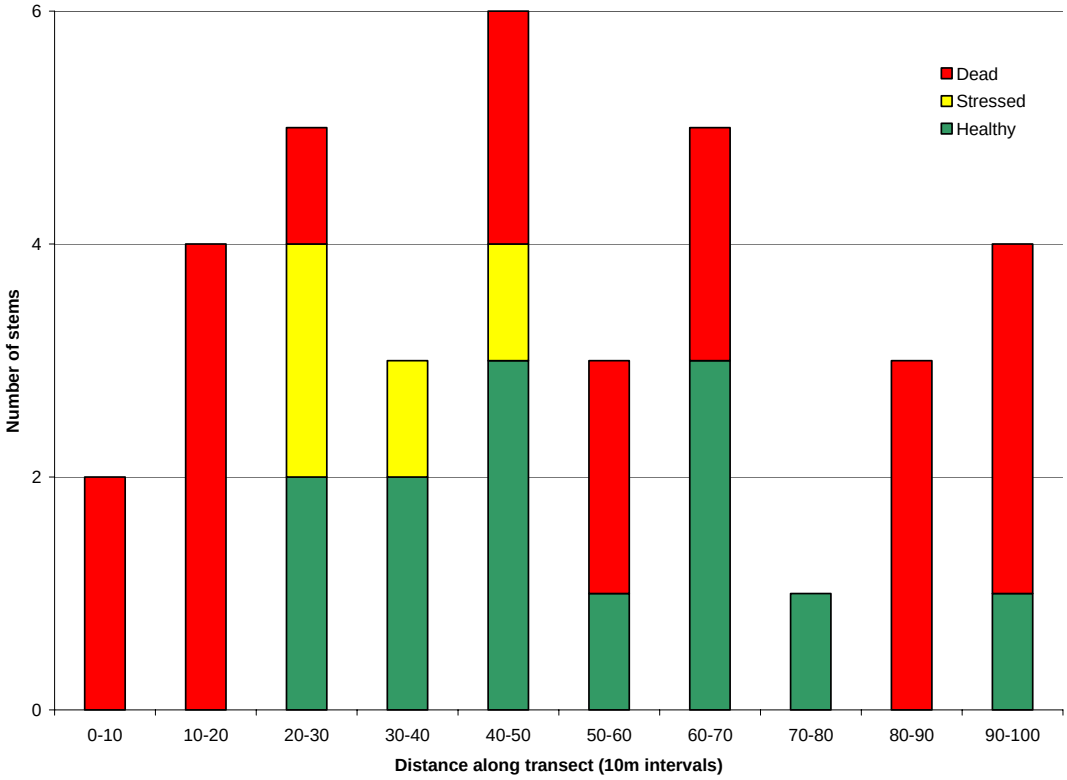


Figure 3.10: Healthy, Stressed and Dead stems along Transect YT0604b

The majority of the death on the upper end of the transect consisted of *Allocasuarina campestris* that had senesced some time ago and like the nearby *Leptospermum erubescens on Transect YT0604a* the population may be declining due to factors such as lack of disturbance rather than salinity or waterlogging. The two remaining *Allocasuarina campestris* individuals on the transect are healthy.

3.3.5 Transect YT0605

Description

Transect YT0605 starts and stops in samphire heath, traversing a saddle on a lunette, with two shallow rises at 60m and 140m and a shallow depression at 95m. The vegetation along the transect is summarised in Table 3.12 below.

Table 3.12: Vegetation along Transect YT0605

Section	Vegetation unit	Mean Height Mean Foliage Cover	Vegetation Health and Comments
0-10m	Low heath of *Halosarcia* sp. and *Frankenia pauciflora*		Heath was slightly stressed.
10-60m	Mid-high open woodland of *Allocasuarina huegeliana* over tall open shrubland of mixed *Melaleuca* sp. over a low open chenopod shrubland of *Rhagodia drummondii.*	4.5m 64% - 98%.	Vegetation was generally healthy; however, there were also many recent and old dead trees and shrubs.
60-80m	Tall mid-high mallee woodland of *Eucalyptus loxophleba* over low open woodland of *Acacia acuminata* over a tall forbland of *Ptilotus polystachyus*	1.0m - 8.0m 85% - 90%.	Peak of first rise of saddle. Understorey was generally healthy; however, the *Acacia* and *Eucalyptus* trees were slightly stressed.
80-125m	Low open woodland of *Acacia acuminata* over tall open shrubland of *Melaleuca* sp. over low chenopod shrubland of *Rhagodia drummondii* over low sparse heath *Halosarcia ?halocnemoides*	1.8m - 3.5m 59% - 90%	Vegetation in depression of saddle. Vegetation was generally slightly stressed and had a few old dead plants.
125-150m	Low open woodland of *Allocasuarina huegeliana* and *Acacia saligna*	3.1m - 3.8m 55%.	Peak of second rise of saddle. Vegetation was overall healthy but had a few recent dead sheoaks.
150-183m	Low open woodland of *Acacia saligna* over tall open shrubland of mixed *Melaleuca* sp.	1.5m - 3.5m 92% - 100%.	Vegetation was overall healthy with a few old dead shrubs.
183-200m	Low sparse heath of *Halosarcia ?halocnemoides* and *Halosarcia ?pergranulata* over low forbland of *Disphyma crassifolium*	0.9m 47%.	A few stressed shrubs and two old dead shrubs were present. *Halosarcia* plants were slightly stressed.

The variation in mean height along the transect shown in Figure 3.11 reflected the changes in overstorey with shrublands and woodlands across most of the transect (10m to 160m) approximately 2.5m to 3m mean heights. *Allocasuarina huegeliana* trees (10m to 60m) increased the mean height from 1m up to 4.5m and *Eucalyptus loxophleba* trees (60m to 80m) increased the mean height to 8m. *Acacia saligna* (150-183m) was approximately 2m in height.

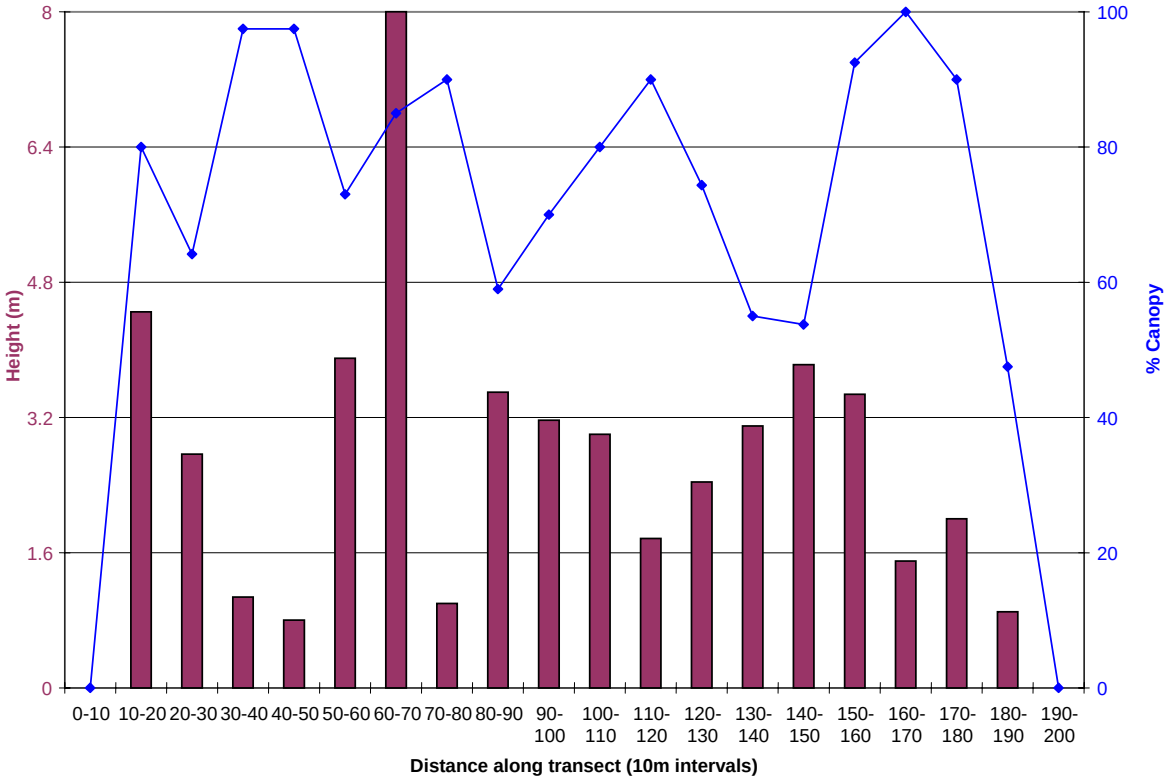


Figure 3.11: Mean height & canopy cover of live trees & shrubs along Transect YT0605

The mean foliage cover of plants at YT0605 was 70%. *Allocasuarina huegeliana* was the species under most stress, with the majority of the plants dead or stressed and the live individuals having less than half of their foliage (Table 3.13).

Table 3.13: Tree and Shrub Vigour along Transect YT0605

Taxa	Mean foliage cover	healthy	stressed	dead	total
Acacia acuminata	72	2	6	2	10
Acacia saligna	100	1	0	1	2
Allocasuarina huegeliana	45	1	10	8	19
Eremaea pauciflora	98	2	0	0	2
Eucalyptus loxophleba	85	0	1	3	4
Melaleuca brophyi	80	1	3	10	14
Regelia ciliata	79	4	2	3	9
Santalum acuminatum	85	1	0	0	1
Total plants		**12**	**22**	**27**	**61**
Mean total foliage	**70**				

Deaths were observed along the entire transect. Of the 65 trees and shrubs recorded, 38 plants (58%) were alive at the time of assessment (Figure 3.12).

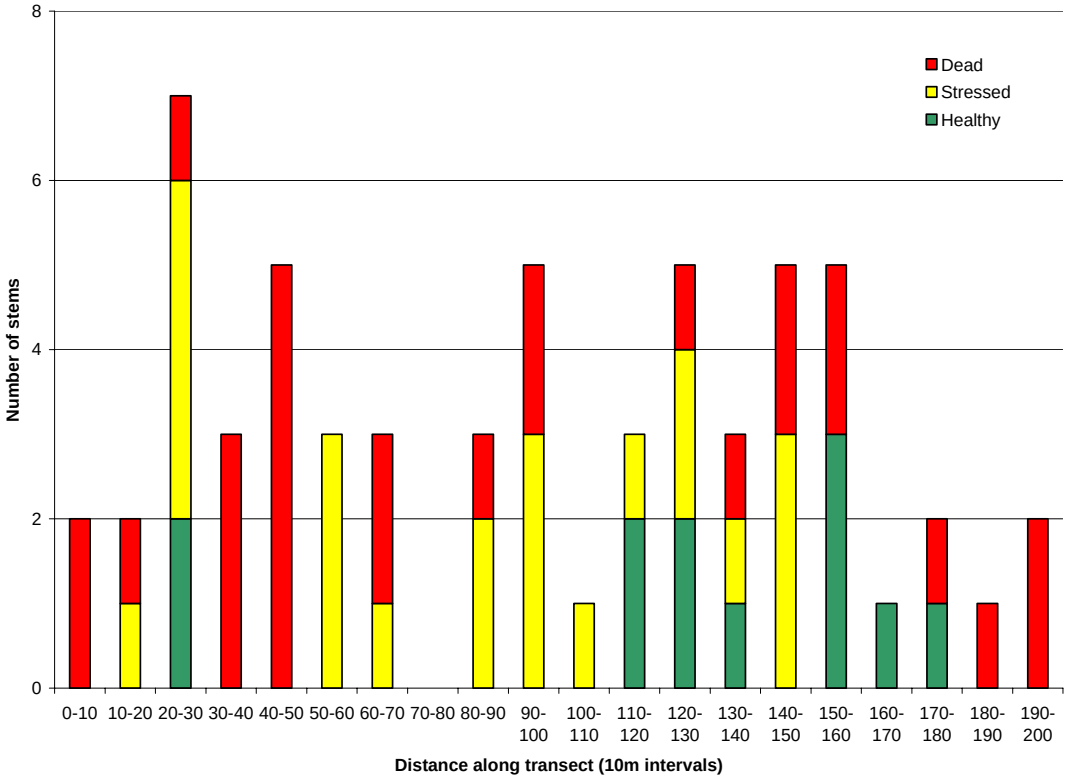


Figure 3.12: Healthy, Stressed and Dead stems along Transect YT0605

Age of deaths varied from moderate to old with one recent death of a sheoak tree in the *Allocasuarina huegeliana* open woodland (10-60m). Deaths were common in several genera: *Acacia, Allocasuarina, Eucalyptus, Melaleuca* and *Regelia* (Appendix 7, Table A7.6).

4.0 Discussion and Conclusions

4.1 Previous Datasets

4.1.1 Assessment of previous mapping

Whilst the 22 vegetation units mapped by Gunness (2003) are broadly accurate, the following limitations of the dataset were identified.

- Gunness estimated that approximately 60 per cent of the vegetated portions of the study area were traversed in preparing her vegetation map; however, she did not provide a reliability diagram with the map (showing groundtruthing traverses) nor did she establish any reference sites. This proved problematic in resolving identified discrepancies in mapping.
- Vegetation descriptions were not detailed (i.e. were not descriptions of vegetation at reference sites to association or sub-association level in accordance with the NVIS).
- No condition mapping was undertaken, and Gunness did not clearly state the degree to which degradation was taken into account in defining vegetation types.

In addition to these broad observations, comments with respect to specific selected vegetation units are provided below.

Salmon Gum Open Forest (Unit 1)

The delineation and description of this vegetation unit by Gunness is somewhat arbitrary given its level of degradation and small extent. There are a small number of Salmon Gums onsite and this unit could be either named a Wandoo Woodland with scattered emergent Salmon Gums or as Salmon Gum Open Forest over a Wandoo Woodland.

Allocasuarina huegeliana Woodlands (Unit 6)

Allocasuarina huegeliana is more prevalent on the central southern boundary of the Yenyening Lakes System as a result of a greater prevalence of granite close to the surface. Granite was observed on the eastern shores of Rocky Lake and there is a large granite outcrop approximately 1km SSE of Ossigs Lake. The description of this unit in these areas is appropriate.

The western side of Ski Lake was groundtruthed and in this area there was little *Allocasuarina huegeliana* present.

The unit was also mapped by Gunness as being prevalent in the vicinity of the Rigs Channels but this area was not groundtruthed by Ecoscape and the prevalence of granite near the surface could not be determined from available imagery.

Scholtzia sp. Yenyening Lakes Shrublands (Unit 12)

This unit appears to be over-represented in the Gunness map and the indicator species has not been provided with a valid name.

This unit appears to be over-represented as it occurs as small patches on very slight rises within other sandplain vegetation types and falls below the threshold for mapping.

Scholtzia sp. Yenyening Lakes is not a valid taxonomic name and no reference could be found to it in WA Herbarium records on Florabase.

The taxon was determined to be *Scholtzia* affin. *capitata.* The taxonomy of this genus requires further revision but a flowering specimen was collected and will be supplied to the DEC along with all the specimens for the project.

Closed Tall Shrublands (Unit 21)

Gunness (2003) has mapped Closed Tall Shrublands as a single vegetation unit dominated by either *Callistemon phoeniceus* or *Melaleuca thyoides*. However, this unit appears to be two separate associations as these two dominant species do not appear to intermingle to any significant degree. The two species occupy the same very narrow position in the landscape which is usually only one individual shrub wide. The dominant species at any individual site can only be determined by extensive groundtruthing.

Overall it appears that *Callistemon phoeniceus* dominates on the southern side of the study area and *Melaleuca thyoides* dominates the northern portion, with the exception of the area immediately adjacent to the rubbish tip on the western boundary of study area in Bill Walker's property. This may reflect decreasing granite and increasing salinity in the soil profile from the south to the north.

4.1.2 Flora Inventories

Despite questioning of the identification of the *Scholtzia* sp. *Yenyening Lakes*, there is every reason to have confidence in the flora inventory presented by Gunness (2003), given that plant identifications were verified at the WA Herbarium with assistance from the specialists: Andrew Brown (Orchids), Elizabeth George (*Verticordia*), Mike Hislop (general, especially *Melaleuca* and Epacridaceae), Mike Lyons (Chenopodiaceae), Bruce Maslin (*Acacia*), Barbara Rye (Rhamnaceae), Malcolm Trudgen (*Scholtzia*) and Paul Wilson (Chenopodiaceae and Asteraceae).

4.2 Significant Vegetation

Acorn Banksia Woodlands (Unit 7)

Gunness (2003) states that the *Banksia prionotes* (Acorn Banksia) woodlands are of high significance as the *Banksia prionotes* onsite is at the southern end of its distribution. This is consistent with Beard (1981) who observed that the yellow sandplain along the valley (on the southern side of the Lakes) covered by *Banksia-Xylomelum* alliance is the ultimate south-

east extent of an alliance which occurs on yellow sandplain as far north as the Murchison River.

However this alliance also occurs at Lake Toolibin 80km to the south, along the Wagin Lakes chain 120km to the south, and further east in a remnant on the eastern side of the Quairading townsite.

Gunness (2003) also quotes the recommendation of Safstrom *et al* (2000) that *Banksia prionotes* woodlands in the Wheatbelt should be considered as a potential threatened ecological community. However, the definition of such a community would have to be defined in a restrictive manner for it not to be considered widespread.

The occurrence of this alliance on yellow Aeolian dunes is probably more significant than the location of its occurrence.

Tamar Shrublands (Unit 15)

Gunness (2003) states that the Tamar Shrubland is of value because of its rarity within the Lakes system itself and is a vegetation type that has been widely cleared from the surrounding area.

This unit is not considered significant as it is very common throughout the Wheatbelt and may be displacing other shrublands as a result of increasing aridity and changed fire regimes (R. Hobbs, *pers comm.*).

Hopkinsia sedgelands (Unit 19)

This unit is significant because it demarcates the distribution of the Priority 3 taxa *Hopkinsia anoectocolea,* which is vulnerable to rising water levels as discussed in Section 4.5.1.

This unit was mapped by Gunness (2003) at two sites covering 0.9 hectares. This is an under-representation of the association's distribution but areas of this vegetation association are generally below the threshold for mapping and the distribution of this association cannot be accurately inferred from aerial photography alone.

At least two areas of this sedgeland were delineated by Gunness (2003) but erroneously identified as different vegetation units (Salt River Gum Woodland and *Melaleuca atroviridis* Shrubland). On the basis of aerial interpretation it would be reasonable to identify these sites as degraded woodlands or shrublands, underlying the fact that the precise extent and distribution of this association could only be verified through extensive groundtruthing.

Perched Freshwater Lakes (Unit 20)

Freshwater vegetation systems in good condition are becoming increasingly uncommon in the wheatbelt and any occurrence with vegetation in undegraded, or only slightly degraded condition, is of interest to land managers and ecologists.

The freshwater seeps known in the vicinity of the study area are shown in Map 6. There are several freshwater seeps on private property in the vicinity of the southern boundary of the study area. From a previous survey by L. Atkins (Brooker *et al* 2001), there are also

freshwater seeps and freshwater wetlands on private property north of the Reserve and approximately 2km west of Qualandary Crossing (in the remnant referred to as 'Fleay's Woodland' in Gunness (2003)).

Transects YT0601 and YT0602 are located in areas mapped by Gunness (2003) as being 'Freshwater Perched Lake Sedgelands'.

4.3 Significant Flora

The two Declared Rare Flora and nine Priority taxa recorded within the study area by Gunness (2003), with their 2006 conservation codes, were:

- *Ptilotus fasciculatus* Declared Rare Flora
- *Roycea pycnophylloides* Declared Rare Flora
- *Acacia sclerophylla* var*. teretiuscula* Priority 1
- *Acacia arcuatilis* Priority 2
- *Blennospora phlegmatocarpa* Priority 3
- *Frankenia drummondii* Priority 3
- *Hopkinsia anoectocolea* Priority 3
- *Triglochin stowardii* Priority 3
- *Eucalyptus spathulata* subsp*. salina* Priority 3
- *Frankenia glomerata* Priority 3
- *Eucalyptus loxophleba x wandoo* Priority 4

Declared Rare and priority Flora were only to be recorded by Ecoscape if observed opportunistically. Ecoscape confirmed populations of *Ptilotus fasciculatus (DRF) and Hopkinsia anoectocolea* (P3), and these are shown in map 6.

Two *Ptilotus fasciculatus* (DRF) populations have been previously recorded and the eastern of these was re-confirmed. This taxon is associated with low-lying flats with underlying clay which corresponds with Gunness Vegetation Unit 16 — Samphire (*Halosarcia lepidosperma, Halosarcia leptoclada* subspecies *inclusa, H. halocnemoides*) Low Open Shrubland over Low Open Herbland with emergent *Melaleuca lateriflora* and *Melaleuca atroviridis*. Given the relatively restricted extent and distribution of this vegetation association it is expected that the recorded populations of this taxon would be the largest in the study area.

Four *Hopkinsia anoectocolea* populations were confirmed but is expected that populations of this Priority taxa are scattered throughout much of the study area.

Eucalyptus loxophleba was recorded in the study area but the extent of *Eucalyptus loxophleba x wandoo,* which is a priority taxon previously recorded in the study area, was not determined. *Eucalyptus orthostemon x loxophleba* subsp. *loxophleba* has also been recorded in the immediate vicinity (Florabase sheet no: 07413580) and given that *Eucalyptus loxophleba* is hybridising with several *Eucalyptus* species in the vicinity a targeted survey would be required to determine the distribution of the priority taxon.

Eucalyptus spathulata subsp*. salina* (P4) was not collected during the survey but has previously been recorded in the area and it is assumed that all *Eucalyptus spathulata* in the study area is this priority subspecies on the basis of the study area's location. Whilst

Eucalyptus spathulata subsp*. spathulata* occupies the southern part of the distribution of the species from Lake Grace and Newdegate to Ongerup and Wagin, *Eucalyptus spathulata* subsp*. salina* occupies the northern part of the distribution of the species, as outlined above.

A number of taxa were identified by Gunness (2003) as being near the edge of their distributions. Upon review it was agreed that *Eucalyptus sargentii* subsp*. sargentii* is at the western limit of its range and *Dianella brevicaulis* is at the north-western limit of its range. The other taxa listed by Gunness (2003) appear to be near their range limits but not significant outliers in the context of collections and taxonomy in 2007.

4.4 Vegetation Health

4.4.1 Baseline Monitoring

Transects YT0601 and YT0602 are located to the south of the main drainage line within the study area. They were established in equivalent freshwater seeps to enable comparison between two sites of this restricted vegetation community. Both transects appear stressed at their upper ends, possibly as a result of changes in water flows out of the seeps. Salinisation is not evident at the lower end of YT0601 but appears to have caused some deaths of melaleucas some time ago at the lower end of YT0602.

Transect YT0603 is the most degraded of those monitored. With the exception of *Hakea preissii* all plants were either stressed or dead, and being both low lying and flat could be readily affected by further changes in salinity or water regimes in the lower (western part) of the study area.

The vegetation units in transects YT0604 was divided into western and eastern sections (a and b respectively). Overall the patterns of death and stress are similar, with the eastern section being in generally poorer condition. In addition to the effects of secondary salinisation in the lower portions of these transects there appears to be other factors (potentially lack of fire) that have lead to the decline of populations of *Leptospermum erubescens* and Allocasuarina campestris at the upper ends of the transects.

As transect YT0605 traverses a saddle in a lunette there is the potential to detect the effects of waterlogging and salinisation in the depression in the centre of the lunette as well as at its lower extremities. The measurement of elevation and soil profiles along this transect could be particularly useful for interpreting data with health expected to decline first on the lower extremities, then in the depression and then on the two rises.

4.4.2 Vulnerable Vegetation

Vegetation in the Yenyening Lakes system could potentially be affected by changes in water table levels and increases in salinity. Waterlogging can cause the death of trees as a precursor to secondary salinisation in Wheatbelt wetlands, with the deaths of fringing, emergent and freshwater aquatic plants tending to occur within 5 years of the rise in salinity levels (Sanders, 1991).

The limited specific published information available on the salinity tolerances of the native plant taxa recorded in the study area is shown in Table 4.1.

Table 4.1: Salinity tolerances of native plants

Salinity Tolerance	Species
Slightly saline (ECe 200-400 mS/m)	*Acacia acuminata*
	Acacia saligna
Moderately saline (ECe 400-800 mS/m)	*Callistemon phoeniceus*
	Eucalyptus loxophleba
	Maireana brevifolia
	Melaleuca acuminata subsp. *websteri*
Extremely saline sites (ECe >1600 mS/m)	*Casuarina obesa*
	Melaleuca thyoides

Department of Agriculture (2006)

The vegetation associations considered most vulnerable within the study area are discussed below.

Modified Shrublands (Unit 16)

The Shrublands of *Melaleuca lateriflora* and *Melaleuca atroviridis* were described by Gunness (2003) as modified as a reflection of their degradation due to secondary salinisation. This association has become degraded due to its vulnerability, which arises from its restricted distribution on low-lying flats with underlying clay, which becomes waterlogged with relative small increases in water tables.

This association still retains some of its overstorey and has yet to become completely degraded

Hopkinsia sedgelands (Unit 19)

Hopkinsia anoectocolea is a Priority 3 listed taxon that is restricted to sand on the margins of salt lakes and streams and in seasonally wet heaths. Based on its listed habitat and its occurrence (within the study area) in small, discrete patches in low-elevation sand, this population could be at risk from higher water levels within the lake system.

Closed Tall Shrublands (Unit 21)

Of the Closed Tall Shrublands that fringe the lake system, *Callistemon phoeniceus* Shrublands, which are moderately salt tolerant, are potentially at greater risk than *Melaleuca thyoides* Shrublands, which are extremely salt tolerant according to Table 4.1.

Perched Freshwater Lakes (Unit 20)

This association may be vulnerable because of its restricted distribution centred on freshwater seeps. It is expected that this vegetation association is analogous to the freshwater seeps on the Leschenault Inlet documented by Cresswell (2000), which also support Sedgelands of *Juncus kraussii.* The seepage was considered fresh if the water was below 3000mgL^{-1} as the ground or surface water entering these seeps was fresh to brackish, but the salinity of this water increased as it increasingly mixed with downslope saline water.

Without a detailed knowledge of the hydrology of the system, the vulnerability can not be determined, but decreases in outflows from the lens of fresh groundwater would be expected to change the composition of this association towards more salt tolerant species such as *Melaleuca thyoides* and *Casuarina obesa* over species such as *Melaleuca brevifolia*. Although *Juncus kraussii* occurs in both brackish and saline water (Pen, 1999) it is expected that increases in freshwater would be expected to increase the distribution of sedges and rushes due to the increased depth and period of inundation. The observation of local farmer Henry Hall (quoted in Gunness (2003)) that the rushes associated with this vegetation unit have appeared in the last 50 years as a result of increased run-off following clearing and the water seeping out in this zone, supports this expectation.

Monitoring of the flows and salinity of water in the freshwater seeps should form part of any intensive monitoring of this vegetation association.

4.4.3 Influences on Salinity

In addition to historical clearing of perennial vegetation in the catchment, the other potential influences on salinity levels observed in the lake system were:

- drains;
- groundwater extraction; and
- the Qualandary Crossing gates.

Drains

In the north-east of the study area there is a drain entering the study area from across Homebush Road that extends approximately 900m into the lake system. This is shown in Plate 4.1.

Plate 4.1 Drain entering system from the east across Homebush Road

There is extensive degradation along either side of the drain shown in Plate 4.1, as indicated in Plate 4.2.

Plate 4.2 Degradation along Drain entering from Homebush Road

It could not be determined whether the death of trees and shrubs in the vicinity of this drain preceded the construction of the drain. The vegetation in the immediate surrounds now appears stable, although the drain is continuing to import sand into the system.

A second drain enters the system, to the east of McLean Road. The dimensions of this drain are smaller than the Homebush Road drain and the vegetation is less degraded, as can be seen in Plate 4.3.

Plate 4.3 Drain entering system from the north near McLean Road

Water Extraction

Small scale water extraction is now occurring at a number of the freshwater seeps in the area, as shown in Plate 4.3.

Plate 4.3 Small scale water extraction at freshwater seep

The rates and volumes of groundwater abstraction at these sites, and whether they are having any detrimental impact on the vegetation, were not determined but baseline information has been collected at two freshwater seeps along Transects YT0601 and YT0602.

It should also be noted that a pine plantation has been established on the slopes above and to the south of Transect YT0601 which may influence groundwater inflows into the freshwater seep.

Qualandary Gate Crossing

Water levels within the lake system can be manipulated by limiting the western outflow of water from the system by closing the gates at Qualandary Crossing. The management arrangements for the Qualandary Gate Crossing are discussed in *Yenyening Lakes Management Strategy 2002-2012* (Water and Rivers Commission, 2002).

In flood events, the presence of the gate at the Qualandary Crossing has no influence on water levels in drainage systems above the Crossing. However, the operation of the gates at Qualandary Crossing remains a source of considerable contention and further research may be required to resolve whether the gate is contributing to long-term salt accumulation (Water and Rivers Commission, 2002).

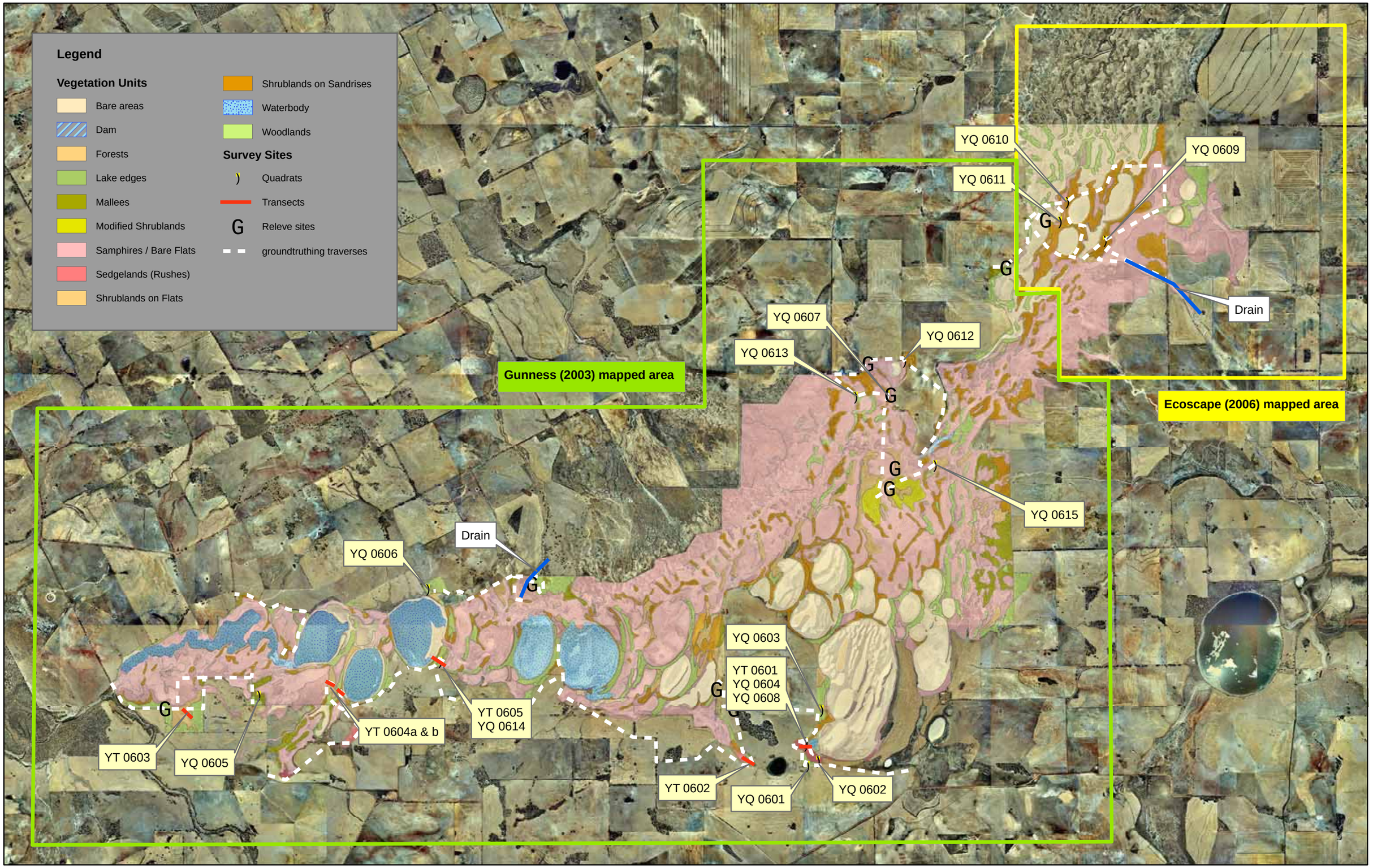
5.0 Recommendations

5.1 Summary of Recommendations

1. A targeted survey should be undertaken to determine the distribution of *Hopkinsia anoectocolea* throughout the study area as populations of this Priority taxa are expected to be small, scattered and susceptible to rises in water levels. The populations cannot be inferred from aerial photography but could be confirmed on foot by volunteers with limited botanical knowledge.
2. Soil profiles be should recorded along the transects to aid in the interpretation of results.
3. Soil salinity be should recorded along the transects to aid in the interpretation of results.
4. Water salinity and flows should be recorded along the transects in freshwater seeps to aid in the interpretation of the results.
5. Contours of the transects should be measured to aid in the interpretation of the results.
6. The total number of understorey and overstorey species in each 20 x 20m quadrat should be recorded in similar projects in the future on the basis that this will provide an indication of the completeness of the flora lists, allow the analysis of changes in species richness over time, and not be time consuming to assess and record.
7. If any additional drainage into the lake system is approved, an assessment should be made as to whether additional transects are necessary to effectively monitor impacts in the vicinity of the inflow of the drain.
8. The volumes and salinity of water entering the system from the drains at Homebush and McLean Roads should be investigated.

6.0 Maps

Vegetation Mapping and Assessment at Yenyening Lakes NR



ecoscape

Study Area | **Map 1**

Vegetation Mapping and Assessment, Yenyening Lakes Nature Reserve

Dec 2006

2.5 1.25 0 2.5 Kilometers

1:60,000

Legend

Vegetation Units

- Bare areas
- Dam
- Forests
- Lake edges
- Mallees
- Modified Shrublands
- Samphires / Bare Flats
- Sedgelands (Rushes)
- Shrublands on Flats
- Shrublands on Sandrises
- Waterbody
- Woodlands

Survey Sites

- Quadrats
- Transects
- Groundtruthing traverses
- Releve sites

Note: Numbers refer to vegetation units.
For description of units refer to Table 3.1.

YQ0606
YQ0614
YQ0605
YT0603S
YT0603F
YT0604aS
YT0604bS
YT0604bF

ecoscape

500 250 0 500 Meters

1:20,000

Western Study Area | **Map 2**

Vegetation Mapping and Assessment, Yenyening Lakes Nature Reserve | Dec 2006

ecoscape

Central Western Study Area | **Map 3**

Vegetation Mapping and Assessment, Yenyening Lakes Nature Reserve | Dec 2006

500 250 0 500 Meters

1:20,000

Legend

Vegetation Units

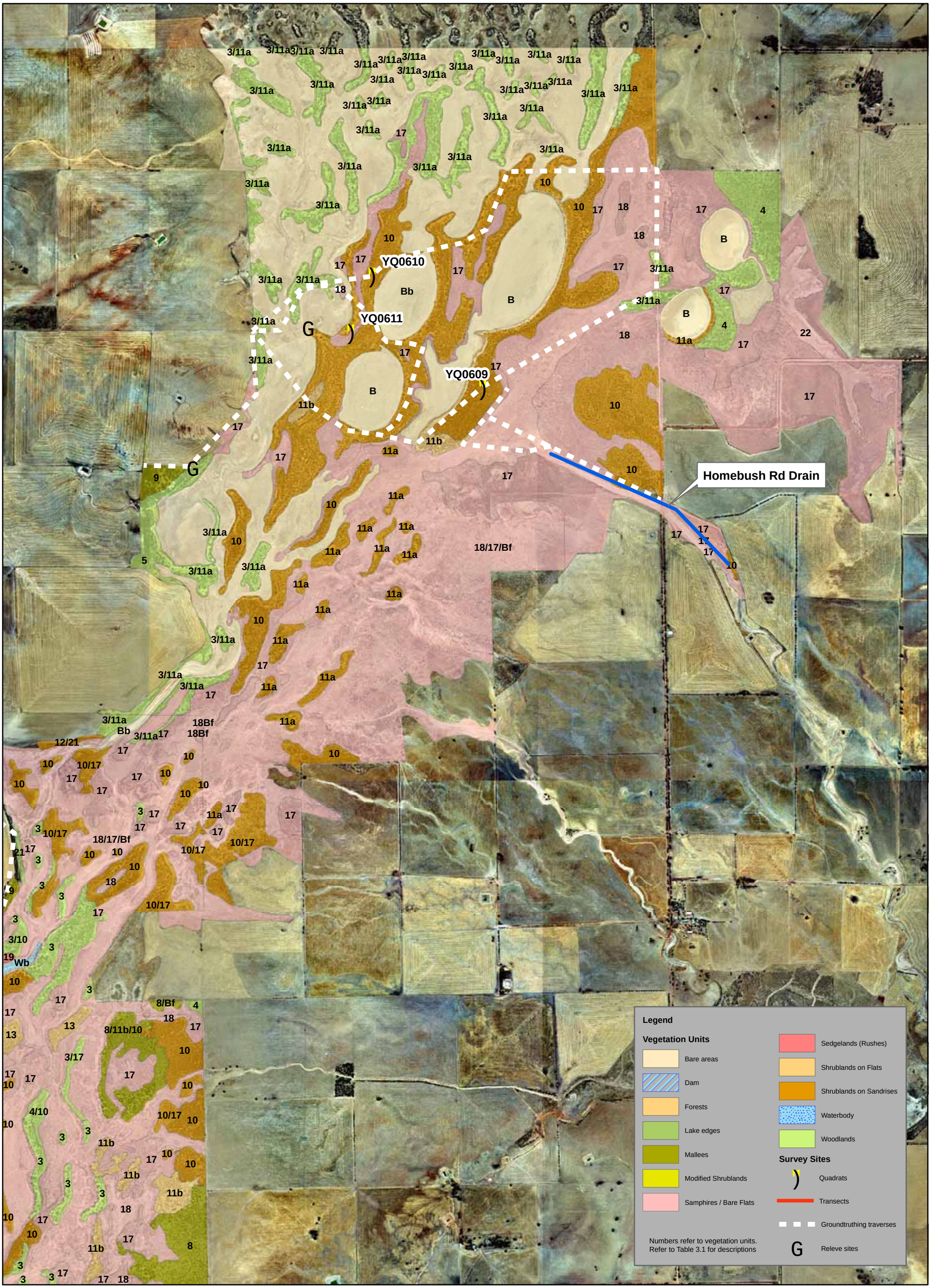
- Bare areas
- Dam
- Forests
- Lake edges
- Mallees
- Modified Shrublands
- Samphires / Bare Flats
- Sedgelands (Rushes)
- Shrublands on Flats
- Shrublands on Sandrises
- Waterbody
- Woodlands

Survey Sites

- Quadrats
- Transects
- Groundtruthing traverses
- Releve sites

Note: Numbers refer to vegetation units.
For descriptions refer to Table 3.1.

YQ0612 YQ0607 YQ0613 YQ0615



ecoscape

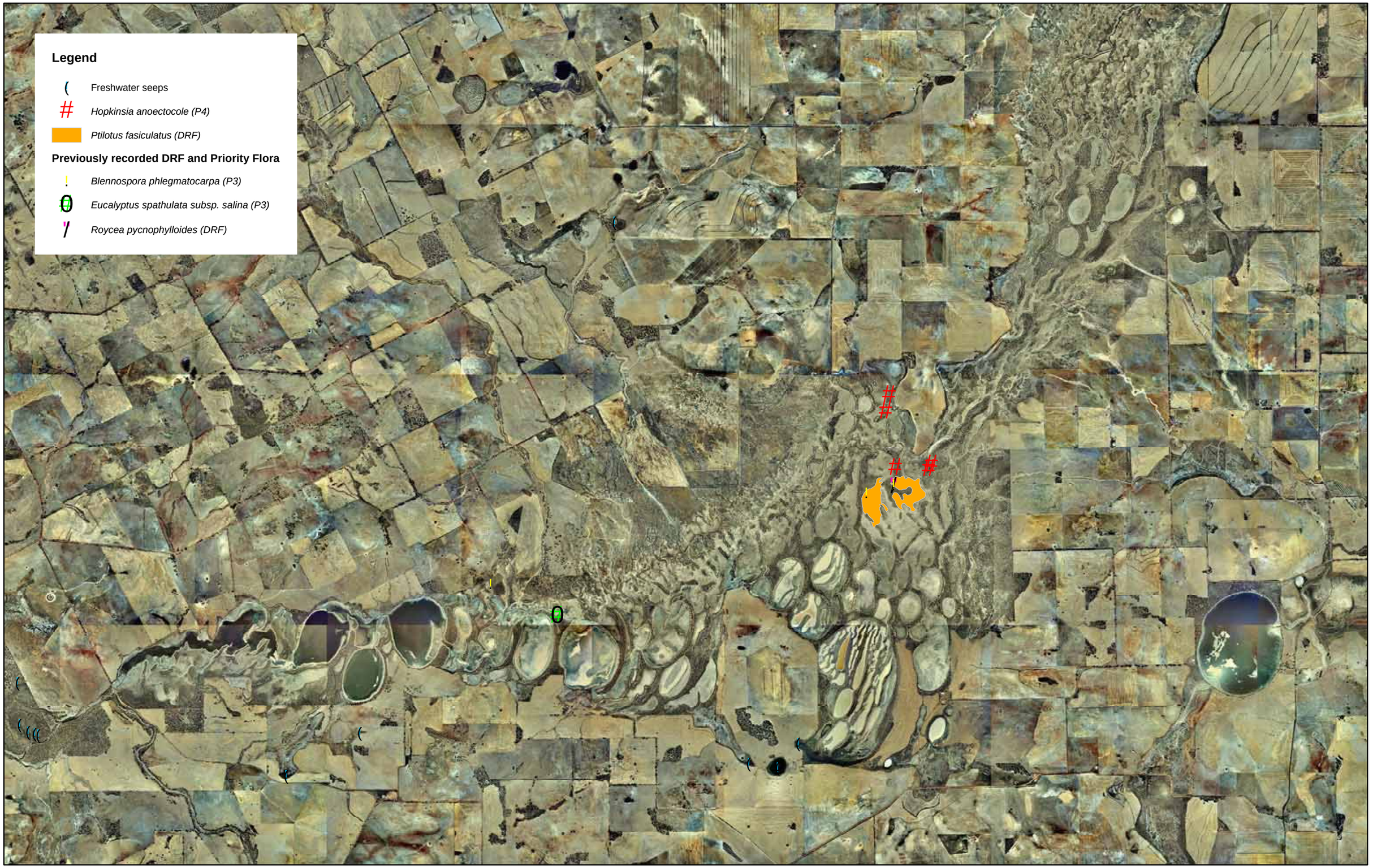
Eastern Study Area | **Map 5**

Vegetation Mapping and Assessment, Yenyening Nature Reserve

Dec 2006

500 250 0 500 Meters

1:20,000



ecoscape

Locations of Significant Flora and Freshwater Seeps

Vegetation Mapping and Assessment, Yenyening Lakes Nature Reserve

2 1 0 2 Kilometers

1:60,000

Map 6

Dec 2006

7.0 References

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Appendix One:
Quadrat Photographs

Vegetation Mapping and Assessment at Yenyening Lakes NR

Plate 1: YQ0601

Plate 4: YQ0604

Plate 2: YQ0602

Plate 5: YQ0605

Plate 3: YQ0603

Plate 6: YQ0606

Plate 7: YQ0607

Plate 10: YQ0610

Plate 8: YQ0608

Plate 11: YQ0611

Plate 9: YQ0609

Plate 12: YQ0612

Plate 13: YQ0613

Plate 15: YQ0615

Plate 14: YQ0614

Appendix Two:
Transect Photographs

Vegetation Mapping and Assessment at Yenyening Lakes NR

Plate 16: YT0601

Plate 19: YT0604a

Plate 17: YT0602

Plate 20: YT0604b

Plate 18: YT0603

Plate 21: YT0605

Appendix Three:
Relevé Site Photographs

Vegetation Mapping and Assessment at Yenyening Nature Reserve

Plate 22: YS0601

Plate 25: YS0604

Plate 23: YS0602

Plate 26: YS0605

Plate 24: YS0603

Plate 27: YS0606

Plate 28: YS0607

Plate 31: YS0610

Plate 29: YS0608

Plate 32: YS0611

Plate 30: YS0609

Appendix Four: Quadrat, Transect & Site Locations

Table A4.1: GPS locations of Quadrats

Quadrats	Easting	Northing	EPE (m)
YQ0601	526226	6431409	6
YQ0602	526444	6431432	13
YQ0603	526503	6432313	9
YQ0604	526233	6431710	7
YQ0605	516762	6432563	12
YQ0606	519688	6434405	12
YQ0607	527647	6437758	11
YQ0608	526234	6431753	12
YQ0609	531409	6440434	9
YQ0610	530755	6441100	9
YQ0611	530629	6440763	9
YQ0612	527937	6438350	11
YQ0613	527095	6437731	9
YQ0614	519901	6433151	9
YQ0615	528467	6436550	7

Table A4.2: GPS locations of Transects

Transect	Start/End Points	Easting	Northing	EPE (m)	Compass direction (start to end)
YT0601	0m	526277	6431722	11	310
	140m	526150	6431724	9	
YT0602	0m	525145	6431483	8	210
	150m	525288	6431414	11	
YT0603	0m	515451	6432311	11	125
	180m	515595	6432173	13	
YT0604a	0m	517939	6432802	8	90
	100m	518035	6432775	12	
YT0604b	0m	518183	6432630	9	300
	100m	518102	6432687	10	
YT0605	0m	519816	6433229	10	100
	200m	519978	6433145	8	

Table A4.3: GPS locations of Relevé Sites

Sites	Easting	Northing
YS0601	524981	6432328
YS0602	521490	6434496
YS0603	515139	6432337
YS0604	529695	6439959
YS0605	527774	6436495
YS0606	521217	6432231
YS0607	527676	6436148
YS0608	527306	6438306
YS0609	527701	6437762
YS0610	530378	6440787
YS0611	524686	6432669

Accessing Transects

YT0601

Preferred Route via Mills property - Lakeside Farm

Description	GPS
Enter through farm-gate on Mills Road about 200m NE of McCooke Road	525802E, 6429565N
Travel 1700m NW to old farm-house	524495E 6430614N
Travel east for 180m to the first gate	524665E 6430626N
Follow fence-line east for 650m, turn north for 740m to second gate	525375E 643325N
Follow fence-line north-east for approximately 770m to the north-east side of the soak	526207E 6431808N
Travel approximately 70m south-east through *Melaleuca* shrubland to lake edge, then travel approximately 100m around edge to islet and start of transect.	

Alternate Route via Hills property

Description	GPS
Enter though farm-gate on Mills Road	527973E 6430952N
Travel 340m north and pass though paddock gate	528107E 6431251N
Travel fence north-west 110m to fence	528039E 6431324N
Travel west for 1850m to the north-west corner of the paddock	526210E 6431353N
Travel north 350m through *Banksia prionotes* shrubland, open *Casuarina obesa* forest, *Juncus kraussii* sedgeland to start of transect on islet	

YT0602

Description	GPS
Access from Mills property - Lakeside Farm	
Enter through farm-gate on Mills Road about 200m NE of McCooke Road	525802E 6429565N
Drive 1700m to old farm-house, turn east for 180m to the first gate	524665E 6430626N
Follow fence-line east for 650m, turn north for 740m to second gate	525375E 643325N
Follow fence-line west around remnant vegetation for approximately 400m	525371E 6431314N
Cross low shrubland to lake & follow lake edge to start of transect 170m N	
Beginning of transect is on the south-east edge of lake	

YT0603

Description	GPS
Enter track off Qualandary Road on north-west corner of paddock	514580E 6432332N
Follow fence-line east for approximately 750m through *E. wandoo* and *E. loxophleba* woodland to a wire gate in the fence	515412E 6432334N
Pass through wire gate and travel 50m south-east of gate to edge of *Melaleuca* shrubland to start of transect.	

YT0604a and YT0604b

Description	GPS
Enter gate on north side of Qualandary Road	516909E 6431185N
Follow fence-line north approximately 1200m to north-west corner of paddock	516909E 64321395N
Follow it east 1000m to north-east corner of paddock	517670E 64321395N
YT0604a - 400m N through *Allocasuarina huegeliana* woodland and *Melaleuca* shrubland to *Halosarcia /Frankenia* heath	
YT0604b - 360m NE through *Allocasuarina huegeliana* woodland to edge of Racehorse Lake	

YT0605

From YT0602

Description	GPS
Start from fence line surrounding YT0602 vegetation.	525371E 6431314N
Travel NW for 870m to first and second gates	524862E 6431739N
Travel N 30m to third gate	524668E 6431765N
Following fence line, travel 260m NNW, 255m W, 215m N, then 1km W to fourth gate	523240E 6432225N
Travel 2000m W to fifth gate	521216E 6432231N
Continue 1000m WNW, then 250m NNE to sixth gate	520368E 6432779N
Travel 260m NW to seventh gate	520194E 6432958N
Travel 85m ENE, then 330 m NNW to southern end of Ossigs Lake	519773E 6433058N
Travel 170m north through *Allocasuarina huegeliana* woodland to edge of Ossigs Lake and start of transect	

From YT0604

Description	GPS
Start from north-east corner of paddock in transect YT0604	517670E 64321395N
Travel east 600m to southern end of Racehorse LakE	517997E 6432389N
Travel 1250m north-east to southern end of Ossigs Lake	519773E 6433058N
Travel 170m north through *Allocasuarina huegeliana* woodland to edge of Ossigs Lake and start of transect	

Appendix Five:
Quadrat Descriptions

Vegetation Mapping and Assessment at Yenyening Nature Reserve

Table A5.1: Summary of Quadrat descriptions

Quadrat	*Vegetation name*	Site description	Vegetation description	Muir code	McDonald Code	Beard code
YQ0601	*Banksia prionotes Low Forest A*	No effective disturbance other than grazing by hoofed animals, northerly aspect, 210m ASL elevation, no surface stones or gravel, simple slope, no evidence of fire, 70% plant litter, 10% bare ground	Low Forest A of Banksia prionotes over Low Woodland B of Allocasuarina campestris over Low Scrub A of Eremaea pauciflora, Rhagodia drummondii, Leptospermum erubescens, Conostephium preissii, Billardiera lehmanniana over Tall Open Sedges of Mesomelaena preissii	LAc, LBi, SAi, VTi	T6M, T5S, S4S, V3S	Lc, Si, Gi
YQ0602	*Casuarina obesa Low Forest A over Melaleuca sp. Scrub*	No effective disturbance, northerly aspect, 226m ASL elevation, no surface stones or gravel, simple slope, no evidence of fire, no litter or bare ground	Low Forest A of Casuarina obesa over Scrub of Melaleuca brevifolia over Dense Tall Sedges of Juncus kraussii	LAc, Si, VTc	T6M, S4S, V3M	Lc, Si, Gc
YQ0603	*Allocasuarina campestris Thicket*	No effective disturbance, no aspect, 220m ASL elevation, no surface stones or gravel, flat, no evidence of fire, 50% plant litter, 0% bare ground	Thicket of Allocasuarina campestris over Open Tall Sedges of Mesomelaena preissii, Lepidobolus preissianus over Very Open Low Grasses of Austrostipa elegantissima, Austrostipa ?trichophylla, Neurachne alopecuroidea, Amphipogon canescens, Austrodanthonia caespitosa over Very Open Herbs of Podolepis canescens, Brachyscome iberidifolia, Ptilotus polystachyus, *Hypochaeris glabra	Sc, VTi, GLr, Jr	S4M, V3S, G2V, F2V	Z, Gi, Jr
YQ0604	*Juncus kraussii Dense Tall Sedges*	No effective disturbance, no aspect, 215m ASL elevation, no surface stones or gravel, flat, no evidence of fire, no plant litter or bare ground	Open Low Woodland B of Casuarina obesa over Dense Tall Sedges of Juncus kraussii over Very Open Herbs of Halosarcia ?pergranulata	LBr, VTd, Jr	T5V, V3D, F2V	Lr, Gd, Jr
YQ0605	*Eucalyptus orthostemon Very Open Tree Mallee*	No effective disturbance, no aspect, 210m ASL elevation, <10% small angular surface stones, no gravel, flat, no evidence of fire, 70% plant litter, 30% bare ground	Very Open Tree Mallee of Eucalyptus orthostemon, Eucalyptus wandoo over Low Scrub A of Melaleuca lateriflora, Melaleuca uncinata over Dwarf Scrub C of Rhagodia drummondii, Halosarcia ?pergranulata over Very Open Tall Sedges of Gahnia sp. over Very Open Herbs of Pogonolepis stricta, Podolepis capillaris	KTr, SAi, SCi, VTr, Jr	M5V, S4S, C3S, V3V, F2V	Lr, Si, Zi, Gr, Jr
YQ0606	*mixed Melaleuca species Low Scrub A*	No effective disturbance, no aspect, 210m ASL elevation, <10% small angular surface stones, no gravel, flat, approx 1 year since last fire, 40% plant litter, 20% bare ground	Low Scrub A of Melaleuca acuminata, Melaleuca atroviridis, Melaleuca adnata over Open Low Scrub B of Stylobasium australe over Dwarf Scrub C of Rhagodia drummondii, Enchylaena tomentosa, Maireana brevifolia over Very Open Low Grasses of *Vulpia myuros, *Pentaschistis airoides	S4M, S3S, G2V	S4M, S3S, G2V	Sc, Zi, Gr
YQ0607	*Hopkinsia anoectocolea Open Tall Sedges*	No effective disturbance, no aspect, 212m ASL elevation, no surface stones or gravel, flat, no evidence of fire, 50% plant litter, 50% bare ground	Open Dwarf Scrub D of Rhagodia drummondii over Open Tall Sedges of Hopkinsia anoectocolea over Very Open Tall Grasses of Austrostipa hemipogon, Austrostipa elegantissima, Neurachne alopecuroidea over Very Open Low Grasses of *Vulpia myuros over Very Open Herbs of Podotheca angustifolia, Podolepis canescens, Podolepis capillaris.	S2S, V3S, G2S, F1V	S2S, V3S, GTV, G2V, F2V	Zi, Gc, Jr
YQ0608	*mixed Melaleuca species Scrub over Juncus kraussii Dense Tall Sedges*	No effective disturbance, no aspect, 213m ASL elevation, no surface stones or gravel, flat, no evidence of fire, no plant litter or bare ground	Scrub of Melaleuca brevifolia, Melaleuca thyoides over Dense Tall Sedges of Juncus kraussii	Si, VTd	S4S, V3D	Si, Gd
YQ0609	*Eucalyptus loxophleba Open Tree Mallee over Acacia acuminata Low Forest B*	No effective disturbance other than grazing by hoofed animals, aspect, 213m ASL elevation, no surface stones or gravel, flat, no evidence of fire, 80% plant litter, 20% bare ground	Open Tall Mallee of Eucalyptus loxophleba over Low Forest B of Acacia acuminata over Heath A of Exocarpos aphyllus, Lycium australe, Rhagodia drummondii, Eremophila decipiens over Open Mat Plants of Sclerolaena diacantha, Maireana ?marginata over Very Open Low Grasses of *Vulpia myuros, *Bromus rubens	KTi, LBc, SAc, Pi, GLr	M5S, T5M, S4M, F1S, G2V	Lc, Sc, Fi, Gr
YQ0610	*Santalum acuminatum emergent Open Low Woodland B over Melaleuca Heath A*	No effective disturbance, no aspect, 214m ASL elevation, no surface stones or gravel, flat, no evidence of fire, 5% plant litter, 50% bare ground	Open Low Woodland B of Santalum acuminatum over Heath A of Melaleuca brophyi, Melaleuca pentagona over Heath B of Darwinia halophila, Rhagodia drummondii over Very Open Low Grass of *Pentaschistis airoides over Very Open Herbs of Podotheca angustifolia, Podolepis capillaris, Podolepis canescens, Waitzia acuminata.	LBr, SAc, SBc, GLr, Jr	T5V, S4M, S4M, G2V, F2V	Lr, Sc, Gr, Jr
YQ0611	*Melaleuca sp. Scrub over Rhagodia drummondii Dwarf Scrub C*	No effective disturbance, no aspect, 214m ASL elevation, <10% small angular surface stones, no gravel, flat, no evidence of fire, 5% plant litter, 40% bare ground	Scrub of Melaleuca uncinata over Dwarf Scrub C of Rhagodia drummondii, Enchylaena tomentosa over Mat Plants of Maireana brevifolia, Dysphania crassifolium over Very Open Herbs of Mesembryanthemum nodiflorum, Pogonolepis stricta, Sclerolaena diacantha	Si, SCi, Pc, Jr	S4S, S3S, F1M, F2V	Si, Zi, Fc, Jr
YQ0612	*Melaleuca sp. Dense Thicket*	No effective disturbance, no aspect, 236m ASL elevation, <10% very small surface stones, no gravel, flat, no evidence of fire, 70% plant litter, 30% bare ground	Dense Thicket of Melaleuca uncinata over Very Open Herbs of Spergularia marina	Sd, Jr	S4D, Fr	Sd,Fr
YQ0613	*Eucalyptus sargentii Woodland over Rhagodia drummondii Low Heath C*	No effective disturbance, no aspect, 223m ASL elevation, <10% surface stones, no gravel, flat, no evidence of fire, 85% plant litter, 10% bare ground	Woodland of Eucalyptus sargentii over Open Low Scrub A of Melaleuca brophyi over Dwarf Heath C of Rhagodia drummondii over Very Open Mat Plants of Maireana sp. over Open Low Grass of *Pentaschistis airoides, Gnephosis angianthoides	Mi, SAi, SCi, Pr, GLi	M5S, S4S, C3S, F1V, G2S	Mi, Si, Zi, Fr, Gi
YQ0614	*Open Low Woodland A of Allocasuarina huegeliana*	No effective disturbance, easterly aspect, 216m ASL elevation, <10% surface stones, no gravel, simple slope, no evidence of fire, 80% plant litter, 10% bare ground	Open Low Woodland A of Allocasuarina huegeliana over Low Scrub B of Rhagodia drummondii, Eremaea pauciflora over Very Open Tall Grasses of Austrostipa elegantissima, Austrostipa ?trichophylla, Austrostipa hemipogon over Very Open Herbs of Podotheca gnaphalioides, Ptilotus humilis, Podolepis canescens, *Hypochaeris glabra	LAr, SBi, GTr, Jr	T6V, S4S, G3V, F2V	Lr, Si, Gr, Jr
YQ0615	*Hakea preissii Open Scrub over Rhagodia drummondii Dwarf Scrub C*	No effective disturbance, no aspect, 216m ASL elevation, <10% surface stones, no gravel, flat, no evidence of fire, 30% plant litter, 20% bare ground	Open Scrub of Hakea preissii over Dwarf Scrub C of Rhagodia drummondii, Enchylaena tomentosa over Open Mat Plants of Maireana sp., Dysphania crassifolium over Open Low Sedges of Gahnia sp. over Very Open Low Grass of Austrostipa elegantissima, Austrostipa ?scabra, *Vulpia myuros, *Pentaschistis airoides	Sr, Sci, Pi, VLi, GLr	S4V, S3S, F1S, V3S, G2V	Sr, Zi, Fi, Gi

Appendix Six:
Relevé Site Descriptions

Vegetation Mapping and Assessment at Yenyening Lakes Nature Reserve

Table A6.1: Vegetation descriptions of Releve sites

Site	Vegetation description	Muir Code	McDonald Code	Beard code
YS0601	Forest of *Eucalyptus salmonophloia* over Dwarf Scrub D of *Rhagodia drummondii* over Very Open Low Grasses of *Austrostipa ?scabra, *Lolium rigidum, *Hordeum leporinum, *Bromus rubens*	Mc, SDi, GLr	T7M, Z3S, G2V	Mc, Zi, Gr
YS0602	Woodland of *Eucalyptus loxophleba* over Open Dwarf Scrub C of *Rhagodia drummondii* over Low Grass of *Eragrostis dielsii, Austrostipa scabra, *Vulpia myuros, *Avena barbata, *Bromus rubens* over Very Open Herbs of *Mesembryanthemum nodiflorum*	Mi, SCr, GLc, Jr	T7S, Z3V, G2M, F1V	Mi, Zr, Gc
YS0603	Woodland of *Eucalyptus wandoo* over Low Woodland A of *Casuarina obesa, Acacia acuminata* over Low Heath C of *Rhagodia drummondii* over *Halosarcia* sp. over Open Low Grasses of *Ehrharta longiflora* with Very Open Herbs of *Moraea setifolia*	Mi, LAi, SCc, GLi, Ji	T7S, T6S, Z3M, G2S, F1S	Mi, Li, Zc, Gi, Fi
YS0604	Open Shrub Mallee of *Eucalyptus hypochlamydea* over Dwarf Scrub D of *Rhagodia drummondii* over Low Grass of *Austrostipa scabra, Austrostipa hemipogon, *Bromus rubens, *Vulpia myuros, *Lolium rigidum* over Very Open Herbs of *Brassica rubens*	KSi, SDi, GLc, Jr	Y6S, Z2S, G1M, F1V	Li, Zi, Gc, Fr
YS0605	Scrub of *Melaleuca acuminata, Melaleuca uncinata, Exocarpos aphyllus* over Open Low Scrub B of *Lycium australe* over Open Dward Scrub C of *Rhagodia baccata* over Dwarf Scrub D of *Enchylaena tomentosa, Sclerolaena diacantha, Disphyma crassifolia* over Open Low Grass of **Vulpia myuros, *Schismus* sp.	Si, SBr, SCr, SDi, GLi	S5S, S4V, S3V, Z2S, G1S	Si, Sr, Zr, Gi
YS0606	Open Scrub of *Melaleuca uncinata* over Heath B of *Scholtzia* affin. *capitata* over Open Dwarf Scrub D of *Rhagodia drummondii* over Open Low Grass of **Vulpia myuros, *Pentaschistis airoides*	Sr, SBc, SDr, GLi	S4V, S3M, Z2V, G1S	Sc, Zr, Gi
YS0607	Dwarf Scrub D of *Halosarcia* sp. over Herbs of *Disphyma crassifolia, Ptilotus fascicularis*	SDi, Jc	Z2S, F1M	Zi, Fc
YS0608	Dwarf Scrub D of *Halosarcia* sp. over Very Open Herbs of *Cotula bipinnata, Disphyma crassifolia*	SDi, Jr	Z2S, F1V	Zi, Fr
YS0609	Low Heath C of *Halosarcia ?pergranulata, Halosarcia ?halocnemoides, Frankenia pauciflora*	SCc	S3M	Zc
YS0610	Thicket of *Melaleuca thyoides* over Open Dwarf Scrub C of *Rhagodia drummondii* over Dwarf Scrub D of *Halosarcia* sp., *Enchylaena tomentosa* over Very Open Herbs of *Calocephalus multiflorus, Spergularia salva*	Sc, SCr, SDr, Jr	S5M, S3V, Z2V, F1V	Sc, Zi, Fr
YS0611	Dense Thicket of *Callistemon phoeniceus* over Very Open Herbs of *Hordeum leporinum, Ehrharta longiflora*	Sd, GLr	Z2D, G1V	Zd, Gr

Appendix Seven: Transect Data

Vegetation Mapping and Assessment at Yenyening Lakes NR\

Table A7.1: Transect data for YT0601

Species	Dist. Along tape(m)	Dist. From tape(m)	DBH (cm)	Height (m)	% Canopy	% Epic	Condition	Comments
Melaleuca thyoides	0	0.5S	n/a	2.3	95	no	H	
Halosarcia sp.	0-20	2.4S	n/a	0.3		n/a	S	70% cover
Melaleuca thyoides	7	1.0S	n/a	2.1	90	no	H	
Melaleuca thyoides	15	1.5S	n/a	fallen	0	n/a	DO	
Melaleuca thyoides	14	2.0S	n/a	0.7	100	no	H	
Melaleuca thyoides	17	0.3S	n/a	1.5	100	no	H	
Juncus kraussii	17	1.5S	n/a	0.7	100	n/a	H	
Juncus kraussii	19.5	0.4S	n/a	1	100	n/a	H	
	20 – 42							water
Juncus kraussii	42 – 88							100% cover
Melaleuca brevifolia	46.4	0.8 S	n/a	1.15	100	no	H	
Casuarina obesa	47.5	1.0 S	6	5.5	100	no	H	
Melaleuca brevifolia	47.8	0.4 N	n/a	2.6	100	no	H	
Casuarina obesa	47.8	4.0 N	5	5.5	100	no	H	
Casuarina obesa	51.1	4.5 N	6.5	6	100	no	H	
Casuarina obesa	47.6	3.0 S	0.3	2	100	no	H	
Casuarina obesa	48.2	1.4 S	n/a	1	0	n/a	DO	
Casuarina obesa	55.5	1.5 N	1	2	100	no	H	
Casuarina obesa	55.5	4.0 N	7.5	6	100	no	H	
Casuarina obesa	56.3	4.0 N	4	4	0	n/a	DO	
Casuarina obesa	57.1	4.0 N	13	7.5	100	no	H	
Casuarina obesa	57.8	5.0 N	2	4	100	no	H	
Casuarina obesa	58.3	5.0 N	2.5	4.7	100	no	H	
Casuarina obesa	60	2.0 S	2.5	5	100	no	H	
Casuarina obesa	60.3	5.0 N	3	4.7	90	no	H	
Casuarina obesa	60.8	2.0 N	2.5	4	100	no	H	
Casuarina obesa	61.3	2.2 N	1.7	4	100	no	H	
Casuarina obesa	61.8	1.6 N	0.5	2	100	no	H	
Casuarina obesa	61.1	0.3 S	6.5	8	100	no	H	
Casuarina obesa	63.1	2.0 N	5.5	10	100	no	H	
Casuarina obesa	63.5	0.7 N	6	10	100	no	H	
Casuarina obesa	63.5	3.0 S	2.5	4.5	100	no	H	
Casuarina obesa	64.7	0.7 S	3	4	100	no	H	
Casuarina obesa	64.7	3.0 N	2.5	4	100	no	H	
Casuarina obesa	67.5	4.5 N	1.2	2.5	100	no	H	
Casuarina obesa	68	5.0 N	n/a	1.6	100	no	H	
Melaleuca thyoides	70.4	0.7 N	n/a	2.2	50	no	SS	
Casuarina obesa	70.4	0.7 N	1.5	2.5	100	no	H	
Melaleuca thyoides	72.2	0.5 N	25	4	50	no	SS	
Melaleuca thyoides	72.8	1.6 S	n/a	4	50	no	SS	
Melaleuca thyoides	74.5	0	n/a	1.7	50	no	SS	
Casuarina obesa	74.5	1	0.5	2	100	no	SS	
Melaleuca thyoides	76.6	0	n/a	4	50	no	SS	

Melaleuca thyoides	77.4	0	n/a	6	50	no	SS	
Melaleuca thyoides	77.4	0.4 S	n/a	4	0	n/a	DO	
Melaleuca thyoides	78.7	0	n/a	6	5	no	VS	
Melaleuca thyoides	79.7	0.5 S	n/a	6	0	n/a	DR	
Melaleuca thyoides	81.4	0	n/a	5.5	50	no	SS	
Melaleuca thyoides	83	0	n/a	5	50	no	SS	
Casuarina obesa	83.3	1.0 N	6	10	80	no	SS	
Casuarina obesa	84	0	2.2	5	90	no	SS	
Melaleuca thyoides	84.3	0	n/a	1.5	0	no	DR	
Melaleuca thyoides	85.1	0.5 N	n/a	5	0	no	DR	
Casuarina obesa	86	1.6 S	12	10	95	no	SS	
Melaleuca thyoides	87.3	0	n/a	4	5	no	VS	
Casuarina obesa	88	0.5 N	18	20	60	no	SS	
Casuarina obesa	88.5	0	15.5	20	60	no	SS	
Casuarina obesa	88.9	0.3 S	1.9	4.5	0	n/a	DM	
Casuarina obesa	90	0	8.5	12	80	no	SS	
Casuarina obesa	90.9	1.0 N	5.5	10	80	no	SS	
?Tetraria microcarpa	91-115							100% cover
Casuarina obesa	93	0.3 S	11	15	50	no	SS	
Casuarina obesa	93	1.5 S	7	15	50	no	SS	
Casuarina obesa	94.3	0.5 N	6.2	10	50	no	SS	
Casuarina obesa	94.6	1.0 N	7.7	10	30	no	S	
Melaleuca brevifolia	95	1.0 N	n/a	2.2	20	no	VS	
Casuarina obesa	96	0.8 N	8	10	50	no	SS	
Casuarina obesa	96.8	0.5 S	7	10	50	no	S	
Casuarina obesa	96.8	1.2 S	n/a	2	100	no	H	
Casuarina obesa	96.8	1.7 S	3	5	50	no	SS	
Casuarina obesa	97.4	1.1 S	1.6	3	90	no	SS	
Casuarina obesa	98.4	0.9 S	12.5	12	70	no	SS	
Casuarina obesa	99	1.1 S	5	13	70	no	SS	
Casuarina obesa	99.7	0.5 S	8	10	50	no	SS	
Casuarina obesa	100.5	0.3 N	9.5	10	30	no	S	
Melaleuca brevifolia	100.8	1.4 S	n/a	3	30	no	S	
Casuarina obesa	100.8	1.4 S	5	5	90	no	SS	
Casuarina obesa	101.7	0.75 S	11	12	90	no	SS	
Melaleuca brevifolia	102.6	0.5 S	n/a	2	10	no	VS	
Casuarina obesa	102.6	0.5 S	5.4	6	90	no	SS	
Casuarina obesa	103.4	0.8 S	4.5	10	50	no	SS	
Melaleuca brevifolia	103.4	0.8 S	n/a	1.7	10	no	VS	
Melaleuca brevifolia	103.7	1.2 N	n/a	2	0	n/a	DM	
Casuarina obesa	104	0.9 S	5.5	9	90	no	SS	
Casuarina obesa	104	1.3 S	6.4	8	90	no	SS	
Casuarina obesa	104.8	1.4 N	6	5.5	90	no	SS	
Melaleuca brevifolia	105.8	0	n/a	1.6	0	n/a	DM	
Melaleuca brevifolia	106	1.0 S	n/a	3	30	no	S	
Melaleuca brevifolia	106.3	0	n/a	3	30	no	S	
Casuarina obesa	106.7	1.2 N	18.5	10	90	no	S	
Casuarina obesa	107.7	0	1.7	3	50	no	S	
Casuarina obesa	107.8	1.0 N	1.4	2.2	50	no	S	
Casuarina obesa	108.8	0.7 N	26.5	18	90	no	H/SS	
Melaleuca brevifolia	109	0.6 S	n/a	5	50	no	S	
Melaleuca brevifolia	110.2	0	n/a	5.5	0	n/a	DR	
Melaleuca brevifolia	112.1	1.2 S	n/a	3	50	no	S	
Melaleuca brevifolia	115.2	1.0 N	n/a	1	0	n/a	DO	

Casuarina obesa	115.6	1.0 N	9.2	15	40	no	S	
Casuarina obesa	115.9	0	3.7	6	40	no	S	
Casuarina obesa	117	1.0 N	4.8	12	40	no	S	
Casuarina obesa	117.2	0	4.5	12	40	no	S	
Melaleuca brevifolia	117.2	1.0 S	n/a	2.5	50	no	S	
Casuarina obesa	118	1.0 S	9.5	15	40	no	S	
Casuarina obesa	118	0	1	2.5	0	n/a	DR	
Casuarina obesa	118	1.0 N	1.7	3	90	no	SS	
Casuarina obesa	119	1.0 N	9.5	12	60	no	S	
Casuarina obesa	119.5	0	2.7	4	50	no	S	
?Lepidosperma sp.	120							90 % cover
Melaleuca brevifolia	122	0.5 S	n/a	2.5	30	no	S	
Casuarina obesa	123.8	0	6.2	10	50	no	S	
Casuarina obesa	123.8	1.0 N	2.2	4	30	no	S	
Melaleuca brevifolia	125.2	0.8 N	n/a	3	40	no	S	
Casuarina obesa	125.3	0.6 S	6	9.5	40	no	S	
Melaleuca brevifolia	125.3	0.6 S	n/a	2	30	no	VS	
Casuarina obesa	126.4	0.6 N	2.2	3.5	30	no	VS	
Melaleuca brevifolia	126.6	0.9 S	n/a	2	40	no	VS	
Casuarina obesa	127.6	0.9 S	2.7	3.5	30	no	VS	
Casuarina obesa	128	0.7 S	1	2	20	no	VS	
Melaleuca brevifolia	128.5	0.6 N	n/a	2	50	no	S	
Casuarina obesa	130.6	1.0 S	3.5	7	30	no	VS	
Melaleuca brevifolia	131.2	0.5 N	n/a	1.5	50	no	S	
Casuarina obesa	133	0.3 S	n/a	2.5	50	no	S	
Casuarina obesa	134.2	0.3 S	1.7	2.5	90	no	H/SS	
Melaleuca brevifolia	134.6	0	n/a	1.5	80	no	SS	
Melaleuca brevifolia	135	0.5 S	n/a	2	90	no	H/SS	
Casuarina obesa	136	1.0 S	6.5	9	50	no	S	
Casuarina obesa	136.1	0	0.9	2.5	20	no	VS	
Casuarina obesa	137.6	1.0 S	3.8	5.5	40	no	S	
Casuarina obesa	139.5	1.0 N	1	2	20	no	VS	
Casuarina obesa	139.6	0.3 S	7.2	11	30	no	VS	

Table A7.2: Transect data for YT0602

Species	Dist. Along tape(m)	Dist. From tape(m)	DBH (cm)	Height (m)	% Canopy	% Epicormic growth	Condition	Comments
	0-12							Bare sand
Halosarcia ?indica	12-15							transition zone
Juncus kraussii	12-15							
Juncus kraussii	16-30							90% cover
Halosarcia ?indica	16-30							10% cover
Juncus kraussii	30	5m2						70% cover
Tetraria microcarpa	30	1m2						70% cover
Dittrichia graveolens	33	1m2						30% cover
Juncus kraussii	33-52							90% cover
Rhagodia drummondii	36	1m2						50% cover
Casuarina obesa	39.7	0.4N	0.7	2	100	no	H	
Maireana brevifolia	39.7	0	n/a	0.7	100	n/a	H	
Casuarina obesa	43	0.7 S	5	4.3	100	no	H	
Halosarcia ?pergranulata	44.8	0	n/a	0.2	50	n/a	SS	
Casuarina obesa	48	1.3N	n/a	1	100	no	H	
Casuarina obesa	49	0.3S	n/a	1.25	100	no	H	
Halosarcia ?pergranulata	52	0	n/a	0.2	50	n/a	SS	
Juncus kraussii	56-60							30% cover
	56-64							bare sand
Melaleuca brevifolia	62.6	0					DO	
Juncus kraussii	63.3	1m2						5% cover
Melaleuca brevifolia	64.2	0	n/a	2	100	no	H	
Juncus kraussii	67-74							
Juncus kraussii	74-135							100% cover
Melaleuca brevifolia	103.4	1.0S	n/a	2	100	no	H	
Casuarina obesa	110.5	2.0S	2.5	5	100	no	H	
Melaleuca acuminata websteri	110.5	3.0S	n/a	2.5	100	no	H	
Melaleuca acuminata websteri	111	4.0N	n/a	2	100	no	H	
Casuarina obesa	112	0.7 N	0.7	1.5	100	no	H	
Casuarina obesa	113.2	0.2N	n/a	1.2	100	no	H	
Melaleuca acuminata websteri	115.3	1.0S	n/a	3	90	no	H	
Melaleuca acuminata websteri	116.5	0.5N	n/a	2.7	90	no	H	
Casuarina obesa	117.1	0	10	10	100	no	H	
Melaleuca acuminata websteri	117.5	0.8S	n/a	4	50	no	S	
Casuarina obesa	118	0	0.5	1.7	100	no	H	
Casuarina obesa	120	0	6	10	100	no	H	
Casuarina obesa	120	0.7S	6	10	100	no	H	Parasite on sheoak
Casuarina obesa	120.9	0.3S	0.7	2	100	no	H	
Casuarina obesa	121.6	0.7S	6	10	100	no	H	
Casuarina obesa	122.3	1.0N	1.7	3.7	100	no	H	
Casuarina obesa	124.5	1.0N	2.5	6	100	no	H	
Casuarina obesa	127	0.6N	1.6	2.9	100	no	H	
Casuarina obesa	128.4	0.5N	13	9	80	no	SS	
Casuarina obesa	131.8	0.3N	5.2	8	90	no	H	
Casuarina obesa	131.8	0.1S	3.9	8	90	no	H	
Casuarina obesa	132.6	0.5S	5	8	90	no	H	
Casuarina obesa	132.6	1.0S	3	8	40	no	S	
Casuarina obesa	132.8	0.8S	3.2	7	50	no	S	

Casuarina obesa	134.4	0.3N	1.7	4.3	95	no	H	Parasite on sheoak
Casuarina obesa	135.3	0.6N	1.7	4	80	no	SS	
Casuarina obesa	135.3	0.2S	3.5	8	40	no	S	
Casuarina obesa	135.6	0.5N	1.2	4	80	no	SS	
Casuarina obesa	137	0.52N	3.5	6	90	no	H	
Casuarina obesa	137	0.7N	1.6	2.5	90	no	H	
Casuarina obesa	138	0.15	1.6	3.5	50	no	S	
Casuarina obesa	138.5	0.26S	6	9	60	no	SS	
Casuarina obesa	138.5	0.5S	2.7	6	90	no	H	
Casuarina obesa	140	0.3N	11	13	90	no	H	
Casuarina obesa	140	0.3S	7	11	80	no	SS	
Juncus kraussii	140							100% cover, 70% dead
Casuarina obesa	142.1	0.2S	6.5	13	70	no	SS	
Casuarina obesa	142.1	0.2N	14	14	70	no	SS	
Casuarina obesa	143.4	0.9N	22	14	70	no	SS	
Casuarina obesa	143.4	0.8S	9	14	70	no	SS	
Casuarina obesa	144.5	0.3N	12	14	70	no	SS	
Casuarina obesa	148.6	0.8N	3.2	5.5	90	no	H	
Casuarina obesa	149	0.3N	1.5	4.5	90	no	H	
Casuarina obesa	150	0.3N	1	2.5	80	no	SS	

Table A7.3: Transect data for YT0603

Species	Dist. Along tape(m)	Dist. From tape(m)	DBH (cm)	Height (m)	% Canopy	% Epic	Condition	Comments
Pogonolepis stricta	0 – 200							70% cover
Austrostipa sp.	0 – 200							30% cover
Melaleuca uncinata	1.5	1.0E	3.5	2.5	50	no	S	
Melaleuca uncinata	2.0	3.0W	n/a	2.5	60	no	SS	
Melaleuca uncinata.	3.8	2.5E			0	n/a	DR	
Melaleuca uncinata	5.3	3.0E	n/a	3	10	no	VS	
Melaleuca uncinata	5.8	5.0E	n/a	3	80	no	SS	
Melaleuca uncinata	8.3	1.3W	n/a	1	0	n/a	DO	
Gahnia sp.	10 – 30							30% cover
Podolepis capillaris	10 – 30							20% cover
Melaleuca uncinata	10.2	0.4E	2.9	2.2	0	n/a	DM	
Melaleuca uncinata	10.2	3.0E	n/a	3.2	40	no	S	
Melaleuca uncinata	11.7	0.2W	n/a	3.5	50	no	S	
Melaleuca uncinata	11.7	1.5W	n/a	3.5	50	no	S	
Melaleuca uncinata	15.9	0	n/a	2	15	no	VS	
Acanthocarpus canaliculatus	15.9	0.3W	n/a	0.3				
Melaleuca uncinata	15.9	4.0E	n/a	2.7	0	n/a	DO	
Lepidosperma A2 island flat	17.2	0	n/a	1				
Melaleuca uncinata	20.5	1.0W	n/a	3.7	0	n/a	DO	
Melaleuca uncinata	22.3	2.0E	n/a	2.3	0	n/a	DO	
Gahnia sp.	20 – 33							25% cover
Melaleuca uncinata	34.2	0.5E	n/a	6	40	no	S	
Melaleuca uncinata	39	1.5E	n/a	6	40	no	S	
Melaleuca uncinata	40.4	1.3E	n/a	5.7	40	no	S	
Melaleuca uncinata	42.2	2.5E	n/a	5	40	n/a	S	
Gahnia sp.	42 – 73							1% cover
Melaleuca uncinata	46.4	0.7E	n/a	0.3	0	n/a	DO	
Melaleuca uncinata	48	2.2E	n/a		0	n/a	DO	
Melaleuca uncinata	57.4	2.5E	n/a		0	n/a	DO	
Melaleuca uncinata	60.4	2.5W	n/a		0	n/a	DO	
Melaleuca uncinata	66.2	0.8W	n/a		0	n/a	DO	
Melaleuca uncinata	73.7	1.2E	n/a	4.3	30	no	S	
Melaleuca uncinata	74.2	0.3E	n/a	4.3	40	no	S	
Melaleuca uncinata	85.5	2.9W	n/a	1.2	0	n/a	DO	
Melaleuca adnata	87	3.0W	n/a	1.5	70	no	SS	
Gahnia sp.	88 – 105							< 5% cover
Melaleuca adnata	89	4.3W	n/a	2	90	no	SS	
Hakea preissii	93	2.0W	n/a	3.7	90	no	SS	
Melaleuca lateriticola	98	0	n/a	2.3	40	no	S	
Melaleuca lateriticola	100	4.7W	5	3.8	40	no	S	
Hakea preissii	102.6	0.3E	n/a	0.2	100	n/a	H	
Melaleuca lateriticola	106	0	n/a		0	n/a	DM	
Melaleuca lateriticola	106.6	0	n/a		0	n/a	DM	
Melaleuca lateriticola	109	3.5E	5	3.7	60	n/a	SS	
Melaleuca lateriticola	111	1.0W	n/a		0	n/a	DO	
Melaleuca lateriticola	111.6	1.0E	n/a		0	n/a	DO	
Melaleuca lateriticola	111.6	5.0E	5	3.7	30	no	S	
Melaleuca lateriticola	115.6	0.5E	n/a		0	n/a	DO	
Hakea preissii	116.7	2.5E	n/a	1.7	100	n/a	H	
Hakea preissii	119	2.0E	n/a	1.4	100	n/a	H	

Melaleuca lateriticola	120	4.0E	n/a		0	n/a	DO	
?Gahnia sp.	120 – 154							70% cover
Hakea preissii	123	2.0E	n/a	1.6	100	n/a	H	
Hakea preissii	131.6	0.3E	n/a	1.6	100	n/a	H	
Hakea preissii	133	0	n/a	1.6	100	n/a	H	
Rhagodia drummondii	133	0.2E	n/a	1.8	100	n/a	H	
Melaleuca lateriticola	133.8	1.0W	n/a	3.7	20	no	VS	
Melaleuca lateriticola	134.2	0	n/a	4.3	0	n/a	DO	
Melaleuca lateriticola	138.1	2.0E	n/a		0	n/a	DM	
Austrostipa sp.	147 – 187							1% cover
Hakea preissii	154.4	0.4E	n/a	0.3	100	n/a	H	
Melaleuca uncinata	155.5	0.5E	n/a	1.7	10	no	VS	
Melaleuca uncinata	156	1.5W	n/a	2.3	10	no	VS	
Hakea preissii	156.2	1.0E	n/a	0.3	100	n/a	H	
Hakea preissii	160	0	n/a	0.2	100	n/a	H	
Hakea preissii	162	0	n/a	0.3	100	n/a	H	
Melaleuca uncinata	164.4	2.0W	n/a	2.3	10	no	VS	
Melaleuca uncinata	164.4	5.0E	n/a	2.7	10	no	VS	
Melaleuca uncinata	167.8	0.5E	n/a		0	n/a	DO	
Melaleuca uncinata	169	0.3W	n/a		0	n/a	DO	
Melaleuca uncinata	172.3	0	n/a	2.3	30	no	VS	
Rhagodia drummondii	172.3	0.4E	n/a	0.3	50	no	S	
Melaleuca uncinata	174.4	0.5W	n/a		0	n/a	DM	
Melaleuca uncinata	176.6	0	n/a		0	n/a	DO	
Gahnia sp.	181 – 200							70% cover
Acacia acuminata	181.4	0.7W	22	5	20	no	VS	

Table A7.4: Transect data for YT0604a

Species	Dist. Along tape(m)	Dist. From tape(m)	DBH (cm)	Height (m)	% Canopy	% Epicormic growth	Condition	Comments
Halosarcia ?pergranulata	0 – 10						VS – DR	30% cover
Halosarcia ?pergranulata	10 – 20						H	60% cover
Melaleuca ?brophyi	0	0	n/a	1.5	0	n/a	DO	
Melaleuca ?brophyi	5.2	5.0S	n/a	1.5	0	n/a	DO	
Melaleuca ?brophyi	9.0	5.0N	n/a	2.0	0	n/a	DO	
Melaleuca ?brophyi	12.7	1.5N	n/a	1.5	0	n/a	DO	
Melaleuca ?brophyi	13.0	1.5S	n/a	2.0	0	n/a	DO	
Melaleuca ?brophyi	14.2	0.5S	n/a	2.0	0	n/a	DO	
Moss	0 – 18						H	70% cover
Melaleuca ?brophyi	17.8	0.5N	n/a	1.8	0	n/a	DO	
Melaleuca ?brophyi	18.1	1.0S	n/a	1.2	0	n/a	DO	
Melaleuca ?brophyi	20	0	n/a	1.8	65	no	S	
Melaleuca ?brophyi	22.4	0.5N	n/a	1.7	95	no	H	
Melaleuca ?brophyi	23.2	3.5S	n/a	2.1	70	no	S	
Melaleuca ?brophyi	25	5.0S	n/a	2.7	90	no	SS	
Melaleuca ?brophyi	25.8	5.0S	n/a	1.8	90	no	SS	
Rhagodia drummondii	23.4	2.0N	n/a	1.3	100	no	H	
Regelia ciliata	26.6	1.0S	n/a	0.9	100	no	H	
Melaleuca ?brophyi	27.3	3.0S	n/a	2.3	0	no	DO	
Melaleuca ?brophyi	30.5	4.0N	n/a	2.0	20	no	VS	
Regelia ciliata	30.5	1.5N	n/a	1.5	100	no	H	
Rhagodia drummondii	34.2	0	n/a	1.0	100	no	H	
Rhagodia drummondii	34 – 46							80% cover
Regelia ciliata	34.4	1.8S	n/a	2.7	40	no	S	
Regelia ciliata	35.6	0	n/a	1.8	0	n/a	DO	
Dead Tree	40	2.0N	70	4.0	0	n/a	DO	
Banksia prionotes	43	3.5S	n/a	3	10	n/a	VS	burrows.
Regelia ciliata	47.2	0	n/a	2.3	0	n/a	DO	
Acacia saligna	47	5.0N	2.5	2.2	100	n/a	H	
Rhagodia drummondii	47.2	0	n/a	1.4	100	n/a	H	
Banksia prionotes	48	3.0N	37	7	0	n/a	DM	
Regelia ciliata	48	0.8S	n/a	1.9	0	n/a	DO	
Regelia ciliata	48.9	2.0S	n/a	2.0	0	n/a	DO	
Regelia ciliata	49.4	0.5N	n/a	3.0	0	n/a	DO	
Rhagodia drummondii	51	0	n/a	1.5	100	n/a	H	
Dianella revoluta	51-100	0	n/a	1.5	100	n/a	H	5% cover
Regelia ciliata	51.5	0	n/a	2.4	25	no	VS	
Austrostipa sp.	50-80							5% cover
Melaleuca ?brophyi	54.5	1.0N	n/a	0	0	n/a	DO	
Regelia ciliata	55.5	1.5S	n/a	2	0	n/a	DO	
Regelia ciliata	56	0	n/a	2.0	50	no	S	
Dianella sp.	56.8	1.0S	n/a	1.0	50	n/a	S	
Regelia ciliata	57.5	0	n/a	3	60	no	SS	
Rhagodia drummondii	56-59.6	0	n/a	1.3	100	n/a	H	
Eremaea pauciflora	61.5	2.0N	n/a	1.5	90	n/a	SS	
Leptospermum erubescens	61.7	1.0S	n/a	2.0	80	n/a	SS	
Regelia ciliata	64	2.0N	n/a	3.0	90	no	SS	
Melaleuca brophyi	64.5	0.5S	n/a	1.2	100	no	H	

Rhagodia drummondii	64.6	0.5S	n/a	1.2	100	no	H	
Regelia ciliata	65.8	0.7S	n/a	ground	0	n/a	DO	
Regelia ciliata	68.6	2.0N	n/a	1.9	90	no	SS	
Lyginia imberbis	69-100	0	n/a	0.3	100	n/a	H	5% cover
Regelia ciliata	69.8	1.5S	n/a	3.0	0	n/a	DO	
Leptospermum erubescens	70.4	0.3N	n/a	2.0	30	n/a	S	
Regelia ciliata	72.5	1.0S	n/a	2.4	90	n/a	SS	
Melaleuca brophyi	75.7	0	n/a	ground	0	n/a	DO	
Melaleuca brophyi	76.2	1.0S	n/a	1.0	50	no	S	
Melaleuca brophyi	77.4	0.3S	n/a	2.5	0	n/a	DM	
Regelia ciliata	77.4	1.8N	n/a	1.5	100	n/a	H	
Rhagodia drummondii	77.7	0	n/a	1.7	100	n/a	H	
Desmocladus sp.	79.2	0	n/a	0.4	100	n/a	H	
Grevillea eriostachya	81.3	3.0N	n/a	1.7	100	no	H	
Rhagodia drummondii	81.3	2.5N	n/a	1.0	100	n/a	H	
Leptospermum erubescens	81.2	3.0S	n/a	1.8	5	no	VS	
Leptospermum erubescens	82.4	0.5N	n/a	2.3	0	n/a	DM	
Leptospermum erubescens	82.2	0	n/a	2.3	0	n/a	DM	
Leptospermum erubescens	85.4	0.8N	n/a	<0.5	0	n/a	DO	
Lyginia imberbis	86.9	0	n/a	0.3	100	n/a	H	
Lyginia imberbis	88.3	0.4N	n/a	0.2	100	n/a	H	
Leptospermum erubescens	89	0.9S	n/a	2.0	0	n/a	DO	burrows
Leptospermum erubescens	91.4	1.0S	n/a	1.6	90	no	SS	
Leptospermum erubescens	91.7	0	n/a	<0.5	0	n/a	DO	
Rhagodia drummondii	92.6	0	n/a	0.3	100	n/a	H	
Leptospermum erubescens	93.5	1.0S	n/a	2.5	0	n/a	DO	
Eremaea pauciflora	95	2.0S	n/a	1.5	95	no	H	
Leptospermum erubescens	97	0	n/a	2.3	0	n/a	DO	

Table A7.5: Transect data for YT0604b

Species	Dist. Along tape(m)	Dist. From tape(m)	DBH (cm)	Height (m)	% Canopy	% Epicormic growth	Condition	Comments
Halosarcia ?pergranulata	0 – 7.5							Dead on lake fringe
Melaleuca ?brophyi	8	0-5+	n/a	3.5av	0	n/a	DO	
Halosarcia ?pergranulata	8 -19			0.3			H	50% cover
Melaleuca ?brophyi	10.9	0.5S	n/a	2.0	0	n/a	DO	
Melaleuca ?brophyi	13.6	0.3N	n/a	1.3	0	n/a	DO	
Melaleuca ?brophyi	14	1.0S	n/a	<0.5	0	n/a	DO	
Melaleuca ?brophyi	17	5.0 N&S	n/a	1.6 av	0	n/a	DO	
Rhagodia drummondii	20	0	n/a	1.5	100	n/a	H	
Melaleuca ?brophyi	22.2	0.4N	n/a	1.3	100	n/a	H	
Melaleuca ?brophyi	22.6	2.0S	n/a	1.1	100	no	H	
Pentaschistis airoides	20 – 30							75% cover
Melaleuca ?brophyi	22.8	4.5N	n/a	2.4	90	no	SS	
Melaleuca ?brophyi	26.4	1.5N	n/a	3.7	50	no	S	
Rhagodia drummondii	26.4	1.5N	n/a	1.5	100	n/a	H	.
Melaleuca ?brophyi	28.2	1.5S	n/a	2.0	0	n/a	DO	
Melaleuca ?brophyi	31	1.3N	n/a	2.3	90	no	SS	
Rhagodia drummondii	34.3	0	n/a	0.5	100	n/a	H	
Regelia ciliata	34	4.5S	n/a	2.5	95	n/a	H	
Rhagodia drummondii	37-41	0	n/a	<0.5	0	n/a	DM	
Regelia ciliata	37.3	4.0S	n/a	1.7	95	no	H	
Melaleuca ?brophyi	40	3.7S	n/a	fallen	0	n/a	DO	
Pentaschistis airoides	30-50							5% cover
Regelia ciliata	40.7	5.0S	n/a	2.9	95	no	H	
Regelia ciliata	42.7	4.0S	n/a	2.7	95	no	H	
Dianella revoluta	43.7	0.3N	n/a	0.4	80	n/a	SS	
Dianella revoluta	44.3	0.5S	n/a	1.3	90	n/a	SS	
Regelia ciliata	44.8	3.0S	n/a	3.0	70	no	SS	
Acacia saligna	49.4	3.0N	n/a	3.0	0	n/a	DO	
Rhagodia drummondii	49.6	0	n/a	1.5	100	n/a	H	
Allocasuarina campestris	49.6	2.5S	n/a	3.0	95	no	H	
Austrostipa sp.	40-100							5% cover
Grevillea eriostachya	57	0	n/a	2.5	90	no	H	
Rhagodia drummondii	57.5-65	0	n/a	1.0	100	n/a	H	
Allocasuarina campestris	58	3.0S	n/a	3.0	0	n/a	DO	
Grevillea eriostachya	59	0.5N	n/a	2.2	0	n/a	DO	
Grevillea paniculata	60	1.0S	n/a	2.0	100	no	H	
Grevillea eriostachya	60	4.0S	n/a	3.0	0	n/a	DO	
Grevillea paniculata	63	0.5S	n/a	2.0	100	n/a	H	
Lepidosperma A2 Island flat	64.4	3.5S	n/a	1.0	50	n/a	S	
Lepidosperma A2 Island flat	64.5	2.0S	n/a	1.0	50	n/a	S	
Lepidosperma A2 Island flat	65.2	1.0N	n/a	1.0	60	n/a	SS	
Lepidosperma A2 Island flat	66.5	1.3N	n/a	1.0	60	n/a	SS	
Lepidosperma A2 Island flat	66.6 – 79	3.0S – 5.0N	n/a	1.0	70	n/a	SS	
Allocasuarina campestris	67.6	0	n/a	1.0	100	no	H	
Allocasuarina campestris	67.6	5.0S	n/a	3.0	0	n/a	DO	
Rhagodia drummondii	67.4 – 69	0	n/a	1.0	100	n/a	H	
Eucalyptus capillosa polyclada	71	0	17	5.0	95	no	H	
Rhagodia drummondii	72.6	0	n/a	1.5	100	n/a	H	
Lepidosperma A2 Island flat	80	2.0S	n/a	1.0	70	n/a	SS	
Lepidosperma A2 Island flat	82.7	0	n/a	1.0	70	n/a	SS	

Allocasuarina campestris	84.7	4.0N	n/a	2.5	0	n/a	DO	
Lepidosperma A2 Island flat	85.4	1.0S	n/a	1.0	50	n/a	S	
Lepidosperma A2 Island flat	85.7	0.9N	n/a	1.0	80	n/a	SS	
Rhagodia drummondii	86.7	0	n/a	0.3	50	n/a	S	
Allocasuarina campestris	87.3	3.0S	n/a	fallen	0	n/a	DO	
Allocasuarina campestris	88.2	2.7N	n/a	3.5	0	n/a	DM	
?Tetraria microcarpa	86-100							30% cover
Allocasuarina campestris	90	0.5N	n/a	3.0	0	n/a	DM	
Grevillea paniculata	92.2	4.0N	n/a	2.0	100	n/a	H	
Allocasuarina campestris	94.5	0	n/a	3.0	0	n/a	DO	
Allocasuarina campestris	100	0	n/a	3.7	0	n/a	DO	

Table A7.6: Transect data for YT0605

Species	Dist. Along tape(m)	Dist. From tape(m)	DBH (cm)	Height (m)	% Canopy	% Epicormic growth	Condition	Comments
	0-1.8							bare sand
Halosarcia halocnemoides	1.8 – 9.2		n/a	0.3	70-90	n/a	SS	
Frankenia pauciflora	7.7 – 10.5		n/a	0.3	80-90	n/a	SS	
Melaleuca brophyi	8.3	0.5N	n/a	1.5	0	n/a	DO	
Rhagodia drummondii	9.7 – 11.4	1.0 N&S	n/a	1.0	100	n/a	H	
Melaleuca brophyi	10.3-11.7		n/a	2.2	0	n/a	DM	
Halosarcia ?pergranulata	11 -12	0 – 5+ N	n/a	0.7	100	n/a	H	
Rhagodia drummondii	17	2 – 5+ S	n/a	0.9	100	n/a	H	
Allocasuarina huegeliana	17.5	0	17	8	60	no	S	
Regelia ciliata	18.3	2.0N	n/a	fallen	0	n/a	DO	
Rhagodia drummondii	18.3 – 21	0	n/a	1.3	80	n/a	SS	
Regelia ciliata	22	0.4N	n/a	0.3	100	no	H	
Allocasuarina huegeliana	21.1	4.0N	3.7	3.8	75	no	SS	
Regelia ciliata	23.1	3.0S	n/a	2.3	0	n/a	DM	
Regelia ciliata	23.1	4.0S	n/a	2.3	20	no	VS	
Regelia ciliata	24.1	0.5N	n/a	1.7	100	no	H	
Regelia ciliata	26.6	0.3S	n/a	2.5	75	no	SS	
Rhagodia drummondii	26.6 – 28.6	0	n/a	1.5	85	n/a	SS	
Allocasuarina huegeliana	28.4	0.7S	20	6	15	no	VS	
Enchylaena tomentosa	29-30	0	n/a	ground	100	n/a	H	
Melaleuca brophyi	30.3	0.5S	n/a	1.5	0	n/a	DM	
Rhagodia drummondii	31 – 31.7	0	n/a	1.0	100	n/a	H	
Rhagodia drummondii	33.2 – 35.8	0	n/a	0.5	100	n/a	H	
Austrostipa elegantissima	34.1	0	n/a	1.2	100	n/a	H	
Austrostipa elegantissima	35.5	0.4S	n/a	0.3	100	n/a	H	
Allocasuarina huegeliana	34.8	0.3S	23	7	0	n/a	DR	
Rhagodia drummondii	37.3	1 – 5 N	n/a	1.3	90	n/a	H	
Austrostipa elegantissima	38.3	1 – 5 N	n/a	1.5	100	n/a	H	
Allocasuarina huegeliana	39.4	0.3S	17	1.6	0	n/a	DO	stump.
Austrostipa elegantissima	40 – 43.4	0	n/a	0.9	100	n/a	H	
Melaleuca brophyi	40.5	0	n/a	1.5	0	n/a	DO	
Melaleuca brophyi	41.2	0.6S	n/a	fallen	0	n/a	DO	
Allocasuarina huegeliana	41.7	0.3N	15	7	0	n/a	DR	
Dianella revoluta	42	1.0N	n/a	0.7	100	n/a	H	
Rhagodia drummondii	45	1.0N	n/a	0.7	100	n/a	H	
Dianella revoluta	45.7	1.0N	n/a	1.0	90	n/a	H	
Austrostipa elegantissima	45.7	0.5N	n/a	0.8	100	n/a	H	
Allocasuarina huegeliana	46.4	2.5N	20	7	0	n/a	DO	
Acacia acuminata	49.3	3.0N	30	6	0	n/a	DO	
Rhagodia drummondii	51	1.0N	n/a	0.3	90	n/a	SS	
Acacia acuminata	52	2.0N	17	7	80	no	SS	
Allocasuarina huegeliana	56	5.0N	25	7	30	no	S	
Acacia acuminata	59	1.0S	7	4.5	75	no	SS	
Rhagodia drummondii	59.5	1.5S	n/a	0.7	90	n/a	SS	
Eucalyptus loxophleba	60	3.0S	57	6	0	n/a	DO	
Eucalyptus loxophleba	63.3 – 71.6	1 – 5+ N	20	8 av.	85	no	SS	
Acacia acuminata	66	1.0S	15	6	0	n/a	DO	
Rhagodia drummondii	66 – 68	1 – 4 N	n/a	1.0	90	n/a	H	
Ptilotus polystachyus	67 – 73.6	0 – 5 N&S	n/a					50% cover
Dianella revoluta	75.6	2.5S	n/a	1.0	90	n/a	H	
Rhagodia drummondii	80 – 85	0 – 5 S	n/a	1.5	100	n/a	H	

Acacia acuminata	80	1.0S	7	4	10	no	VS	
Eucalyptus loxophleba	82.3	3.0S	n/a	3.0	0	n/a	DO	
Acacia acuminata	84.3	3.0N	15	4	75	no	SS	
Acacia acuminata	90.1	3.0S	12	3.5	80	no	SS	
Acacia acuminata	91	5.0S	17	3.5	70	no	SS	
Rhagodia drummondii	92 – 120	0 – 5+ N&S	n/a	1.0-1.5	95	n/a	H	70% cover
Eucalyptus loxophleba	95.4	4.0S	17	3.5	0	n/a	DO	
Melaleuca brophyi	96.6	5.0N	n/a	2.5	60	no	S	
Melaleuca brophyi	99	0.3S	n/a	2.3	0	n/a	DO	
Halosarcia halocnemoides	99 – 115	0 – 5+ N&S	n/a	0.5 av.	90	n/a	SS	30% cover
Melaleuca brophyi	100.6	0	n/a	3.0	80	n/a	SS	
Melaleuca brophyi	112	0.5N	n/a	1.9	90	no	SS	
Melaleuca brophyi	112.5	0	n/a	1.6	90	no	H	
Regelia ciliata	119	0	n/a	1.8	90	no	H	
Rhagodia drummondii	121	0.5N	n/a	0.3	80	n/a	SS	
Rhagodia drummondii	124.2	0	n/a	0.4	50	n/s	S	
Allocasuarina huegeliana	124.4	5.0S	25	7.5	30	no	S	
Allocasuarina huegeliana	124.5	2.5N	17	5	0	n/a	DM	
Santalum acuminatum	125.1	2.0N	n/a	1.5	100	no	H	
Allocasuarina huegeliana	127.3	2.0N	17	6	60	no	SS	
Eremaea pauciflora	129.5	3.0S	n/a	1.5	95	no	H	
Rhagodia drummondii	129.5	3.0S	n/a	1.0	90	n/a	H	
Austrostipa elegantissima	129.5	3.0S	n/a	1.3	90	n/a	H	
Acacia saligna	132.1	0.6N	5	3.2	100	no	H	
Allocasuarina huegeliana	133	0	25	5	0	n/a	DM	
Allocasuarina huegeliana	134.5	2.0N	3	3	10	no	VS	
Lepidobolus preissianus	136-138	0	n/a	0.3	100	n/a	H	
Allocasuarina huegeliana	140.5	3.5S	16	5	10	no	VS	
Allocasuarina huegeliana	140.3	4.0N	4	4.8	40	no	S	
Dianella revoluta	144.1	0	n/a	1.0	90	n/a	H	
Allocasuarina huegeliana	145.5	2.0S	21	5	0	n/a	DR	
Rhagodia drummondii	145.5-156	0 – 4 S	n/a	1.0	90	n/a	H	
Austrostipa elegantissima	145.5-156	0 – 4 S	n/a	1.3	90	n/a	H	
Allocasuarina huegeliana	148	2.0S	28	4.5	0	n/a	DM	
Allocasuarina huegeliana	149.5	0.7N	16	4.5	75	no	SS	
Melaleuca broyphyi	151.7	0.5N	n/a	fallen	0	n/a	DO	
Acacia acuminata	152.4	1.0S	7	3.9	90	no	H	
Acacia saligna	155	3.0S	18	buckled	0	n/a	DM	
Acacia acuminata	153.7	0.7S	1	2	100	no	H	
Allocasuarina huegeliana	155	5.0S	20	7	90	no	H	
Eremaea pauciflora	166.5	1.5N	n/a	1.5	100	no	H	
Regelia ciliata	172.3	2.5N	n/a	fallen	0	n/a	DO	
Regelia ciliata	174.8	2 N&S	n/a	2.0	90	no	H	
Rhagodia drummondii	175-176.6	0	n/a	0.7	75	n/s	SS	
Halosarcia halocnemoides	178 – 187	0-5+ N&S	n/a	0.3-0.7	70	n/a	SS	
Rhagodia drummondii	180-183	0-5+ N&S	n/a	1.3	75	n/a	SS	
Melaleuca brophyi	182.3	0.5N	n/a	fallen	0	n/a	DO	
Disphyma crassifolium	182-185.6	0-5+ N&S	n/a	ground	100	n/a	H	70% cover
Rhagodia drummondii	185	0-5+ N&S	n/a	0.5	20	n/s	VS	
Melaleuca brophyi	190	1.0N	n/a	fallen	0	n/a	DO	
Melaleuca brophyi	193-195	0-5+ N&S	n/a	2.0	0	n/a	DO	dead melaleucas in lake

Appendix Eight: Flora Inventory

Vegetation Mapping and Assessment at Yenyening Lakes NR

Acacia acuminata
Acacia saligna
Acanthocarpus canaliculatus
Allocasuarina campestris
Allocasuarina huegeliana
Amphipogon caricinus
Austrodanthonia acerosa
Austrodanthonia caespitosa
Austrostipa elegantissima
Austrostipa hemipogon
Austrostipa sp.
Austrostipa trichophylla
Banksia prionotes
Billardiera lehmanniana
Billardiera lehmanniana
Brachyscome iberidifolia
Bromus rubens
Casuarina obesa
Centrolepis pilosa
Conostephium preissii
Darwinia halophila
Desmocladus sp.
Dianella revoluta
Disphyma crassifolium
Dittrichia graveolens
Enchylaena tomentosa
Eragrostis dielsii
Eremaea pauciflora
Eremophila decipiens
Eucalyptus capillosa subsp*. polyclada*
Eucalyptus loxophleba
Eucalyptus orthostemon
Eucalyptus sargentii
Eucalyptus wandoo
Exocarpos aphyllus
Frankenia pauciflora
Gahnia sp.
Gnephosis angianthoides
Grevillea eriostachya
Grevillea paniculata
Hakea preissii
Halosarcia ?halocnemoides
Halosarcia ?indica
Halosarcia ?pergranulata
Halosarcia sp.
Helipterum tenellum
Hopkinsia anoectocolea
Hyalosperma glutinosum
**Hypochaeris glabra*
Juncus kraussii
Lepidobolus preissianus
Lepidosperma sp. A2 Island flat
Leptospermum erubescens
**Lolium rigidum*
Lycium australe
Lyginia imberbis
Maireana ?marginata
Maireana brevifolia
Maireana sp.
Melaleuca ?brophyi
Melaleuca ?pentagona
Melaleuca acuminata subsp*. websteri*
Melaleuca adnata
Melaleuca brevifolia
Melaleuca brophyi
Melaleuca carrii
Melaleuca lateriticola
Melaleuca sparsiflora
Melaleuca subtrigona
Melaleuca thyoides
Melaleuca uncinata
Mesembryanthemum nodiflorum
Mesomelaena preissii
Neurachne alopecuroidea
**Pentaschistis airoides*
Podolepis canescens
Podolepis capillaris
Podolepis lessonii
Podotheca angustifolia
Podotheca gnaphalioides
Pogonolepis stricta
Ptilotus humilis
Ptilotus polystachyus
Regelia ciliata
Rhagodia drummondii
Santalum acuminatum
Scholtzia affin*. capitata*
Sclerolaena diacantha
Spergularia marina
Stylobasium australe
**Vulpia myuros*
?Tetraria microcarpa
Waitzia acuminata

Appendix Nine: Landholder contacts

Table A9.1: Phone numbers of landholders surrounding Yenyening Lakes

Landholder	Phone number
Hall, Margaret and Paul	08 9642 6031
Mills, Wally	08 9642 6067
McLean, Neville	08 9646 4018
McLean, Trevor	08 9646 1381
Walker, Bill	08 9646 6228