BEAGLE BAY *Big Tree Country* TIMBER PLANTATION

Flora Assessment Survey

March 2004

ecologia ENVIRONMENT

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TABLE OF CONTENTS

EXECUTIVE SUMMARY iv

1.0 INTRODUCTION 1
1.1 BEAGLE BAY – *BIG TREE COUNTRY* PROJECT 1
1.1.1 Background 1
1.1.2 Location 1
1.2 OBJECTIVES 1

2.0 EXISTING ENVIRONMENT 4
2.1 PHYSICAL ENVIRONMENT 4
2.1.1 Climate 4
2.1.2 Geology and Soils 4
2.1.3 Hydrogeology 6
2.1.4 Fire History 6
2.2 BIOLOGICAL ENVIRONMENT 7
2.2.1 Previous Biological Surveys 7
2.2.2 Landuse History 7

3.0 SURVEY METHODOLOGY 9
3.1 SURVEY LIMITATIONS AND CONSTRAINTS 10

4.0 FLORA 13
4.1 FLORA OF CONSERVATION SIGNIFICANCE 14
4.1.1 Environment Protection and Biodiversity Conservation Act 14
4.1.2 Wildlife Conservation Act 15
4.2 INTRODUCED FLORA 16

5.0 VEGETATION 17
5.1 REGIONAL DESCRIPTION 17
5.2 VEGETATION OF THE STUDY AREA 18

6.0 CONSERVATION SIGNIFICANCE 21
6.1 STATE SIGNIFICANCE 21
6.2 REGIONAL SIGNIFICANCE 21
6.3 LOCAL SIGNIFICANCE 22

7.0 ENVIRONMENTAL IMPACTS 24

STUDY TEAM 26

REFERENCES 27

APPENDICES 29
A Species recorded during the surveys 30
B Species by Site Matrix 37
C Description of Site Locations 44
D Dampier Peninsula Fire History, 1993 - 2003 72

FIGURES

1.1 Location of Plantation Lease Area within the Dampier Peninsula 3
3.1 Location of flora sampling sites 12
5.1 Beard Vegetation Description 17
5.2 Type 1 vegetation 19
5.3 Type 2 vegetation 20
6.1 Pindan vegetation three years after a high intensity fire 23
6.2 Pindan vegetation three years after a low intensity fire 23

TABLES

2.1 Summary of climatic data for Dampier Peninsula 5
3.1 Flora survey constraints 10
4.1 Proportion of significant taxa within the Dampier Peninsula for each unidentified collection 13
4.2 Definition of categories described under the EPBC Act 14
4.3 Definition of Declared Rare and Priority Categories 15
4.4 Priority taxa previously recorded in the vicinity of the Beagle Bay Community 16
6.1 Regional percentage of vegetation loss as a result of clearing for the proposed plantation 22

EXECUTIVE SUMMARY

In 2000 Beagle Bay Community Inc. and Capricorn Timber Pty Ltd entered into an agreement to establish a tropical timber plantation of Teak (*Tectona grandis*), Indian Rosewood (*Dalbergia latifolia*), Indian Sandalwood (*Santalum album*), and African Mahogany (*Khaya senegalensis*) within the Beagle Bay Aboriginal Reserve. The proposed area for development is located approximately 12 km SE of the Beagle Bay Community, on the Dampier Peninsula. Beagle Bay lies 120 km north of Broome, Western Australia along the Broome-Cape Leveque Road.

In 2001, a 4 ha trial plantation of Teak and Indian Sandalwood was established and the progress of the trial tropical timber plantation indicates that the venture is economically viable. The Proponents therefore now propose the development of a 900 ha plantation. The development will be progressively implemented over a three year period. The infrastructure required for this development is largely already in place and any expansion will constitute the upgrade of existing facilities.

A development of this magnitude requires environmental approval from the State, and *ecologia* Environment were commissioned by the Proponents to undertake a two phase flora assessment survey of the proposed plantation site in April 2003 and February 2004. Twenty four sites were sampled using 50 x 50 metre quadrats and additional opportunistic collections were made during transit between sites. In addition, areas beyond the boundary of the plantation site and *Melaleuca* woodland to the north-east were investigated to place the flora components in a local context.

One hundred and ninety three taxa from 56 families and 117 genera were recorded within the plantation site. No Rare or Priority taxa were recorded during these surveys; however, one Priority species, *Phyllanthus aridus* (P3), was recorded outside the project area during the April 2003 survey. Given the proximity of this species to the project area, its presence within the plantation development site cannot be completely excluded. If present, this taxon would have significance at a State level.

The vegetation of the plantation site is characterised as savannah woodlands (Pindan); *Eucalyptus tectifica-Corymbia dampieri* dominated woodlands over open mixed tall shrubs over hummock and tussock grasslands.

At a regional scale the impact of the plantation is considered low due to its location within Pindan vegetation, which is well represented within the region. The vegetation of the plantation site is in excellent condition with little evidence of cattle or feral animal grazing or weed infestation. Nevertheless, much of the plantation site exhibits evidence of recent fires with regenerating vegetation dominating the site. Furthermore, in some areas, late, intense Dry season fires have destroyed some of the vegetation structure, which has not regenerated. Whilst the level of clearing at a local scale is significant, provided that effective fire and pest management strategies are implemented, it is anticipated that the impact of the plantation on native vegetation will be low.

1.0 INTRODUCTION

1.1 BEAGLE BAY – *BIG TREE COUNTRY* PROJECT

1.1.1 Background

In 2000 Beagle Bay Community Inc. and Capricorn Timber Pty Ltd entered into an agreement to establish a tropical timber plantation of Teak (*Tectona grandis*), Indian Rosewood (*Dalbergia latifolia*), Indian Sandalwood (*Santalum album*) and African Mahogany (*Khaya senegalensis*) within the Beagle Bay Aboriginal Reserve.

In 2001 a 4 ha trial plantation of Teak and Indian Sandalwood was established. The trial plantation suggests that the venture is economically viable. The Proponents therefore propose the development of a 900 ha plantation to be progressively implemented over a three year period. The infrastructure required for this development is largely already in place and any expansion will constitute the upgrade of existing facilities.

1.1.2 Location

The proposed area for development is located approximately 12 km SE of the Beagle Bay Community, on the Dampier Peninsula. Beagle Bay lies 120 km by road north of Broome, Western Australia (Figure 1.1). The plantation site is low-lying (approximately 70 m above sea level) and relatively flat.

1.2 OBJECTIVES

This report details the approach and results of two flora assessment surveys conducted within the proposed tropical timber plantation.

The primary objective of these surveys was to obtain data for the development of measures to minimise impacts on significant flora and the impacts relating to clearing.

These surveys were conducted in accordance with the Environmental Protection Authority (EPA) requirements for biological inventory and assessment and the Department of Conservation and Land Management (CALM) biological survey guidelines for the Kimberley Region. Quantitative data, supplemented by opportunistic collections, were recorded for flora species occurring within the proposed plantation.

This report provides baseline information on the flora and vegetation associations within the proposed plantation site, assesses the potential environmental impacts arising from the proposed development and provides recommendations to reduce any impacts from the development on flora and vegetation within the Lease area. More specifically the report details:

A) An inventory of:
- flora species including recent published and unpublished records;
- vegetation types; and
- records of Declared Rare Flora (DRF) and Priority flora species that have previously been recorded in the area, or were recorded during the current surveys. Where possible the extent of populations, viability and potential impacts are documented.

B) A review of:
- biologically significant species including DRF and Priority flora; and
- weed species and their management.

(C) An assessment of:
- the state and local conservation value of the flora of the study area and adjacent habitat; and
- environmental impacts associated with the plantation development. .

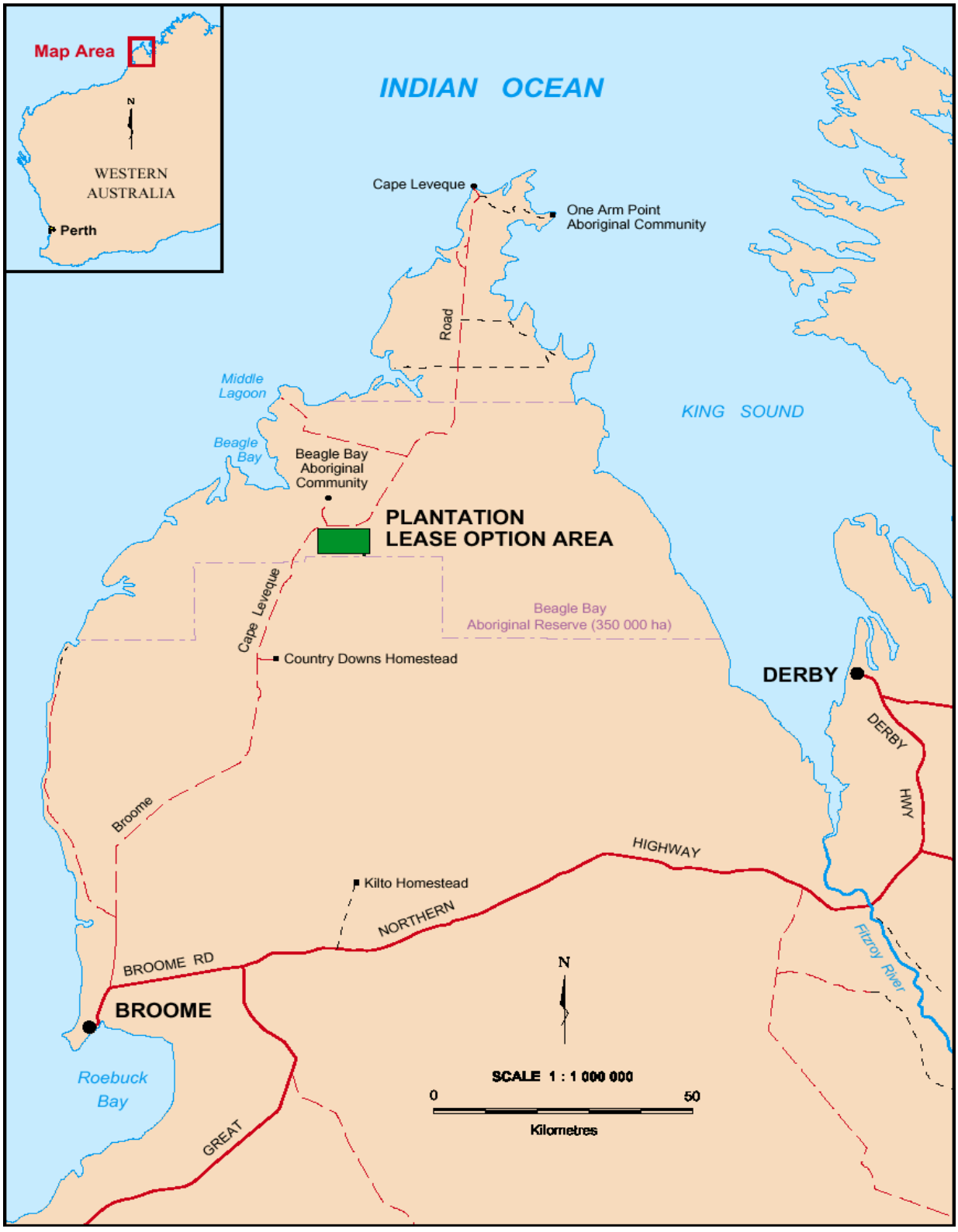

Figure 1.1 Location of Plantation Lease Area within the Dampier Peninsula

2.0 EXISTING ENVIRONMENT

2.1 PHYSICAL ENVIRONMENT

2.1.1 Climate

The Dampier Peninsula has a distinct tropical climate with a wet season from December to March during which almost all the annual rainfall is received and humidity is high (Kenneally *et al.* 1996). Rainfall in the Dampier Peninsula ranges from 596 mm/yr at Broome to 768 mm/yr at Cape Leveque (Table 2.1) (Bureau of Meteorology 2003). Beagle Bay lies midway between these two sites and receives an average of 725 mm of rainfall annually.

Daytime temperatures are high throughout the year, particularly during the months prior to the wet season when maxima greater than 40 ºC are common (Bureau of Meteorology 2003). Night-time minimum temperatures are also normally high throughout the year.

2.1.2 Geology and Soils

The Dampier Peninsula is located within the Fitzroy Trough, a major subdivision of the greater sedimentary Canning Basin. The Canning Basin contains Quaternary sandplains on relatively low hills and alluvia with local outcrops of Phanerozoic sandstone and reef limestone that were laid down upon a Precambrian basement during various epochs. The area is underlain by approximately 8,000 m of sedimentary rocks including several extensive sandstone formations. No faulting or folding has been observed in the rock formations of the Dampier Peninsula.

Soils are remarkably uniform across the Dampier Peninsula. The dominant soil profile in the area is the Yeeda Land System (Speck *et al.* 1964), comprising low lying Quaternary sandplains or relatively low hills, featuring deep red sandy soils of the Cockatoo family (commonly referred to as Pindan). Towards the northern end of the Peninsula where rainfall is higher, the red aeolian sandplains grade into yellowish-grey sandplains.

The Broome sandstone comprises lithified to unconsolidated fine to coarse grained sandstone with local beds of conglomerate, siltstone and shale. The top of the sandstone lies approximately 40 m below the surface and is overlain in downward order by up to 20 m of superficial silty sand (Pindan) overlying a 20 m thick lateritic profile of ferruginised sandstone and siltstone developed on, and underlain by, the Broome Sandstone. In the project area the Broome Sandstone extends to a depth of about 250 m below surface, has a saturated thickness of about 200 m, and extends beneath the project area within a radius of 30 km (Rockwater 2004).

It is possible that broad doming took place in the central part of the Peninsula during the Tertiary, and this may have diverted the ancestral Fitzroy River from a previous course toward Roebuck Bay to its present outlet of King Sound.

Table 2.1 Summary of climatic data for Dampier Peninsula

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Daily Maximum Temperature (° C)													
BME	33.3	32.9	33.9	34.2	31.5	29.1	28.8	30.3	31.8	32.9	33.5	33.8	32.2
CL	31.9	31.6	32.2	32.5	30.4	27.9	27.4	28.5	29.9	31.1	32.0	32.4	30.6
Mean Daily Minimum Temperature													
BME	26.2	25.9	25.4	22.5	18.2	15.3	13.6	15.0	18.4	22.3	25.0	26.4	21.2
CL	26.1	26.0	26.0	25.2	22.5	20.0	18.8	19.8	21.9	24.1	25.8	26.6	23.5
Mean Rainfall (mm)													
BME	176.1	176.4	98.0	27.9	30.0	19.3	5.0	1.6	1.5	1.4	8.4	50.8	596.3
CL	210.0	198.3	137.3	46.9	47.4	20.8	12.2	2.0	1.1	1.7	6.3	84.4	768.4
Mean no. rainy days													
BME	11.2	11.3	7.6	2.7	2.6	1.9	1.1	0.6	0.8	0.5	1.2	5.3	46.7
CL	11.9	10.7	8.2	3.0	2.1	1.5	0.8	0.4	0.3	0.4	1.0	4.7	44.9

Broome (BME): Latitude: 17.9492 S
Longitude: 122.2336 E
Elevation: 7.0 m

Cape Leveque (CL): Latitude: -16.3972 S
Longitude: 122.9264 E
Elevation: 25.0 m

Data from Bureau of Meteorology (2003).

2.1.3 Hydrogeology

The project site is located in the Kimberley-Canning Groundwater Management Area. It is underlain by the Broome Sandstone, which is a regional unconfined aquifer with some areas of confined (pressure) water near discharge areas and beneath confining layers of siltstone and shale. At the proposed plantation site the water table lies approximately 55 m below the surface. Groundwater in the aquifer flows north towards Bobby's Creek. It has a low salinity of less than 250 mg/L (total dissolved solids), which probably increases in salinity with depth.

2.1.4 Fire History

Fire is a conspicuous element of the environment on the Dampier Peninsula. Traditional aboriginal burning practices were low intensity, small-scale fires occurring across a range of habitats, creating a mosaic effect of patchy burns. However, fire regimes are changing dramatically, with a propensity for hot, intensive and broad-scale late dry season fires. In 1995 approximately 27 % of the Kimberley was affected by fire and this increased to 34 % in 2000 (Climate Action Network Australia 2003).

Although bushfires are recognised as an important natural factor in the modification of vegetation structure and floristics, fires that are too intense (canopy scorching) or occur too frequently in any given area can contribute to a decrease in species richness and diversity (McKenzie and Kenneally 1983; Russell-Smith *et al.* 2003). Without sufficient time to regenerate, larger species such as *Eucalyptus* and *Acacia* spp., are lost to the dominance of annuals such as *Sorghum* spp. (Russell-Smith *et al.* 2003). Conversely, if fire is inhibited completely, there is a general decrease in the diversity of both annuals and larger perennials that require fire to set seed (Russell-Smith *et al.* 2003). Moreover, mature species such as *Acacia* spp., can be overcome by parasitic mistletoes such as *Lysiana spathulata* and *Dendrophthoe acacioides* (Kenneally *et al.* 1996). It needs to be appreciated that, just as fire can cause species decline, it can also promote an increase in the richness of fire dependent species.

Given the extent of habitat modification of the Dampierland biogeographic region as a result of fire and other historic variables (natural and non-natural) there is little or no opportunity to create the pre-European landscape, the components of which are not even well documented (Start 2003). Therefore, the present landscapes should be viewed as worthy of as much conservation as the traditional landscapes might have been. Conservation objectives should target the preservation of the biodiversity that is present, rather than aimed at the recreation of historic flora assemblages.

The fire-regeneration cycle in Pindan generally spans five to seven years, and if a low- to moderate fire regime (4 – 7 years) is maintained in a tropical savannah, woody vegetation will remain structurally stable (Russell-Smith *et al.* 2003; Start 2003; Williams *et al.* 2003). During the first few years of this regeneration cycle, sub-shrubs, grasses, and ephemeral and perennial vines diversify and proliferate and are then succeeded by trees greater than two metres tall that regenerate from burnt saplings (Williams *et al.* 2003). Appendix D details the fire history of the Dampier Peninsula over the last ten years.

2.2 BIOLOGICAL ENVIRONMENT

2.2.1 Previous Biological Surveys

Beard (1979) and Kenneally *et al.* (1996) provide detailed accounts of the botanical surveys of the Kimberley region that date back to the early 20th Century. Broadscale vegetation mapping of the Dampier Peninsula was conducted by Beard in 1979, with detailed floristic inventories of the region commencing in 1977. In 1983, Kenneally published a listing of 311 plant species for the Peninsula. This information has been supplemented by field collections by the Broome Botanical Society. More recently, a survey of the Broome to Cape Leveque Road between Beagle Bay and Cape Leveque was conducted by Western Infrastructure and *ecologia* (2002), and Willing and Dureau (2000) conducted a dry season survey of the proposed Beagle Bay Plantation.

Previous fauna surveys on the Dampier Peninsula are few. The only study relevant to this proposal is a broad-scale survey by the (then) Department of Fisheries and Wildlife (McKenzie 1983). A dry season bird survey for the project area was conducted by Swann (2003) for Tropical Timber Plantations Pty Ltd and a wet season terrestrial vertebrate fauna survey was undertaken by *ecologia* in 2003. The information from these surveys has been supplemented by opportunistic collecting by amateur herpetologists, much of which is lodged at the Western Australian Museum (WAM).

2.2.2 Landuse History

Aboriginal occupation of the Dampier Peninsula may date back as far as 27,000 years ago (O' Connor 1989). Over that period, and until recent times, Aboriginal family groups camped at favourable sites throughout the Peninsula on a semi-nomadic basis, relying mainly on coastal resources for their survival (Kenneally *et al* 1996).

The first tangible reference to Australian Aborigines was made by William Dampier in 1688 when he encountered the Bardi people (Bindon 1978). These people occupied the Cape Leveque area from Cape Borda in the west to Cygnet Bay/Cunningham Point in the east.

According to Bindon (1978), on the western side of the Dampier Peninsula, between Cape Borda and Sandy Point and extending across the Peninsula to Goodenough and Disaster Bay, live the Nyul Nyul. Their territory extended further South of Disaster Bay previously, but their occupation of this land was usurped by the Nimanburu, who occupied the Fraser River drainage basin near the head of King Sound (Bindon 1978). Remnants of these groups can be located in Broome, Beagle Bay and Derby. There is currently little exploration of their traditional lands by these people, unlike the Bardi, whose occupational history of tribal lands is virtually unbroken.

To the west of the Nimanburu lies the country of the Djabera Djabera. Their coastal territory extends from Beagle Bay in the north, to Coulomb Point in the South. There were only a handful of these people alive in 1953 when Tindale (1974) examined the

area. No people from this group were located during the survey performed in 1978 (Bindon 1978).

The Beagle Bay Community was started as a Catholic mission that came under the control of Trappist Monks around 1890 (Moncrief 2001). After ten years under the Trappists, in 1901, the mission was officially placed in the care of German Pallottine Monks (Moncrief 2001). Beagle Bay was, and to a certain degree still is, traditionally home to the Nyul Nyul people. Beagle Bay has in the past few decades become well known for its church, more specifically its mother-of-pearl shell altar built entirely by hand by the monks and Aboriginal people (Moncrief 2001).

Beagle Bay is one of a number of such communities in Western Australia previously used as a home for separated Indigenous children (known as the Stolen Generation), and is now currently administered by those same children (Moncrief 2001).

Since *circa* 1890, the Dampier Peninsula has been subjected to intensive pastoralism, involving grazing, very frequent and widespread burning and occasional localised clearing. McKenzie and Kenneally (1983) note that "during our field work in 1977 and 1978… [we observed] hardly a hectare of the Dampier Peninsula which did not include at least one cattle pad while huge areas were at early stages of regeneration after fire."

European land-use has centred mainly on use of the land for cattle production when the Beagle Bay Community ran a commercial beef production business. The Wanganut Land system, which characterises the project area, is classified as having low potential for pastoral activities due to its limited carrying capacity (2-4 cattle units per km^2). The land use plan for the old Waterbank station located to the south of Beagle Bay identified Pindan soils in this region as having potential for more intensive forms of agriculture (Anon. 2000).

3.0 SURVEY METHODOLOGY

The flora and vegetation surveys were conducted from 9th – 15th April 2003 and from the 13th – 15th February, 2004. Twenty-four sites were sampled during the April survey, using 50 x 50 metre quadrats (Figure 3.1). Sites were selected by visual assessment from access tracks; however, as long grass impeded visibility in some locations aerial photography was also used to determine site location. The April survey sites were resurveyed during the February survey.

Sites were located both within and adjacent to the plantation site in order to place the vegetation of the site in a local context. The *Melaleuca viridiflora* woodland that occurs to the east of the plantation site (Figure 3.1) was investigated due to its close proximity to the plantation site. The plantation site occurs on the fringe of the transition zone between two soil and vegetation types, but is confined to Pindan soil and vegetation only. The differing *Melaleuca viridiflora* woodland is confined to ephemeral drainage systems that flow into Beagle Bay. Both field investigations and aerial photography indicate that this vegetation type does not occur within the plantation site.

Quadrat size was determined using the Nested Quadrat Technique in the initial stage of the April 2003 survey. This technique is used to establish an optimal size for collecting the maximum amount of floristic data according to the vegetation type. It is performed by measuring the number of species that occur in quadrats of increasing size, usually contained within each other (hence the term 'nested'). For each quadrat of increasing size, the number of new species discovered within these quadrats increases; however, a point is reached when the number of new species found in subsequent quadrats tapers off and the return for effort is no longer justifiable.

Five nested quadrats were performed. Quadrat sizes were designated as 10 by 10 m, 25 by 25 m, 50 by 50 m, 75 by 75 m and 100 by 100 m. A quadrat size of 50 by 50 m was determined to be of sufficient size to adequately represent the vegetation assemblage in these vegetation types. It is acknowledged that quadrats of up to 100 by 100 m are not uncommon in the Pilbara and Kimberley Regions.

Opportunistic collections were restricted to records of additional species observed in transit between quadrats and on walks to remote quadrats from access roads.

The following parameters were recorded at each quadrat using a standardised data sheet to ensure consistency between sites and data:

- Location details, including a mudmap showing the position of the site relative to nearby landforms, roads and GPS coordinates;
- Site parameters such as topography and surface lithology (where present);
- Structural information describing the community, including the height, cover, form and dominant species within each stratum;
- Presence/absence, maximum height and foliar cover for each species within the site including introduced species; and
- The status of vegetation with respect to fire using standardised criteria.

Each site was digitally photographed from a standardised viewpoint to enhance subsequent site recognition and to allow future comparisons in vegetation condition.

Voucher specimens of taxa not identified in the field were collected for subsequent identification and comparison to specimens lodged at the State Herbarium.

3.1 SURVEY LIMITATIONS AND CONSTRAINTS

According to the EPA Guidance Statement for Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (2003), flora and vegetation surveys may be limited by the following:

- Scope (*i.e.* the influence in terms of reference, such as what life forms *etc.* were sampled);
- Proportion of flora collected and identified (based on sampling, timing and intensity;
- Sources of information (*i.e.* pre-existing background versus new material);
- The proportion of the task achieved and further work which might be needed;
- Timing/weather/season/cycle;
- Disturbances (*e.g.* fire, flood, accidental human intervention etc.);
- Intensity (in retrospect was the intensity adequate?);
- Completeness (*e.g.* was the relevant area fully surveyed);
- Resources (*e.g.* degree of expertise available in plant identification to taxon level);
- Access problems;
- Availability of contextual information; and
- Experience levels.

Table 3.1 Flora survey constraints

Aspect	Constraint (yes/no); Significant, moderate or negligible	Comment
Scope	No	The survey methodology satisfies the scope of a baseline flora assessment
Proportion of flora identified, recorded and/or collected	No	Species accumulation curve suggest species richness was adequately surveyed
Sources of information	No	The region has been well surveyed in the past: • Beard (1979); • Summary in Kenneally *et al.* (1996); • Kenneally (1983); and • *ecologia* (2002).
Proportion of tasks achieved	No	Initial work in April 2003, and follow-up in February 2004 ensured all tasks were achieved.
Timing/weather/season/cycle	No	Timing was opportune (i.e. after summer rain), resulting in a large number of annual herbs and perennial grasses being sampled.
Disturbances which affected results of survey	Yes - moderate	Habitat was disturbed by fire.
Intensity	No	The intensity (24 sites twice assessed) was adequate for the size of the area.
Completeness	No	Survey was completed as proposed
Resources	No	Eleanor Bennett provided identification. These were confirmed by C. Macpherson. Priority flora and undescribed taxa were lodged at the WA Herbarium
Access problems	No	Not a limitation due to roads and uniformity of habitat
Availability of contextual information	No	Background information was available for the project
Experience levels	No	Carol Macpherson has over 12 years experience as a botanist. Jerome Bull has over 5 years experience as a botanist.

460000mE
465000mE
470000mE
475000mE
8120000mN
8115000mN
Beagle Bay
500 metres
To
Cape Leveque
Site 5
Site 13
Site 23
Beagle Bay Access Road
Airstrip
Seismic Line
BROOME CAPE LEVEQUE ROAD
OLD CAPE LEVEQUE ROAD
Site 18
Site 12
Site 4
Site 4
Site 3
5000 ha Lease Option Area
Site 19
Site 16
Site 17
Site 2
Site 22
Site Access Road
Wildlife
Corridors
Plantation Development Site
Site 3
Nested Site
Site 1
Site 1
Nested Site
Site 20
Site 21
Site 24
Teak
100 ha
Teak
Teak
Sandalwood
Sandalwood
Sandalwood
Teak
Sandalwood
Mahogany
Sandalwood
Mahogany
Sandalwood
Mahogany
Sandalwood
Teak
Site 2
Nested Site
Site 11
Site 5
Trial Lease Area
Vincent Well
Fence Line
Site 9
Site 6
Site 15
Nested Site
Site 10
Site 8
Site 7
Site 6
Site 14
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1:50 000
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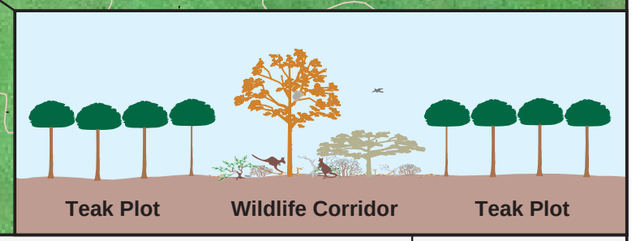
MAP GRID of AUSTRALIA
GRID BASED ON TRANSVERSE MERCATOR PROJECTION
Country Downs Station



Legend
- Flora Survey Location Sites
- Fauna Survey Location Sites

JOHN BRENNAN AND ASSOCIATES
Project Managers

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Client: TROPICAL TIMBER PLANTATIONS PTY LTD

Project: BEAGLE BAY PROJECT
PROPOSED STAGE 2 EXPANSION

FLORA AND FAUNA SURVEY SITE LOCATIONS

A3

Date: 23 January 2004
Scale: 1:50 000
Rev. No. 3
Plan No. BB-04

4.0 FLORA

A total of 203 taxa of vascular flora from 56 families and 117 genera were collected during the two field surveys. However ten of these taxa were recorded solely in the *Melaleuca* woodland external to the site, resulting in a total inventory for the plantation of 193 taxa. An additional five collections could not be identified beyond family level and 12 collections could not be identified beyond genus level due to the absence of reproductive material.

The likelihood of any of these unidentified taxa being of Rare or Priority status is considered negligible as there are proportionally few taxa of conservation significance within the Dampier Peninsula (see Table 4.1 below).

Table 4.1 Proportion of significant taxa within the Dampier Peninsula for each unidentified collection

Unidentified collection	Total taxa	Significant taxa	Weed taxa	Proportion of priority taxa
Ptilotus sp.	39	0	0	0
Heliotropium sp.	21	0	0	0
Bonamia sp.	5	0	0	0
Ipomoea sp.	17	0	5	0
Polymeria sp.	2	0	0	0
Phyllanthus sp.	8	1	0	0.125
Haemodorum sp.	1	0	0	0
Sida sp	10	0	0	0
Acacia sp.	71	0	0	0
Themeda sp.	2	0	1	0
Corchorus sp.	10	0	1	0

The most numerously represented families were Papilionaceae (20 species), Poaceae (19 species) and Convolvulaceae (9 species); whilst the most numerously represented genera were *Crotalaria*, *Tephrosia* and *Grevillea* (each with 5 species). Twenty-three families and 69 genera were represented by a single species.

The survey was timed to coincide with the end of the wet season, which commenced in late December (J.Brennan, John Brennan & Associates, pers. comm.). Consequently a large proportion of identified species were annual herbs and perennial grasses. The April survey yielded a greater number of wet season species than the February survey, during which most annuals were in an emergent phase and were thus difficult to identify to a species level.

The high proportion of sand in the soil of the project area indicates that no dampland areas occur in the immediate project area that would support a diversity of Cyperaceae or Restionaceae species such as those that occur in other locations in the Kimberley and can be wetland transients. It is possible that a small number of additional species, which are

ephemeral wet season-only species, may be collected during a survey immediately following the onset of rains. However, as a result of the poor condition of the road from Broome to Beagle Bay, access is not generally possible immediately following heavy rains.

4.1 FLORA OF CONSERVATION SIGNIFICANCE

4.1.1 Commonwealth Environment Protection and Biodiversity Conservation Act

The Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) provides for the protection of certain flora species. The Act references a list of species that are considered to be Critically Endangered, Endangered, Vulnerable, Conservation Dependent, Extinct or Extinct in the Wild (Table 4.2).

Table 4.2 Definition of categories described under the EPBC Act

Conservation Category	Description
Extinct	A species is extinct if there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A species is categorised as extinct in the wild if it is only known to survive in cultivation, in captivity or as a naturalized population well outside its past range; or if it has not been recorded in its known/expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	The species is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Conservation Dependent	The species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

No species listed under the EPBC Act were recorded during either of the two surveys.

4.1.2 Wildlife Conservation Act

Whilst all native flora are protected under the *Wildlife Conservation Act* 1950-1979*,* a subset of flora are also protected under the Western Australian *Wildlife Conservation (Rare Flora) Notice* 2004 of the *Wildlife Conservation Act* 1950. The notice lists protected flora taxa that are extant and considered likely to become extinct or rare. Generally speaking, species of flora are considered as being of Declared Rare Flora (DRF) or Priority conservation status when their populations are restricted geographically or threatened by local processes. DRF taxa are specifically protected by the *Wildlife Conservation (Rare Flora) Notice* 2004 and cannot be removed or impacted in any way without approval of an "Application to Take" by the Minister for the Environment. Priority species are maintained on a "Reserve List", which is reviewed on an annual basis, and assigned to one of four Priority categories (Atkins 2004). Definitions of categories of DRF and Priority Flora are provided in Table 4.3 below.

Table 4.3 Definition of Declared Rare and Priority Categories (From Atkins, 2004)

Conservation Category	Description
DRF	Declared Rare Flora - Extant Taxa. Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection.
1: Priority One	Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations which are under threat.
2: Priority Two	Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat.
3: Priority Three	Poorly Known Taxa. Taxa which are known from several populations, at least some of which are not believed to be under immediate threat.
4: Priority Four	Rare Taxa. Taxa which are considered to have been adequately surveyed and which whilst being rare, are not currently threatened by any identifiable factors.

Priority flora previously recorded in area

Eight taxa of conservation significance have been recorded within the the vicinity of Beagle Bay of which four taxa potentially occur within the project area. These species are listed in Table 4.4 below.

Priority flora recorded during the surveys

No DRF or Priority taxa as listed in the Department of Conservation and Land Management Wildlife Conservation (Rare Flora) Schedule 2004 were collected within the proposed plantation site. However a single record of the Priority 3 taxon *Phyllanthus aridus* was recorded approximately 100 m from the boundary of the plantation site.

Phyllanthus aridus is an erect, much-branched shrub which grows to 0.25 m high with cream to green flowers which occur between May and June. It is commonly recorded on

sandstone, gravel and red sand (Florabase 2003). During the survey it was recorded 100 metres to the east of the site (51K 0472573, UTM 8115197) at low frequency.

It has previously been recorded at West Kimberley, Chichester Range, West Angelas, Pardoo, Shay Gap, Doongan Homestead and Durack River (Atkins 2003), thus showing a broad distribution in the Kimberleys and a more sporadic occurrence in the Pilbara.

Although not recorded within the study site, the proximity of the collection to the eastern boundary means that its presence within the site cannot be discounted.

Table 4.4 Priority taxa recorded in the vicinity of the Beagle Bay Community

Species	Priority	Species Description	Location
Aphyllodium parvifolium	P1	Small prostrate shrub growing to 10 cm. Flowers are mauve in April. Favours sandy substrates in sand dunes.	Bobby's Creek (*ecologia* 2004).
Glycine pindanica	P1	Prostrate or scrambling perennial, herb or climber. Flowers pink, blue, purple from Feb–Mar/Jun. Occurs on Pindan soils. **Potentially occurs.**	15 km NNE of Beagle Bay Community
Gomphrena pusilla	P2	Small semi-prostrate to sprawling annual herb growing to 20 cm high. Produces flower spikes between April and June. Favours fine sandy substrates.	Bobby's Creek (*ecologia* 2004).
Nymphoides beaglensis	P2	Aquatic annual, herb. Flowers white, pink, purple, from Mar–Jun. Grows in shallow freshwater, usually at edges of permanent waterholes or in seasonally inundated claypans & depressions.	Bobby's Creek near Beagle Bay (*ecologia* 2004)
Aphyllodium glossocarpum	P3	Spreading or erect shrub, to 1.2 m high. Flowers pink, purple from Apr–Oct. Occurs in sand and Pindan. **Potentially occurs.**	Bobby's Creek (*ecologia* 2004)
Phyllanthus aridus	P3	Erect, much-branched shrub growing to 0.25 m with cream/green flowers between May and June. Prefers sandstone, gravel and red sand. **Potentially occurs.**	100 m east of plantation site (current survey)
Stylidium costulatum	P3	Erect, tufted annual, herb, to 0.1(–0.2) m high. Flowers yellow, orange, red, from Apr–Aug. Occurs on sandy or clayey soils, along creeks or seasonally wet areas.	4 km E of Beagle Bay Community (*ecologia* 2004)
Triodia acutispicula	P3	Tussock-forming resinonus perennial grass that grows to heights of 0.5–1.5 m. Cream to brown flowers between January and April. Prefers sandy soils on river levees, pindan plains, rocky hillslopes and outcrops. **Potentially occurs.**	Bobby's Creek (*ecologia* 2004)

4.2 INTRODUCED FLORA

No introduced flora were recorded during the surveys.

5.0 VEGETATION

5.1 REGIONAL DESCRIPTION

The Beagle Bay Timber Plantation study area falls within the Dampier Botanical District, which is broadly characterised by Pindan formation on sandplains (Beard, 1979; see Figure 5.1). The Dampier Botanical District comprises eight sub-districts, of which the relevant sub-district for the Beagle Bay Timber Plantation is the Dampier Peninsula. Within the Dampier Peninsula, ten terrestrial plant communities are recognised (Kenneally *et al.* 1996) of which, the plantation site occurs within a single type; Pindan vegetation.

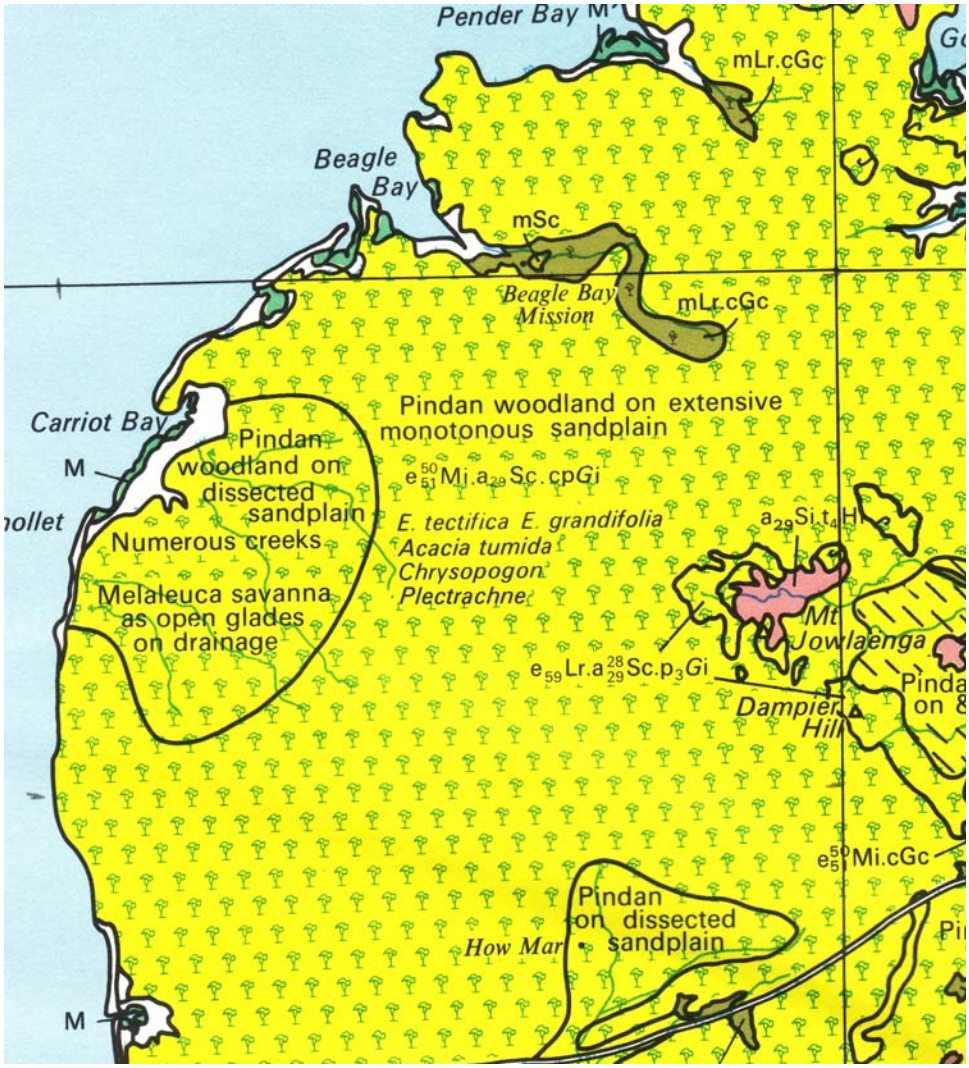

Figure 5.1 Beard Vegetation Description (reproduced from Beard 1979)

Beard (1979) describes the Pindan vegetation of the sandplains as an open layer of trees 12-15 metres in height over a dense layer of *Acacia* species and a sparse grass ground covering. The Pindan vegetation of the Peninsula represents a significant transition zone between the deserts to the south and the sub-tropics to the north and comprises

woodlands which are generally co-dominated by scattered to open Darwin Box (*Eucalyptus tectifica*) and Ochre Bloodwood (*Corymbia dampieri*), together forming a canopy 8-12 m high. A sparse layer of small trees/tall shrubs typically occurs below with the species *Acacia tumida, A. platycarpa, Brachychiton diversifolius, Bauhinia* (previously *Lysiphyllum*) *cunninghamii, Dolichandrone heterophylla, Ehretia saligna, Erythrophleum chlorostachys*, *Ficus opposita, Hakea macrocarpa, H. arborescens, Grevillea pyramidalis*, *G. refracta, Terminalia* spp. and *Persoonia falcata* as common elements. The understorey is dominated by grasses such as *Triodia schinzii, Sorghum stipoideum, Chrysopogon pallidus* and *Heteropogon contortus,* and few shrubs such as *Carissa spinarum, Distichostemon hispidulus, Trichodesma zeylanica, Acacia adoxa* and *Solanum cunninghamii* (Kenneally *et al.* 1996).

Whilst the species composition within the site is relatively homogeneous, localised variations in the structure occur (Figure 5.2 and 5.3). In many cases this is almost certainly in response to the fire regime, with more frequently burnt areas impoverished in the shrub/low tree stratum.

5.2 VEGETATION OF THE STUDY AREA

The study area is comprised of savannah woodlands which, on the red sandy loams soils of the Dampier Peninsula, are also termed 'Pindan woodland' (Kenneally *et al*. 1996). To the east of the Lease Option Area is a prominent drainage line dominated by *Melaleuca viridis* woodlands over grey-white clay soils. These two vegetation types are described below:

Type 1: Savannah woodlands (Pindan); *Eucalypt tectifica* / *Corymbia dampieri* dominated woodlands over open mixed tall shrubs over hummock and tussock grasslands.

This vegetation type is characterised by a particular assemblage of species, rather than characteristic species unique to this vegetation type. Although actual species composition changes slightly between sites, the typical Pindan overstorey in the area consists of medium sized open woodlands of Ochre Bloodwood *Corymbia dampieri,* and Darwin Box *Eucalyptus tectifica*. Both *Corymbia dampieri* and *Eucalyptus tectifica* form monospecific stands at a small number of sites (*e.g.* Sites 5 & 6 for *E. tectifica*), but in most sites are codominant (*e.g.* Sites 9, 13 & 16).

The tall shrub/small tree stratum is a characteristic and prominent component of the vegetation in the study area and is also represented by typical Pindan species. It forms an open to scattered assemblage beneath taller tree species and consists of characteristic species such as *Bauhinia cunninghamii*, Ironwood *Erythrophleum chlorostachys*, Lemonwood *Dolichandrone heterophylla*, Northern Kurrajong *Brachychiton diversifolius*, Wild Pear *Persoonia falcata*, Caustic Tree *Grevillea pyramidalis* and an assemblage of *Acacia* species. The most conspicuous *Acacia* species within the study site is the Wongai or Spear Wattle *Acacia tumida*. There are very few species characteristic of the middle storey vegetation, such as *Distichostemon hispidulus* and *Corchorus pumilio.* More commonly the mid-storey comprises juvenile and regenerative large shrubs and trees.

At ground level there is a moderately dense to open cover of small shrubs, creepers and herbs such as *Gossypium rotundifolium*, Woolly Glycine *Glycine tomentella*, *Hybanthus aurantiacus* and *Goodenia sepalosa*. The grass stratum is a conspicuous component of the Pindan woodlands in the study area and typically consists of mixed or uniform stands of *Triodia schinzii*, Ribbongrass *Chrysopogon pallidus* and/or Northern Kerosene Grass *Aristida hygrometrica*.

Type 2: Creekline vegetation; moderately dense to open *Melaleuca viridiflora* woodlands over open mixed tall shrubs over mixed sedges, grasses and herbs.

This vegetation type is confined to comparatively small areas within the major low lying creek lines of the Dampier Peninsula (Western Infrastructure 2002) and was considered worthy of investigation because of its proximity to the Lease Option Area - being located approximately 3 km east of the eastern boundary (Site 1). The creek line runs in a north to north-westerly direction toward Beagle Bay Inlet and forms part of the Bobby's Creek complex. It delineates the border between the Pindan vegetation on red sandy loam soils to the west and the riverine vegetation on grey-white clays to the east. The plantation site itself is located on the eastern fringe of the transition zone between the two soil types. Further east of the creekline, the Pindan becomes more prominent again (J. Brennan, John Brennan & Associates, pers comm.).

Whilst the coverage of the tree/shrub *Melaleuca viridiflora* varies locally from sparse to moderately dense, the shrub cover is generally sparse. Many familiar shrub species from the Pindan also occur here, albeit in lower densities, and include *Brachychiton diversifolius*, *Acacia platycarpa*, and *Bauhinia cunninghamii*. At ground level there is a dense to moderately dense cover of *Triodia schinzii* and *Chrysopogon pallidus*, sedges and herbs. As might be expected, there are species which were only recorded within this habitat, including the herbs *Drosera derbyensis, Tephrosia remotiflora*, the sedge *Xyris complanata,* the grass *Thaumastochloa major* and the fern *Platyzoma microphyllum.* All watercourses were dry at the time of both surveys, and the diversity of aquatic and damp-land species would be expected to be considerably greater following the wet season.

Figure 5.2 **Savannah woodlands (Pindan); *Eucalypt tectifica* / *Corymbia dampieri* dominated woodlands over open mixed tall shrubs over hummock and tussock grasslands**

Figure 5.3 **Creekline vegetation; moderately dense to open *Melaleuca viridiflora* woodlands over open mixed tall shrubs over mixed sedges, grasses and herbs**

6.0 CONSERVATION SIGNIFICANCE

The significance of the flora and vegetation of the project area has been assessed at three spatial scales; State, Regional and Local.

6.1 STATE SIGNIFICANCE

State significance refers to those features of the environment that are recognised under State legislation as being of importance to the Western Australian community. It is based primarily on the presence of flora species protected under the WA *Wildlife Conservation Act* 1950.

No species of Declared Rare Flora or Priority flora status were recorded within the plantation site. However given the proximity of a single record of the Priority 3 taxon *Phyllanthus aridus* to the boundary of the study area, it is also possibly found within the study area. If present, this taxon would be of significance at a State level.

6.2 REGIONAL SIGNIFICANCE

Regional significance refers to the importance of a site at a biogeographic regional level. The plantation site is located within the Dampier Botanical District, which is broadly characterised by Pindan formation on sandplains (Beard, 1979). The reservation status of the bioregion is less than five percent which is comparatively low, with Pindan vegetation being particularly poorly represented. DOLA's Waterbank Structure Plan (Anon 2000) proposed a "Reserve for Conservation and Aboriginal Heritage" (92,234 ha) immediately south and east from the Coulomb Point Nature Reserve. At the present time, tenure arrangements are the subject of high level negotiations between the State Government and the Kimberley Land Council. If implemented, this area would conserve: (a) significant coastal monsoon vine thickets between Barred Creek and James Price Point; (b) inland spring and riparian communities running approximately north east from Wonganut Spring; and (c) large areas of pindan communities (mainly Wanganut Land System with some areas of Yeeda Land System) (T. Willing, CALM, pers. comm.). This would significantly increase the amount of Pindan vegetation reserved in the State's conservation estate. Nevertheless, this vegetation type is abundant throughout the Peninsula and the magnitude of clearing associated with the project on a regional scale is considered to be small (See Table 6.1).

Table 6.1 Regional percentage of vegetation loss as a result of clearing for the proposed plantation

Region	Size	Percent loss
Beagle Bay Aboriginal Reserve	350 000 ha	0.26
Dampier Peninsula	14 000 km^2	<0.001
Dampier Botanical District	84 400 km^2	<0.001

6.3 LOCAL SIGNIFICANCE

Local significance refers to those species or vegetation associations that are poorly represented in the area, those with the capacity to support site-specific elements or those that are in better condition than other similar locations. As the development of the plantation has potential to influence fire regimes and fire is a controlling element affecting vegetation in the region, the control of fire will influence the local conservation value and significance of the area.

The vegetation of the plantation site is relatively undisturbed, with little evidence of cattle or feral animal grazing. With the exception of fire scars, there is also little sign of anthropogenic disturbances. Like much of the Dampier Peninsula, most areas surveyed have been exposed to fire within the last five years. In the absence of fire, mature species of Pindan vegetation such as *Acacia* spp. may be killed by overgrowth of mistletoe species such as *Lysiana spathulata* and *Dendrophthoe acacioides* (Kenneally *et al.* 1996). However, when fires occur too frequently this can contribute to a decrease in species richness and diversity (McKenzie 1983; Russell-Smith *et al.* 2003). Similarly, fires that are too intense (canopy scorching) also decrease diversity. Figure 6.1 shows the resultant effect of a late dry season fire in 2001 near to the plantation site. It is pertinent to note the destruction of the middle level canopy and the inability of many mature trees to regenerate after such an intense fire.

Given the extent of habitat modification of the Dampierland biogeographic region as a result of fire and other historic variables (natural and non-natural), there is little or no opportunity to create the pre-European landscape, the components of which are not even well documented (Start 2003). Conservation objectives should target the preservation of the biodiversity that is present rather than aimed at the recreation of historic vegetation assemblages (Start 2003).

The fire-regeneration cycle in Pindan generally spans five to seven years, and if a low- to moderate fire regime (4 – 7 years) is maintained in a tropical savannah, woody vegetation will remain structurally stable (Russell-Smith *et al.* 2003; Start 2003; Williams *et al.* 2003). Opportunities for fire management exist for the plantation site and it is feasible to achieve the five to seven year fire regeneration cycle with localised fires only occurring during the wet season to reduce intensity. When fire is retarded and the intensity is minimised, the vigour of vegetation structure at all strata levels best represents the pre-European landscape (Figure 6.2).

Figure 6.1 **Growth and structure of vegetation three years after an intense late dry season fire**

Figure 6.2 **Pindan vegetation 3 years after low intensity fire, illustrating the well developed and vigorous mid storey and ground storey vegetation**

7.0 ENVIRONMENTAL IMPACTS

A project of this scope raises potential issues for the local flora and vegetation including:

- Loss of natural vegetation flora through clearing; and
- Indirect loss of vegetation and flora, and fauna habitat subsequent to clearing from ongoing plantation practices.

1. *Clearing: Loss of natural vegetation and flora*

The single most widespread environmental impact arising from the project will be the clearing of native vegetation and the potential loss of significant species. Ultimately, once fully operational, the plantation will result in a loss of approximately 900 ha of natural vegetation. However, as previously outlined, this loss represents a small portion of the same vegetation type occurring outside the project area and will not constitute a significant loss of biodiversity on the Dampier Peninsula. Furthermore, between each of the plantation plots, areas will be set aside as habitat corridors. These areas will remain undisturbed and provide a foundation for regeneration of natural vegetation from the habitat corridors into the plantation plots. To date, the trial plot is exhibiting signs of regeneration, particularly groundstory grasses, annuals and perennials. The resultant mixture of exotic and native vegetation, once mature, should comprise a vegetation unit not too dissimilar from the current native woodland, providing fauna habitat for local species. Nevertheless, it is possible that P3 taxon, *Phyllanthus aridus* may occur in the plantation development site and, if present, individuals of this taxon will most likely be lost due to clearing.

2. *Plantation Practices: Indirect loss of vegetation*

Clearing and disturbance of soil associated with plantation development will provide an ideal environment for the spread of weed species. Typically, weeds have evolved a life strategy of rapid growth and dispersal and their invasive nature in disturbed environments means that they can dominate an area at the expense of native species and reduce the habitat value of any adjacent native vegetation. In this instance, regeneration of native vegetation among the plantation plots may be inhibited by the growth of weeds in disturbed areas. Similarly, if weeds do become established in response to disturbance, they may encroach into the habitat corridors and affect the diversity of native flora. Hence, weed management must be a priority for the life of the project to mitigate the indirect losses of vegetation that occurs subsequent to initial clearing.

Ground disturbance during the clearing process can also generate significant dust which will deposit on adjacent native vegetation. This will lead to a decrease in the health and vigour of these plants and may, in severe cases, cause the death over time of individuals at all strata levels. Dust suppression techniques must also be implemented during the clearing process to mitigate the ongoing effects of dust on native vegetation.

Clearing for plantation purposes, and the creation of access tracks and other infrastructure, has the potential to increase the occurrence and extent of surface water erosion. Loss of vegetation means that surface water flow is not restricted and overland flow will occur when soil moisture storage and water infiltration capacity is exceeded. When this flow is concentrated, typically along roads or fire breaks, gully erosion will occur with a subsequent loss of soil structure and overlying vegetation. Water erosion is not expected to have a significant impact, given the low topography of the site. However, clearing in association with the construction of contour trenches and cross-ties will limit surface water flow and allow time for infiltration.

The application of herbicides and fungicides to control weeds and baiting to control the Giant Northern Termite (*Mastotermes darwiniensis*) has the potential to degrade vegetation over time. However, this impact will be minimised if treatment is highly targeted (*e.g.* herbicides applied to the root systems).

STUDY TEAM

The Beagle Bay Tropical Timber Plantation Flora Assessment described in this document was planned, coordinated and executed by:

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PERMITS

The Beagle Bay Timber Plantation Flora Assessment was conducted under the authorisation of the following licence issued by CALM to:

Mr J. Bull, ***ecologia*** Environmental Consultants
Flora Survey: "Licence for Scientific or other Prescribed purposes,"
Licence No. SL006184, valid to 17 June 2004.

Ms C.J. Macpherson, ***ecologia*** Environmental Consultants
Flora Survey: "Licence for Scientific or other Prescribed purposes,"
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REFERENCES

Anonymous (2000) *Waterbank Structure Plan.* Department of Land Administration, Perth.

Atkins, K.J. (2004) *Declared Rare and Priority Flora List April 2004*, Department of Conservation and Land Management, Perth.

Atkins, K.J. (2003) *Declared Rare and Priority Flora List April 2003*. Department of Conservation and Land Management, Perth.

Beard, J.S. (1979) *Vegetation Survey of Western Australia: Kimberley.* University of Western Australia Press, Perth.

Bindon, P. (1978). A Survey for Aboriginal Sites in Central Dampier Land. Unpublished report for Esso Exploration.

Bureau of Meteorology (2003) http://www.bom.gov.au

Climate Action Network Australia (2003). http://swiftek.modwest.com/cana/bush/rangelands.htm

ecologia Environment (2004) Beagle Bay Big Tree Country Tropical Timber Plantation: Groundwater Dependent Ecosystem Flora Assessment. Unpublished report for Tropical Timber Plantations Pty Ltd.

ecologia Environment (2003) Beagle Bay Big Tree Country Tropical Timber Plantation Project Fauna Assessment Survey. Unpublished report for Tropical Timber Plantations Pty Ltd.

ecologia Environment (2002) *Cape Leveque Road, Beagle Bay to Cape Leveque Section*. Environmental Assessment and Management Plan. Unpublished Report for Main Roads, WA.

Kenneally, K.F., Edinger, D.C. and Willing, T. (1996) *Broome and Beyond.*. Department of Conservation and Land Management, Perth.

McKenzie, N.L. and Kenneally, K.F. (1983) Background and Environment. In: N.L. Mckenzie (ed.), *Wildlife of the Dampier Peninsul, South-West Kimberley, Western Australia.* Department of Fisheries and Wildlife, Perth.

McKenzie N.L. (ed.) (1983) *Wildlife of the Dampier Peninsul, South-West Kimberley, Western Australia.* Department of Fisheries and Wildlife, Perth.

Moncrief, D. (2001) Bringing Them Home Goes to Beagle Bay, Bringing Them Home Oral History Project. URL (http://www.nla.gov.au). Last accessed 11/02/04.

Rockwater Proprietary Limited (2004) Beagle Bay Big Tree Country Plantation Project. Groundwater Assessment and Modelling to Support Groundwater Licence Application. Unpublished report for Tropical Timber Plantations Pty Ltd.

Russell-Smith, J., Whitehead, P.J., Cook, G.D. and Hoare, J.L. (2003) *Response of Eucalyptus-dominated savanna to frequent fires: Lessons from Munmarlary, 1973 – 1996.* Ecological Monographs. 73: 349 – 375.

Speck, N.H., Wright, R.L. and Rutherford, G.K. (1964) *General Report on Lands of the West Kimberley Area, W.A.* Land Research Series No. 9, CSIRO, Melbourne.

Start, A. (2003) *Fire management and healthy country in the Kimberley Region, Western Australia*. In: Kohen, J.L. (ed) Proceedings of the 2nd Biannual Kimberley Fire Forum. Kimberley Specialists.

Swann, G. (2003). Ornithological Survey for Proposed Tropical Timber Plantation. Unpublished Report for John Brennan & Associates.

Tindale, N. B. (1974) Aboriginal Tribes of Australia. ANU Press, Canberra.

Western Infrastructure (2002) *Cape Leveque Road, Beagle Bay to Cape Leveque Section*. Environmental Assessment and Management Plan. Unpublished Report for Main Roads, WA.

Williams, P.R., Congdon, R.A., Grice, A.C. and Clarke, P.J. (2003) Effect of fire regime on plant abundance in a tropical eucalypt savanna of north-eastern Australia. *Austral Ecology* **28 (3):** 327-338.

Willing, T. and Dureau, D. (2000) *Botanical Survey for Proposed Tropical Timber Plantation, Beagle Bay, West Kimberley, WA*. Conservation and Land Management, Broome, W.A.

APPENDICES

APPENDIX A

Species recorded during the surveys

Appendix A: List of flora species collected within the proposed Beagle Bay Tropical Timber Plantation.

Classification and nomenclature according to the Western Australian Herbarium and R.J. Hnatiuk (1990), Census of Australian Vascular Plants. Australian Government Publishing Service.

Key: * = introduced species
§ = taxa that could not be fully identified due to a lack of material
⚐= Priority taxa.

FAMILY	SPECIES
ACANTHACEAE	*Dicliptera armata*
AIZOACEAE	*Trianthema pilosa*
AMARANTHACEAE	*Gomphrena canescens* *Gomphrena flaccida* *Ptilotus calostachyus* var. *calostachyus* *Ptilotus corymbosus* *Ptilotus fusiformis* *Ptilotus* sp.
ANTHERICACEAE	?*Tricoryne elatior*
APIACEAE	*Trachymene didiscoides*
APOCYNACEAE	*Carissa spinarum* *Wrightia saligna*
ASCLEPIADACEAE	*Cynanchum* ?*pedunculatum* *Cynanchum carnosum* *Cynanchum floribundum* *Marsdenia angustata*
ASTERACEAE	*Pterocaulon verbascifolium*
BIGNONIACEAE	*Dolichandrone heterophylla*
BORAGINACEAE	*Ehretia saligna* *Heliotropium diversifolium* *Heliotropium foliatum* *Heliotropium leptaleum* *Heliotropium* sp. *Trichodesma zeylanicum*
CAESALPINIACEAE	*Bauhinia cunninghamii* *Chamaecrista symonii*

FAMILY	SPECIES
	Erythrophleum chlorostachys
	Senna costata
	Senna oligoclada
CAPPARACEAE	*Cleome tetrandra* var. *tetrandra*
	Cleome viscosa
CARYOPHYLLACEAE	*Polycarpaea corymbosa*
	Polycarpaea longiflora
CELASTRACEAE	*Maytenus cunninghamii*
COMBRETACEAE	*Terminalia canescens*
	Terminalia hadleyana subsp. *carpentariae*
	Terminalia latipes
	Terminalia latipes subsp. *latipes*
COMMELINACEAE	*Cartonema parviflorum*
	Cartonema spicatum
	Murdannia graminea
CONVOLVULACEAE	*Bonamia linearis*
	Bonamia sp.
	Evolvulus alsinoides
	Ipomoea diamantinensis
	Ipomoea graminea
	Ipomoea polymorpha
	Ipomoea sp.
	Jacquemontia pannosa
	Polymeria ambigua
	Polymeria calycina
	Polymeria linearis
	Polymeria sp.
CUCURBITACEAE	*Mukia maderaspatana*
CYPERACEAE	*Bulbostylis barbata*
	Crosslandia setifolia
	Cyperus microcephalus subsp. *microcephalus*
	Cyperus viscidulus
	Fimbristylis cardiocarpa
	Fimbristylis denudata
	Fimbristylis macrantha
	Fimbristylis oxystachya
	Scleria brownii

FAMILY	SPECIES
DROSERACEAE	*Drosera derbyensis*
EUPHORBIACEAE	*Bridelia tomentosa* *Euphorbia mitchelliana* *Flueggea virosa* *Phyllanthus aridus* *Phyllanthus maderaspatensis* *Phyllanthus* sp. *Phyllanthus virgatus* *Sebastiania chamaelea*
GOODENIACEAE	*Goodenia sepalosa* *Velleia panduriformis*
GYROSTEMONACEAE	*Codonocarpus cotinifolius* *Gyrostemon tepperi*
HAEMODORACEAE	*Haemodorum gracile* *Haemodorum* sp.
HALORAGACEAE	*Gonocarpus leptothecus*
LAMIACEAE	*Anisomeles malabarica*
LAURACEAE	*Cassytha capillaris*
LECYTHIDACEAE	*Planchonia careya*
LOGANIACEAE	*Mitrasacme connata*
MALVACEAE	*Abutilon hannii* *Gossypium populifolium* *Gossypium rotundifolium* *Sida hackettiana* *Sida rohlenae* *Sida rohlenae* subsp. *occidentalis* *Sida* sp.
MENISPERMACEAE	*Tinospora smilacina*
MIMOSACEAE	*Acacia holosericea* *Acacia platycarpa* *Acacia* sp. *Acacia tumida*
MORACEAE	*Ficus opposita*

FAMILY	SPECIES
MYRTACEAE	*Corymbia dampieri*
	Corymbia polycarpa
	Eucalyptus tectifica
	Melaleuca cajuputi
	Melaleuca viridiflora
NYCTAGINACEAE	*Boerhavia gardneri*
OLEACEAE	*Jasminum didymum*
	Jasminum molle
PAPILIONACEAE	*Alysicarpus rugosus*
	Cajanus marmoratus
	Crotalaria crispata
	Crotalaria cunninghamii
	Crotalaria medicaginea
	Crotalaria ramosissima
	Crotalaria retusa
	Cullen cuneatum
	Galactia tenuiflora
	Glycine tomentella
	Indigofera trita
	Tephrosia leptoclada
	Tephrosia remotiflora
	Tephrosia rosea var. *rosea*
	Tephrosia sp. B. Kimberley Flora
	Tephrosia stipuligera
	Uraria cylindracea
	Vigna vexillata var. *angustifolia*
	Zornia albiflora
	Zornia chaetophora
PLATYZOMATACEAE	*Platyzoma microphyllum*
POACEAE	?*Themeda* sp.
	Alloteropsis semialata
	Aristida holathera var. *holathera*
	Aristida hygrometrica
	Aristida latifolia
	Aristida pruinosa
	Chrysopogon fallax
	Chrysopogon pallidus
	Dichanthium fecundum
	Eriachne ciliata
	Eriachne obtusa
	Panicum decompositum
	Panicum effusum

FAMILY	SPECIES
	Schizachyrium pachyarthron
	Sehima nervosum
	Sorghum stipoideum
	Thaumastochloa major
	Triodia schinzii
	Urochloa holosericea subsp. *velutina*
POLYGALACEAE	*Polygala longifolia*
	Polygala tepperi
PORTULACACEAE	*Calandrinia quadrivalvis*
	Calandrinia strophiolata
	Calandrinia uniflora
	Portulaca bicolor
	Portulaca oligosperma
	**Portulaca pilosa*
PROTEACEAE	*Grevillea heliosperma*
	Grevillea pyramidalis
	Grevillea refracta
	Grevillea refracta subsp. *refracta*
	Grevillea striata
	Hakea arborescens
	Hakea macrocarpa
	Persoonia falcata
RHAMNACEAE	*Ventilago viminalis*
RUBIACEAE	*Gardenia pyriformis*
	Gardenia pyriformis subsp. *keartlanii*
	Gardenia sericea
	Oldenlandia galioides
	Oldenlandia mitrasacmoides
	Spermacoce auriculata
	Spermacoce leptoloba
SANTALACEAE	*Santalum lanceolatum*
SAPINDACEAE	*Atalaya variifolia*
	Distichostemon hispidulus
	Distichostemon hispidulus var. *aridus*
SCROPHULARIACEAE	*Lindernia chrysoplectra*
	Stemodia lathraia
	Stemodia lythrifolia
	Stemodia viscosa

FAMILY	SPECIES
	Striga curviflora
SOLANACEAE	*Solanum cunninghamii*
	Solanum dioicum
STACKHOUSIACEAE	*Stackhousia intermedia*
STERCULIACEAE	*Brachychiton diversifolius*
	Melhania oblongifolia
	Waltheria indica
TILIACEAE	*Corchorus* sp.
	Corchorus sidoides subsp. *vermicularis*
	Grewia brevifolia
	Grewia retusifolia
	Triumfetta ?*breviaculeata*
	Triumfetta simulans
VERBENACEAE	*Clerodendrum floribundum*
	Clerodendrum floribundum var. *ovatum*
	Clerodendrum tomentosum var. *mollissima*
VIOLACEAE	*Hybanthus aurantiacus*
	Hybanthus enneaspermus
XYRIDACEAE	*Xyris complanata*
ZYGOPHYLLACEAE	*Tribulopis angustifolia*
	Tribulus occidentalis

APPENDIX B

Species by Site Matrix

Species / Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	N1	N2	N3	N4	TPT
Abutilon hannii	N								N	1	T	N		T	N			T		T	3	1	1					
Acacia eriopoda														2															
Acacia holosericea																	T						N						T
Acacia platycarpa		1	2	2	2		2		2	1		3	2		1		2	1					T	2					
Acacia sp.												N																	
Acacia tumida	1	3	N	2	1	3	1	1	1	1	2	2	1		2	3	1	2	1	3	4	3	4	1	2	2	2	2	
Alloteropsis semialata									N	T																		N	
Alysicarpus rugosus																											T		
Anisomeles malabarica																											1		
Aristida holathera var. holathera																											2		
Aristida hygrometrica	T	1	2	T	T	4	3	3	2	4	T	T	4	4	T	4	4	1		2	2		3	1			T	T	
Aristida latifolia																									N	2			
Aristida pruinosa					T																								
Atalaya variifolia																									N				
Bauhinia cunninghamii	T	3	2	T	T		T	T	T	2	T	T	2	T	T	T	2	T	2	1	1	T		1	T	T	2	T	
Boerhavia gardneri												N			N														
Bonamia linearis		N	N																				1		N		N		T
Bonamia sp.							T																						
Brachychiton diversifolius	T	T	T	2	T	T	T	T	2	2	T	2	T	T	T	T	N	2	2	2	2	T	T	T	2	T	N	T	
Bridelia tomentosa														N															
Bulbostylis barbata					1			N				1	1									1							1
Cajanus marmoratus		N									N					T		T						T	N	N	2	N	N
Calandrinia quadrivalvis	N		N					T	T			T			T								N						
Calandrinia strophiolata		N			N					N	N		T									1		T			N		
Calandrinia uniflora																									N				
Carissa lanceolata								N													N			T					T
Cartonema parviflorum	T																												
Cartonema spicatum																													
Cassytha capillaris	N					T	1			1	N	T								1	1	T	N						
Chamaecrista symonii																											N		
Chrysopogon fallax		2									2																		
Chrysopogon pallidus	4	2	2	2	3	2	4	3	2	3	2	3	4	3	3	3	3	3	3	0	1	3	3	2	2	4	2		
Cleome tetrandra var. tetrandra	T				T	N						N			T	N				T	N	1					N		
Cleome viscosa																													T
Clerodendron floribundum							N			T				1	1	N	T	N	N	T	N	T		T					
Clerodendron floribundum var. ovatum		N																		N									
Clerodendrum tomentosum var. mollissima										N																			

Species / Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	N1	N2	N3	N4	TPT
Codonocarpus cotinifolius														T															
Corchorus sidoides subsp. vermicularis				T	1	T			T																		N	N	
Corchorus sp. 1																					T								
?Corchorus sp.																						N							
Corymbia dampieri	1	2	T	2	N	N	3	2	2	3	2	2	T	T	2	3	3	2	3	3	2	2	2	2	2	4	2	2	
Corymbia flavescens						T					2		T						2		2		N			3	T		
Corymbia polycaarpa					N																				N				
Crosslandia setifolia	T				T																								
Crotalaria cunninghamii								N																					
Crotalaria ramossisima	N			T			T		N	N	T		T	T	T		T	T	T	1	1	1			N	N	N		
Crotalaria retusa							N																						
Crotelaria crispata																							1						
Crotelaria medicaginea	N																												
Cullen cuneatum																												N	
Cynanchum ?pedunculatum					2																								
Cynanchum carnosum														N											N				
Cynanchum floribundum						T	N																						
Cyperus microcephalus subsp. Microcephalus																									N				
Cyperus viscidulus		N	N							N																	T		
Dichanthium fecundum																									2		3		
Dicliptera armata													N								T								
Distichostemon hispidulus				2	T				3			T	T	2					N			T	3				N		
Distichostemon hispidulus var. aridus																												T	
Dolichandrone heterophylla	T	2	T	T	T	2	2	T		T	T	T	2	2	1	T	1	T	T						N	N		2	
Drosera derbyensis	1																												
Ehretia saligna				N		N						T								N									
Eriachne ciliata		T				T	1						T	2		2				T									
Eriachne obtusa		T	T				2			T	N	N	1	T		1		1		1	4	2	3	1			N		
Erythrophleum chlorostachys							N	T	T	2	1		3	T						3	2		3		2				
Eucalyptus tectifica	N	3	3			2		T	2	2		T	3	T	2	2	2	2	3		N	3	2	2	2	N		T	
Euphorbia mitchelliana	1																												
Evolvulus alsinoides		N			T		N		T	1	N						T	N	T		N	N	T				T	N	
Ficus opposita			N							N		T		T	N	N	1					T			N			N	
Fimbristylis cardiocarpa																											N		
Fimbristylis denudata																													N
Fimbristylis macrantha	T							T					N		N		T						1						
Fimbristylis oxystachya					T										3	T													

Species / Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	N1	N2	N3	N4	TPT
Flueggea virosa		T			N					T			T				T	N	N	N	N	N					2	
Galactia tenuiflora																			N						N				
Gardenia pyriformis																			N										
Gardenia pyriformis subsp. keartlanii																			T	N		T	T	T					
Gardenia resinosa subsp. resinosa			1		2													1							T		N		
Gardenia sp. A Kimberley Flora																										2			
Glycine tomentella		T			N				1	T		N			1	1	1	1	1	1		1	N		N	N	2	N	
Gomphrena canescens											N																		
Gomphrena flaccida										N															N		N		
Gonocarpus leptothecus																													
Goodenia sepalosa	N	N	T	N	T		N	N	T	2	T	N	N		T	T	N	T	T	T	T	N	N	N	N	N	N	N	
Gossypium populifolium				T					1																T	N			
Gossypium rotundifolium											T		1	1	1	1	1	T	N			1		T					
Grevillea heliosperma																											N		
Grevillea pyramidalis	N	T	1	2		T	2	1	T		1	T	T	T	T	1	1	1	T	2				1		2	T	T	
Grevillea refracta					T	T		1	2	1		2									N	N	T		T				
Grevillea refracta subsp. refracta				T																									
Grevillea striata									T																				
Grewia brevifolia						N																							
Grewia retusifolia		T							N			T	T				T		N									N	
Gyrostemon tepperi																						N							
Haemodorum gracile									T	N					T	N	T			T						N			
Haemodorum sp. 1			T					N																	N		N		
Hakea arborescens									T																			T	
Hakea macrocarpa		T		T				N		T	T	T	T	T	N	T	T	N	T	T				T		T			
Heliotropium diversifolium					1																								
Heliotropium foliatum																										N			
Heliotropium leptaleum		T	T	T		T	T	T	T	1	1	N	T	T	T	1	1	1	T	1	1	1		1			T	N	
Heliptropium sp.																													N
Hybanthus aurantiacus				1					T	T		T					N					1			N			N	
Hybanthus enneaspermus																												T	N
Indigofera trita													N						N										
Ipomoea diamantinensis									N																				
Ipomoea graminea																												N	
Ipomoea polymorpha				N																									
Ipomoea sp. 1																												N	
Jacquemontia pannosa			1							N																			

Species / Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	N1	N2	N3	N4	TPT
Jasminum didymum																											1		
Jasminum molle																								T					
Lindernia chrysoplecta	T																												
Marsdenia angustata			N			T	T	N				N		T										N		N	N		
Maytenus cunninghamii										N	N		N														N	N	
Melaleuca cajuputi																					T								
Melaleuca viridiflora	3				2																								
Melhania oblongifolia		T								N				T															
Mitrasacme connata																				N									
Mukea maderaspatana		N	N																				N						
Murdannia graminea	N		N	N		N	T	1	N	T	T	T			T	T	T	N		N		1		T	N	T			
Oldenlandia galioides	N																												
Oldenlandia mitrasacmoides												N																	
Panicum compositum																											1		
Panicum effusum	T				1			N	1								N				1	T		T					T
Persoonia falcata	N	T	N		T		T			N	N			3			N		N					N	T		T	2	
Phyllanthus aridus		T																											
Phyllanthus maderaspatensis																	T				T						T		
Phyllanthus sp. 1																										N			
Phyllanthus virgatus							T		N	T				T						T		T							
Planchonia careya			N	N	T						T		T				T												
Platyzoma microphyllum	N																												
Polycarpaea corymbosa					N						T	N	N									1		T	N				1
Polycarpaea longiflora																													
Polygala longifolia														N															
Polygala tepperi		T	T	N	1	T			T	T	N	N	T	N			1	N	T	1	T	1		N	T	N	N		
Polymeria ambigua			N	2	1	N	N	N					N					1	T	T	1		1	1	N				
Polymeria calycina												N																	
Polymeria linearis											N			N	1	1		N	T	N				1					
Polymeria sp. 1										N																N			
Polymeria sp. 2																													N
Portulaca bicolor																						N							
Portulaca oligosperma																													T
Portulaca pilosa																						N							
Pterocaulon verbascifolium		T																									N	N	
Ptilotus calostachyus var. calostachyus	N				T																								
Ptilotus corymbosus	1				T	N		1	1	N		T	1	1	N				N	1	T	1	N					N	T

Species / Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	N1	N2	N3	N4	TPT
Ptilotus fusiformis												T																	N
Ptilotus sp. 1														1															
Santalum lanceolatum												N		T															
Schizachrium pachyarthron					1																								
Scleria brownii					T			T					T																
Sebastiana chamaelea						T											T				1						N		
Sehima nervosum		4							T	1	2		1		T		2	3	4	1						T		T	
Senna costata						N	1		N	N		N	N		N														
Senna oligoclada										N																			
Sida hackettiana	T	T		1	1				N	T		T	T	N	N	N	T		T	T	1		1				N	
Sida rohlenae																							1				N		
Sida rohlenae subsp. occidentalis				T	T									T	N						T								
Sida rohlenae var. mutica						N			N														1						
Sida sp.												N																	
Solanum cunninghamii		N		1	1	1	N		1	T	N	1	T	T	N	T	N	N	T	1	1	1	1		N	N	T	T	
Solanum diocum																											N		
Sorghum stipoideum		3	4	4		T		4	1	3	3	4			1	4	4	3	4	2		4		5	4	5	N	4	
Spermacoce auriculata	1											N		N							1	1	N				N		
Spermococe leptoloba						N																							
Stackhousia intermedia							N			N										T		T			N	N	N		N
Stemodia lathraia	T																												
Stemodia lythrifolia																											N		
Stemodia viscosa										T																			
Striga curviflora								N		N				N		N				N					N				
Tephrosia leptoclada		T					N			N											T				N				T
Tephrosia remotiflora	T																				1								
Tephrosia rosea var. rosea																				1									
Tephrosia sp. B. Kimberley Flora																											T		
Tephrosia stipuligera										N			N																
Terminalia canescens										N								T		2	1	T		1				N	
Terminalia hadleyana subsp. carpentariae			1																							N			
Terminalia latipes	1				T					N			N		N				N		N	T					2		
Terminalia latipes subsp. latipes				T	N					N									N		N	T							
Thaumastochloa major	T																												
?Themeda sp.																										T			
Tinospora smilacina	N											N	N		N	N	N		T	N	N		T				N		
Trachymene didiscoides																					T						1		

Species / Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	N1	N2	N3	N4	TPT
Trianthema pilosa	T	T						T					N							N							T		
Tribulopis angustifolia												T										N							T
Tribulus occidentalis								N																					
Trichodesma zeylanicum																													
?Tricoryne elatior																													T
Triodia schinzii	3		N	2		3	2	2	3	1	1	3			4			T	1	4	4	4	3	2	N	T	T	T	
Triumfetta ?breviaculeata																													
Triumfetta simulans																													
Uraria cylindacea											N																		
Urochloa holosericea subsp. velutina																													N
Velleia panduriformis										N		N								T	N					N	N		N
Ventilago viminalis																										T			
Vigna vexillata var. angustifolia																													
Waltheria indica					N																					N			T
Wrigatia saligna		N	T			T	3	1		1	N		T		T	T	N	T	N	T	T			T	N			T	
Xyris complanata	N																												
Zornia albiflora																												N	
Zornia chaetophora															1														

APPENDIX C

Description of Site Locations

Explanation of codes:
* = Introduced species
P = Priority species
subsp. = subspecies
var. = variety

VEGETATION CONDITION

Pristine:	Vegetation pristine; no disturbance evident at all.
Excellent:	Strata essentially intact: some signs of human non native disturbance; *e.g.* feral scats, litter, minor tracks.
Good:	One or more strata significantly impacted; *e.g.* grazing, some weeds, some vegetation removal.
Poor:	One or more strata severely impacted; *e.g.* dense weed invasion, substantial logging or tracks.
Degraded:	native vegetation largely or totally removed.

DENSITY (Vegetation, leaf litter, woodlitter)

Scattered	0-2% total cover
Sparse	2-10%
Open	10-30%
Moderately dense	30-70%
Dense	70-100%

FIRE HISTORY

Recent:	0-2 years (completely devoid of vegetation or vegetation re-seeding/re-shooting. Eucalypts and shrubs may have juvenile foliage from rootstock and/or branches. Shrubs, spinifex, herbs and grasses may evident as seedlings)
Moderate:	2-5 years (burn scars on shrubs and trees still obvious, shrubs and spinifex may not be fully mature but species composition resembles original vegetation)
Old:	5 years + (Vegetation mature but burn scars evident on trees, no evidence of fire damage on shrubs, grasses, herbs and spinifex)
None evident:	No burn scars evident. Vegetation mature.

Site 1: **Sparse to open *Eucalyptus tectifica* and *Melaleuca* woodland over Spinifex/ Chrysopogon grassland.**

Date:	11/04/2003
Location:	51K 0476787, UTM 8114124 (AGD 84)
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Light grey sandy loam
Leaf litter:	<10% cover, 1-2 cm depth
Distribution:	General
Wood litter:	Negligible
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	10-20 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Persoonia falcata, Melaleuca viridiflora*
Trees <5 m	5-10 %	*Grevillea pyramidalis, Melaleuca viridiflora, Persoonia falcata, Terminalia latipes*
Shrubs >2 m	5-10 %	*Acacia tumida, Bauhinia cunninghamii, Melaleuca viridiflora*
Shrubs 1-2 m	2-5 %	*Dolichandrone heterophylla, Sida hackettiana, Wrightia saligna*
Shrubs 0-0.5	2-5 %	*Abutilon hannii, Dolichandrone heterophylla, Platyzoma microphyllum, Tephrosia remotiflora*
Soft Grasses	30-50 %	*Aristida hygrometrica, Chrysopogon pallidus, Panicum effusum, Thaumastochloa major*
Hummock Grasses	30-50 %	*Triodia schinzii*
Herbs	<5 %	*Drosera derbyensis, Goodenia sepalosa, Oldenlandia galioides, Calandrinia quadrivalvis, Cartonema parviflorum, Cleome tetrandra* var. *tetrandra, Crotalaria ramosissima, Crotalaria medicaginea, Murdannia graminea, Euphorbia mitchelliana, Lindernia chrysoplectra, Ptilotus calostachyus* var. *calostachyus*, *Ptilotus corymbosus, Spermacoce auriculata, Stemodia lathraia*
Vines/Creepers	<5 %	*Tinospora smilacina, Trianthema pilosa, Cassytha capillaris*
Sedges	<5 %	*Crosslandia setifolia, Fimbristylis macrantha, Xyris complanata*

Site 2: **Open scattered *Eucalyptus tectifica/ Corymbia dampieri*, woodland over mixed *Gardenia pyramidalis*, *Acacia platycarpa*/ *A. tumida* over regrowth and mixed grasses.**

Date:	11/04/2003
Location:	51 K 0472573, UTM 8115197
Topography:	Sandy plain
Slope:	Gentle (<15 º)-Flat
Surface soil:	Sandy loam
Leaf litter:	<10% cover, 1-2 cm depth
Distribution:	Mainly under grasses
Wood litter:	Negligible
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	5-10 %	*Corymbia dampieri, Eucalyptus tectifica, Persoonia falcata, Brachychiton diversifolius*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Grevillea pyramidalis, Hakea macrocarpa*
Shrubs >2 m	<5 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Dolichandrone heterophylla, Clerodendrum floribundum* var. *ovatum*
Shrubs 1-2 m	5-10 %	*Flueggea virosa, Grewia retusifolia, Acacia platycarpa*
Shrubs 0.5-1 m	<5 %	*Sida hackettiana, Wrightia saligna*
Shrubs 0-0.5	<5 %	*Solanum cunninghamii, Melhania oblongifolia, Tephrosia leptoclada*
Soft Grasses	70-100 %	*Aristida hygrometrica, Chrysopogon pallidus, Chrysopogon fallax, Sehima nervosum, Sorghum stipoideum, Eriachne ciliata, Eriachne obtusa*
Herbs	5-10 %	*Goodenia sepalosa, Bonamia linearis, Calandrinia strophiolata, Evolvulus alsinoides, Heliotropium leptaleum, Phyllanthus aridus, Polygala tepperi, Pterocaulon verbascifolium,*
Vines/Creepers	<5 %	*Cajanus marmoratus, Glycine tomentella, Trianthema pilosa, Mukia maderaspatana*

Site 3: **Open *Eucalyptus tectifica* woodland over open mixed lower trees over open regrowth and sorghum grassland.**

Date:	11/04/2003
Location:	51K 0467204, UTM 8116349
Topography:	Sandy plain
Slope:	Gentle (<15 º)-Flat
Surface soil:	Sandy loam
Leaf litter:	<10% cover, 1-2 cm depth
Distribution:	Mainly under grasses
Wood litter:	Sparse
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Gardenia resinosa, Grevillea pyramidalis, Persoonia falcata, Planchonia careya, Terminalia hadleyana*
Shrubs >2 m	5-10 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Dolichandrone heterophylla*
Shrubs 1-2 m	5-10%	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Dolichandrone heterophylla, Ficus opposita, Marsdenia angustata*
Shrubs 0.5-1 m	5-10 %	*Acacia platycarpa, Bauhinia cunninghamii, Dolichandrone heterophylla, Wrightia saligna*
Shrubs 0-0.5	<5 %	*Dolichandrone heterophylla*
Soft Grasses	30-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Sorghum stipoideum, Eriachne obtusa*
Hummock Grasses	<5 %	*Triodia schinzii*
Herbs	5-10 %	*Calandrinia quadrivalvis, Murdannia graminea, Goodenia sepalosa, Haemodorum* sp.*, Heliotropium leptaleum, Bonamia linearis, Polygala tepperi*
Vines/Creepers	<5 %	*Polymeria ambigua, Jacquemontia pannosa*
Sedges	<5 %	*Cyperus viscidulus*

Site 4: **Open *Corymbia dampiera/E. tectifica* woodland over burnt low trees/tall shrubs over open to moderately dense seedlings and grasses.**

Date:	11/04/2003
Location:	51K 0464340, UTM 8116493
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	20% cover, 2-3 cm depth
Distribution:	General
Wood litter:	Moderate
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	10-30 %	*Corymbia dampieri, Eucalyptus tectifica, Hakea macrocarpa, Planchonia careya, Terminalia latipes* subsp. *latipes, Acacia platycarpa, Brachychiton diversifolius*
Trees <5 m	2-10 %	*Brachychiton diversifolius, Grevillea pyramidalis, Grevillea refracta* subsp. *refracta*
Shrubs >2 m	2-10 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Dolichandrone heterophylla*
Shrubs 1-2 m	5-10 %	*Distichostemon hispidulus, Sida hackettiana, Ehretia saligna, Gossypium rotundifolium*
Shrubs 0.5-1 m	5-10 %	*Sida hackettiana*
Shrubs 0-0.5	30-50 %	*Acacia platycarpa, Acacia tumida, Corchorus sidoides* subsp. *vermicularis, Solanum cunninghamii, Sida rohlenae* subsp. *occidentalis*
Soft Grasses	30-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Sorghum stipoideum*
Hummock Grasses	<5 %	*Triodia schinzii*
Herbs	<5 %	*Crotalaria ramosissima, Goodenia sepalosa, Heliotropium leptaleum, Hybanthus aurantiacus, Polygala tepperi, Murdannia graminea*
Vines/Creepers	<5 %	*Polymeria ambigua, Ipomoea polymorpha*

Site 5: **Open *Eucalyptus tectifica/ Corymbia polycarpa* woodland over mixed open low trees and regrowth over *Sida* shrubs over chrysopogon and creeper understorey.**

Date:	11/04/2003
Location:	51K 0473695, UTM 8121323
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Grey/brown sandy loam
Leaf litter:	20-30% cover, 1 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Sparse
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	10-30 %	*Eucalyptus tectifica, Brachychiton diversifolius, Corymbia dampieri, Corymbia polycarpa, Grevillea refracta, Persoonia falcata, Planchonia careya, Terminalia latipes*
Trees <5 m	10-30 %	*Brachychiton diversifolius, Gardenia resinosa, Grevillea refracta, Melaleuca viridiflora, Persoonia falcata, Terminalia latipes* subsp. *latipes*
Shrubs >2 m	<2 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Dolichandrone heterophylla*
Shrubs 1-2 m	5-10 %	*Bauhinia cunninghamii, Distichostemon hispidulus, Dolichandrone heterophylla, Sida hackettiana, Flueggea virosa*
Shrubs 0.5-1 m	5-10 %	*Sida hackettiana, Distichostemon hispidulus, Waltheria indica*
Shrubs 0-0.5	5-10 %	*Solanum cunninghamii, Corchorus sidoides* subsp. *vermicularis, Sida rohlenae* subsp. *occidentalis*
Soft Grasses	10-30 %	*Aristida pruinosa, Panicum effusum, Schizachyrium pachyarthron*
Herbs	<5 %	*Calandrinia strophiolata, Goodenia sepalosa, Heliotropium diversifolium, Euphorbia mitchelliana, Polycarpaea corymbosa, Polygala tepperi, Ptilotus corymbosus, Cleome tetrandra* var. *tetrandra, Evolvulus alsinoides, Polygala tepperi, Glycine tomentella, Ptilotus calostachyus* var. *calostachyus,*
Vines/Creepers	5-10 %	*Polymeria ambigua, Cynanchum ?pedunculatum*
Sedges		*Bulbostylis barbata, Crosslandia setifolia, Fimbristylis oxystachya, Scleria brownii*

Site 6: **Sparse *Eucalyptus tectifica/ A. tumida* overstorey over open to moderately dense *Acacia tumida* shrubland over moderately dense *Triodia schinzi/Chrysopogon pallidusi* grassland.**

Date:	12/04/2003
Location:	51K 0477952, UTM 8111121
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Rock type:	N/A
Leaf litter:	<5% cover, 1 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Moderate
Condition:	Pristine
Fire History	Recent-Moderate

Vegetation Cover

Trees 5-15 m	5-10 %	*Corymbia dampieri, Eucalyptus tectifica*
Trees <5 m	<5 %	*Brachychiton diversifolius, Grevillea pyramidalis, Grevillea refracta*
Shrubs >2 m	30-70 %	*Acacia tumida, Dolichandrone heterophylla*
Shrubs 1-2 m	5-10 %	*Acacia tumida, Dolichandrone heterophylla, Ehretia saligna, Grewia brevifolia, Senna costata, Wrightia saligna*
Shrubs 0.5-1 m	5-10 %	*Acacia platycarpa, Dolichandrone heterophylla, Wrightiasaligna*
Shrubs 0-0.5	5-10 %	*Sida rohlenae* subsp. *occidentalis, Solanum cunninghamii*
Soft Grasses	5-10 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne ciliata, Sorghum stipoideum*
Hummock Grasses	30-70 %	*Triodia schinzii*
Herbs	<5 %	*Cleome tetrandra* var. *tetrandra, Corchorus sidoides* subsp. *vermicularis, Murdannia graminea, Heliotropium leptaleum, Polygala tepperi, Polymeria ambigua, Ptilotus corymbosus, Sebastiania chamaelea, Spermacoce leptoloba,*
Vines/Creepers	<5 %	*Cassytha capillaris, Cynanchum floribundum, Marsdenia angustata*

Site 7: **Open *Corymbia dampiera/ Acacia platycarpa* woodland over open mixed low trees and tall shrubs over *Triodia schinzii/ Aristida hygrometrica* grassland.**

Date:	12/04/2003
Location:	51K 0474484, UTM 8111076
Topography:	Sandy plain
Slope:	Gentle (<15 º) - Flat
Surface soil:	Sandy loam-loam
Leaf litter:	50% cover, 3-4 cm depth
Distribution:	General
Wood litter:	Moderate-Sparse
Condition:	Pristine
Fire History	Old

Vegetation Cover

Trees 5-15 m	10-30 %	*Brachychiton diversifolius, Corymbia dampieri, Persoonia falcata*
Trees <5 m	5-10 %	*Erythrophleum chlorostachys, Grevillea pyramidalis, Clerodendrum floribundum*
Shrubs >2 m	5-10 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Dolichandrone heterophylla*
Shrubs 1-2 m	5-10 %	*Wrightia saligna*
Shrubs 0.5-1 m	5-10 %	*Wrightia saligna*
Shrubs 0-0.5	5-10 %	*Solanum cunninghamii, Wrightia saligna*
Soft Grasses	10-30 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa, Eriachne ciliata*
Hummock Grasses	10-30 %	*Triodia schinzii*
Herbs	<5 %	*Bonamia* sp., *Crotalaria ramosissima, Crotalaria retusa, Murdannia graminea, Evolvulus alsinoides, Goodenia sepalosa, Heliotropium leptaleum, Phyllanthus virgatus, Polymeria ambigua, Stackhousia intermedia, Tephrosia leptoclada*
Vines/Creepers	<5 %	*Cynanchum floribundum, Marsdenia angustata*

Site 8: **Open to scattered *Corymbia dampiera* woodland over mixed grasses.**

Date:	12/04/2003
Location:	51K 0470695, UTM 8111226
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	<10% cover, 1-2 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Sparse
Condition:	Pristine
Fire History	Recent

Vegetation Cover

Trees 5-15 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Erythrophleum chlorostachys, Grevillea refracta, Grevillea pyramidalis, Hakea macrocarpa*
Shrubs >2 m	<5 %	*Acacia platycarpa, Dolichandrone heterophylla*
Shrubs 1-2 m	<5 %	*Acacia platycarpa, Carissa spinarum, Dolichandrone heterophylla*
Shrubs 0.5-1 m	<5 %	*Bauhinia cunninghamii*
Shrubs 0-0.5	5-10 %	*Wrightia saligna*
Soft Grasses	70-100 %	*Aristida hygrometrica, Chrysopogon pallidus, Panicum effusum, Scleria brownii, Sorghum stipoideum, Striga curviflora*
Hummock Grasses	10-30 %	*Triodia schinzii*
Herbs	5-10 %	*Calandrinia quadrivalvis, Crotalaria cunninghamii, Murdannia graminea, Goodenia sepalosa, Haemodorum* sp.*, Heliotropium leptaleum, Polymeria ambigua, Ptilotus corymbosus, Tribulus occidentalis*
Sedges	<5 %	*Bulbostylis barbata, Fimbristylis macrantha*
Vines/ creepers	<5 %	*Marsdenia angustata, Trianthema pilosa*

Site 9: **Open *Eucalyptus tectifica/ Corymbia dampiera* woodland over sparse mixed trees and shrubs over *Triodia schinzii/ Aristida* grassland.**

Date:	13/04/2003
Location:	51K 0463806, UTM 8111167
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	<15% cover, 2-3 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Sparse
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Grevillea pyramidalis, Grevillea refracta, Hakea arborescens*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Grevillea refracta*
Shrubs >2 m	2-5 %	*Acacia platycarpa, Acacia tumida Erythrophleum chlorostachys*
Shrubs 1-2 m	2-5 %	*Acacia platycarpa, Bauhinia cunninghamii, Distichostemon hispidulus, Erythrophleum chlorostachys, Grevillea striata, Senna costata, Solanum cunninghamii,*
Shrubs 0.5-1 m	2-5 %	*Distichostemon hispidulus, Sida hackettiana, Abutilon hannii, Corchorus sidoides* subsp. *vermicularis, Grevillea striata*
Shrubs 0-0.5	5-10 %	*Gossypium rotundifolium, Grewia retusifolia, Sida rohlenae* subsp. *occidentalis*
Soft Grasses	50-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Sehima nervosum, Sorghum stipoideum, Alloteropsis semialata, Panicum effusum, Sorghum stipoideum*
Hummock Grasses	10-30 %	*Triodia schinzii*
Herbs	5-10 %	*Crotalaria ramosissima, Murdannia graminea, Goodenia sepalosa, Heliotropium leptaleum, Hybanthus aurantiacus, Polygala tepperi, Ptilotus corymbosus, Evolvulus alsinoides, Phyllanthus virgatus, Polygala tepperi*
Sedges	2-5 %	*Haemodorum gracile*
Vines/Creepers	2-5 %	*Glycine tomentella, Ipomoea diamantinensis*

Site 10: **Open mixed *Corymbia dampieri, Eucalyptus tectifica* woodland over mixed low woodland over *Aristida/ Sorghum* grassland and mixed herbs and creepers.**

Date:	13/04/2003
Location:	51K 0466464, UTM 8111115
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	30% cover, 1-2 cm depth
Distribution:	General
Wood litter:	Sparse
Condition:	Pristine
Fire History	Old

Vegetation Cover

Trees 5-15 m	10-30 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Terminalia latipes* subsp. *latipes*
Trees <5 m	5-10 %	*Grevillea refracta, Hakea macrocarpa, Persoonia falcata, Maytenus cunninghamii, Terminalia canescens*
Shrubs >2 m	5-10 %	*Acacia platycarpa, Bauhinia cunninghamii, Clerodendrum tomentosum* var. *mollissima, Dolichandrone heterophylla, Ficus opposita, Grevillea pyramidalis*
Shrubs 1-2 m	5-10 %	*Abutilon hannii, Acacia platycarpa, Acacia tumida, Clerodendrum floribundum, Erythrophleum chlorostachys, Flueggea virosa, Senna costata, Sida hackettiana, Senna oligoclada*
Shrubs 0.5-1 m	5-10 %	*Abutilon hannii, Erythrophleum chlorostachys, Wrightia saligna, Melhania oblongifolia*
Shrubs 0-0.5	5-10 %	*Abutilon hannii, Solanum cunninghamii*
Soft Grasses	30-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa, Sehima nervosum, Sorghum stipoideum*
Hummock Grasses	10-30 %	*Triodia schinzii*
Herbs	<5 %	*Alloteropsis semialata, Calandrinia strophiolata, Crotalaria ramosissima, Murdannia graminea, Evolvulus alsinoides, Gomphrena flaccida, Goodenia sepalosa, Heliotropium leptaleum, Hybanthus aurantiacus, Polygala tepperi, Ptilotus corymbosus, Stackhousia intermedia, Stemodia viscosa, Tephrosia stipuligera, Velleia panduriformis, Phyllanthus virgatus, Polymeria* sp., *Striga curviflora, Tephrosia leptoclada*
Vines/Creepers	<5 %	*Cassytha capillaris, Glycine tomentella*, *Jacquemontia pannosa*

Sedges	<5 %	*Haemodorum gracile, Cyperus viscidulus*

Site 11: **Open *Eucalyptus tectifica/ Corymbia dampiera* woodland over mixed lower woodland and regrowth over *Sorghum stipoideum/ Chrysopogon pallidus* grassland.**

Date:	13/04/2003
Location:	51K 0468838, UTM 8111931
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	10-20 % cover, 1-2 cm depth
Distribution:	General
Wood litter:	Negligible
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Maytenus cunninghamii, Erythrophleum chlorostachys*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Grevillea pyramidalis, Hakea macrocarpa, Persoonia falcata, Planchonia careya, Erythrophleum chlorostachys*
Shrubs >2 m	5-10 %	*Acacia tumida, Bauhinia cunninghamii, Dolichandrone heterophylla, Erythrophleum chlorostachys*
Shrubs 1-2 m	5-10 %	*Abutilon hannii, Acacia tumida Bauhinia cunninghamii, Erythrophleum chlorostachys*
Shrubs 0.5-1 m	5-10 %	*Acacia platycarpa, Bauhinia cunninghamii, Erythrophleum chlorostachys*
Shrubs 0-0.5	5-10 %	*Solanum cunninghamii, Uraria cylindracea, Wrightia saligna*
Soft Grasses	30-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa, Eriachne ciliata, Sehima nervosum, Sorghum stipoideum*
Hummock Grasses	5-10 %	*Triodia schinzii*
Herbs	<5 %	*Calandrinia strophiolata, Crotalaria ramosissima, Murdannia graminea, Evolvulus alsinoides, Gomphrena canescens, Goodenia sepalosa, Heliotropium leptaleum, Polycarpaea corymbosa, Polygala tepperi, Polymeria linearis*
Vines/Creepers	5-10 %	*Cajanus marmoratus, Cassytha capillaris, Gossypium rotundifolium*

Site 12: **Sparse to open *Eucalyptus tectifica/ Corymbia dampiera* woodland over moderately dense small trees and regrowth over moderately dense *Sorghum/* Spinifex grassland.**

Date:	13/04/2003
Location:	51K 0462949, UTM8116529
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam - loam
Leaf litter:	30-40% cover, 1-2 cm depth
Distribution:	General
Wood litter:	Moderate - Sparse
Condition:	Pristine
Fire History	Recent

Vegetation Cover

Trees 15-30 m	<5 %	*Eucalyptus tectifica*
Trees 5-15 m	10-30 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Hakea macrocarpa, Acacia platycarpa*
Trees <5 m	10-30 %	*Grevillea pyramidalis, Grevillea refracta, Santalum lanceolatum, Acacia platycarpa*
Shrubs >2 m	5-10 %	*Acacia tumida*
Shrubs 1-2 m	5-10 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Distichostemon hispidulus, Dolichandrone heterophylla, Ehretia saligna, Ficus opposita, Grewia retusifolia*
Shrubs 0.5-1 m	5-10 %	*Abutilon hannii, Bauhinia cunninghamii, Grewia retusifolia, Senna costata, Sida hackettiana, Solanum cunninghamii*
Shrubs 0-0.5	5-10 %	*Acacia platycarpa, Sida* sp.
Soft Grasses	30-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa, Sorghum stipoideum*
Hummock Grasses	10-30 %	*Triodia schinzii*
Herbs	5-10 %	*Boerhavia gardneri, Calandrinia quadrivalvis, Cleome tetrandra* var. *tetrandra, Murdannia graminea, Goodenia sepalosa, Heliotropium leptaleum, Hybanthus aurantiacus, Oldenlandia mitrasacmoides, Polycarpaea corymbosa, Polygala tepperi, Polymeria calycina, Ptilotus corymbosus, Ptilotus fusiformis, Spermacoce auriculata, Velleia panduriformis*
Sedges	<5 %	*Bulbostylis barbata*

Vines/Creepers	<5 %	*Cassytha capillaris, Glycine tomentella, Marsdenia angustata, Tinospora smilacina, Tribulopis angustifolia*

Site 13: **Open *Eucalyptus tectifica/ Corymbia dampiera* woodland over open mixed low trees and regrowth over *Chrysopogon pallidus/ Aristida hygormetrica* grassland.**

Date:	13/04/2003
Location:	51K 0472657, UTM 8119631
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	10-20 % cover, 1-2 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Moderate - Sparse
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	10-30 %	*Brachychiton diversifolius, Corymbia dampieri, Corymbia flavescens, Erythrophleum chlorostachys, Eucalyptus tectifica, Planchonia careya*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Grevillea pyramidalis, Hakea macrocarpa, Flueggea virosa, Terminalia latipes*
Shrubs >2 m	5-10 %	*Acacia platycarpa, Bauhinia cunninghamii, Dolichandrone heterophylla, Erythrophleum chlorostachys, Flueggea virosa*
Shrubs 1-2 m	10-30 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Erythrophleum chlorostachys, Senna costata, Grewia retusifolia*
Shrubs 0.5-1 m	5-10 %	*Acacia platycarpa, Distichostemon hispidulus, Sida hackettiana, Wrightia saligna, Maytenus cunninghamii*
Shrubs 0-0.5	5-10 %	*Gossypium rotundifolium, Solanum cunninghamii*
Soft Grasses	30-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa, Sehima nervosum, Eriachne ciliata*
Herbs	5-10 %	*Calandrinia strophiolata, Crotalaria ramosissima, Goodenia sepalosa, Heliotropium leptaleum, Polycarpaea corymbosa, Polygala tepperi, Ptilotus corymbosus, Tephrosia stipuligera, Dicliptera armata, Indigofera trita*
Sedges	<5 %	*Bulbostylis barbata, Fimbristylis macrantha, Scleria brownii*
Vines/Creepers	<5 %	*Polymeria ambigua, Tinospora smilacina, Trianthema pilosa*

Site 14: **Sparse overstorey of *Eucalyptus tectifica* and *Corymbia dampieri* over open shrubland of *Acacia eriopoda, Bauhinia cunninghamii* and *Brachychiton diversifolius i* over *Aristida hygrometrica* grassland.**

Date:	14/04/2003
Location:	51K 0459783, UTM 8110066
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	40% cover, 2-3 cm depth
Distribution:	General
Wood litter:	Moderate
Condition:	Pristine
Fire History	Moderate

Vegetation Cover

Trees 5-15 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Hakea macrocarpa, Bauhinia cunninghamii*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Grevillea pyramidalis, Persoonia falcata, Santalum lanceolatum*
Shrubs >2 m	10-30 %	*Acacia eriopoda, Bauhinia cunninghamii, Dolichandrone heterophylla, Erythrophleum chlorostachys, Ficus opposita*
Shrubs 1-2 m	5-10 %	*Bauhinia cunninghamii, Clerodendrum floribundum, Distichostemon hispidulus, Sida hackettiana, Bridelia tomentosa, Codonocarpus cotinifolius*
Shrubs 0.5-1 m	5-10 %	*Abutilon hannii, Clerodendrum floribundum, Codonocarpus cotinifolius, Gossypium rotundifolium, Melhania oblongifolia*
Shrubs 0-0.5	5-10 %	*Sida rohlenae* subsp. *occidentalis, Solanum cunninghamii, Spermacoce auriculata, Sida hackettiana*
Soft Grasses	30-50 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa*
Herbs	<5 %	*Crotalaria ramosissima, Heliotropium leptaleum, Polygala tepperi, Polymeria linearis, Ptilotus corymbosus, Ptilotus corymbosus, Striga curviflora, Phyllanthus virgatus, Polygala longifolia, Ptilotus* sp.
Vines/Creepers	<5 %	*Cynanchum carnosum, Gossypium rotundifolium, Marsdenia angustata*

Site 15: **Open *Corymbia dampera* woodland with scattered mixed shrubs over mixed grasses.**

Date:	14/04/2003
Location:	51K 0461463, UTM 8111120
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam-loam
Leaf litter:	<5% cover, 1-2 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Sparse
Condition:	Pristine
Fire History	Recent

Vegetation Cover

Trees 5-15 m	10-15 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Terminalia latipes* subsp. *latipes*
Trees <5 m	10-15 %	*Brachychiton diversifolius, Grevillea pyramidalis, Hakea macrocarpa, Terminalia canescens*
Shrubs >2 m	<5 %	*Acacia tumida Bauhinia cunninghamii, Dolichandrone heterophylla*
Shrubs 1-2 m	5-10 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Dolichandrone heterophylla, Ficus opposita, Senna costata*
Shrubs 0.5-1 m	2-5 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii, Clerodendrum floribundum, Gossypium rotundifolium, Wrightia saligna, Sida hackettiana*
Shrubs 0-0.5	2-5 %	*Abutilon hannii, Bauhinia cunninghamii, Sida rohlenae* subsp. *occidentalis, Solanum cunninghamii, Zornia chaetophora*
Soft Grasses	30-50 %	*Aristida hygrometrica, Chrysopogon pallidus, Sehima nervosum, Sorghum stipoideum*
Hummock Grasses	30-50 %	*Triodia schinzii*
Herbs	<5 %	*Calandrinia quadrivalvis, Cleome tetrandra* var. *tetrandra, Crotalaria ramosissima, Murdannia graminea, Goodenia sepalosa, Heliotropium leptaleum, Polymeria linearis, Ptilotus corymbosus*
Sedges	<5 %	*Fimbristylis oxystachya, Haemodorum gracile, Fimbristylis macrantha*
Vines/Creepers	<5 %	*Glycine tomentella, Boerhavia gardneri, Tinospora smilacina*

Site 16: **Open *Corymbia dampiera/ Eucalyptus tectifica* over open mixed shrubs over mixed grasses.**

Date:	15/04/2003
Location:	51K 0469941, UTM 8115534
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	20-30% cover, 1-2 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Sparse
Condition:	Pristine
Fire History	Very recent

Vegetation Cover

Trees 5-15 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Grevillea pyramidalis, Hakea macrocarpa*
Shrubs >2 m	2-5 %	*Acacia platycarpa, Acacia tumida, Bauhinia cunninghamii*
Shrubs 1-2 m	5-10 %	*Acacia platycarpa, Bauhinia cunninghamii, Clerodendrum floribundum, Dolichandrone heterophylla, Ficus opposita, Wrightia saligna*
Shrubs 0.5-1 m	<5 %	*Bauhinia cunninghamii, Clerodendrum floribundum, Dolichandrone heterophylla*
Shrubs 0-0.5	<5 %	*Acacia platycarpa, Bauhinia cunninghamii, Dolichandrone heterophylla, Sida hackettiana, Solanum cunninghamii*
Soft Grasses	30-50 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne ciliata, Eriachne obtusa, Sorghum stipoideum*
Herbs	5-10 %	*Calandrinia* sp., *Murdannia graminea, Goodenia sepalosa, Heliotropium leptaleum, Polymeria linearis, Striga curviflora, Cleome tetrandra* var. *tetrandra*
Vines/Creepers	<5 %	*Cajanus marmoratus, Glycine tomentella, Gossypium rotundifolium, Tinospora smilacina*
Sedges	<5 %	*Fimbristylis oxystachya, Haemodorum gracile*

Site 17: **Open *Corymbia dampieri, Eucalyptus tectifica* woodland over *Brachychiton diversifolius* and *A. tumida/A. platycarpa* regrowth over *Sorghum stipoideum/ Chrysopogonpallidus* grassland.**

Date:	15/04/2003
Location:	51K 0471293, UTM 8115609
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	30% cover, 2-3 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Sparse
Condition:	Pristine
Disturbance details:	N/A
Fire History	Old

Vegetation Cover

Trees 5-15 m	10-20 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Hakea macrocarpa*
Trees <5 m	2-5 %	*Brachychiton diversifolius, Ficus opposite, Grevillea pyramidalis, Hakea macrocarpa, Persoonia falcata, Planchonia careya*
Shrubs >2 m	2-5 %	*Acacia holosericea, Acacia platycarpa, Acacia platycarpa, Bauhinia cunninghamii, Grewia retusifolia*
Shrubs 1-2 m	2-5 %	*Acacia platycarpa, Bauhinia cunninghamii, Ficus opposita, Wrightia saligna*
Shrubs 0.5-1 m	2-5 %	*Acacia platycarpa, Bauhinia cunninghamii, Clerodendrum floribundum, Sida hackettiana, Flueggea virosa*
Shrubs 0-0.5	<2 %	*Bauhinia cunninghamii, Dolichandrone heterophylla, Solanum cunninghamii*
Soft Grasses	30-50 %	*Aristida hygrometrica, Chrysopogon pallidus, Panicum effusum, Sehima nervosum, Sorghum stipoideum*
Herbs	<5 %	*Crotalaria ramosissima, Murdannia graminea, Evolvulus alsinoides, Goodenia sepalosa, Heliotropium leptaleum, Hybanthus aurantiacus, Polygala tepperi, Phyllanthus maderaspatensis, Sebastiania chamaelea*
Sedges	<5 %	*Fimbristylis macrantha, Haemodorum gracile*
Vines/Creepers	5-10 %	*Glycine tomentella, Gossypium rotundifolium, Tinospora smilacina*

Site 18: **Open *Eucalyptus tectific/ Corymbia dampiera a* woodland over scattered *Brachychiton diversifolius* and shrubs over *Sorghum stipoideum/ Chrysopogonpallidus* grassland.**

Date:	15/04/2003
Location:	51K 0466074, UTM 8116665
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	20% cover, 1-2 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Negligible
Condition:	Pristine
Fire History	Old

Vegetation Cover

Trees 5-15 m	10-30 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica*
Trees <5 m	5-10 %	*Brachychiton diversifolius Gardenia resionosa* subsp. *resinosa, Grevillea pyramidalis, Hakea macrocarpa, Terminalia canescens, Bauhinia cunninghamii*
Shrubs >2 m	<5 %	*Bauhinia cunninghamii, Dolichandrone heterophylla*
Shrubs 1-2 m	<5 %	*Acacia tumida, Acacia platycarpa, Bauhinia cunninghamii, Clerodendrum floribundum, Dolichandrone heterophylla*
Shrubs 0.5-1 m	<5 %	*Abutilon hannii, Bauhinia cunninghamii, Dolichandrone heterophylla, Solanum cunninghamii*
Shrubs 0-0.5	<5 %	*Abutilon hannii, Bauhinia cunninghamii, Flueggea virosa, Gossypium rotundifolium, Wrightia saligna*
Soft Grasses	30-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa, Sehima nervosum, Sorghum stipoideum*
Hummock Grasses	<5 %	*Triodia schinzii*
Herbs	<5 %	*Crotalaria ramosissima, Murdannia graminea, Evolvulus alsinoides, Goodenia sepalosa, Heliotropium leptaleum, Polygala tepperi, Polymeria linearis, Polymeria linearis*
Vines/Creepers	<5 %	*Cajanus marmoratus, Glycine tomentella, Polymeria ambigua*

Site 19: **Open *Eucalyptus tectifica/ Corymbia dampiera/ C. flavescens* woodland over scattered mixed low trees over scattered mixed shrubs over *Sorghum* grassland.**

Date:	15/04/2003
Location:	51K 0465771, UTM 8115586
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	20-30% cover, 1-3 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Negligible
Condition:	Pristine
Fire History	Old

Vegetation Cover

Trees 5-15 m	10-30 %	*Brachychiton diversifolius, Corymbia dampieri, Corymbia flavescens Eucalyptus tectifica*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Grevillea pyramidalis, Hakea macrocarpa, Persoonia falcata, Terminalia latipes, Gardenia pyriformis, Gardenia pyriformis subsp. keartlanii, Terminalia latipes* subsp. *latipes*
Shrubs >2 m	5-10 %	*Bauhinia cunninghamii, Dolichandrone heterophylla*
Shrubs 1-2 m	5-10 %	*Acacia platycarpa, Bauhinia cunninghamii, Dolichandrone heterophylla, Flueggea virosa*
Shrubs 0.5-1 m	5-10 %	*Bauhinia cunninghamii, Clerodendrum floribundum, Distichostemon hispidulus, Dolichandrone heterophylla, Grewia retusifolia, Sida hackettiana*
Shrubs 0-0.5	5-10 %	*Dolichandrone heterophylla, Solanum cunninghamii, Indigofera trita, Wrightia saligna*
Soft Grasses	70-100 %	*Chrysopogon pallidus, Sehima nervosum, Sorghum stipoideum*
Hummock Grasses	<5 %	*Triodia schinzii*
Herbs	5-10 %	*Crotalaria ramosissima, Evolvulus alsinoides, Goodenia sepalosa, Heliotropium leptaleum, Polygala tepperi, Ptilotus corymbosus*
Vines/Creepers	<5 %	*Glycine tomentella, Gossypium rotundifolium, Polymeria ambigua, Polymeria linearis, Tinospora smilacina*

Site 20: **Open *Corymbia dampiera* woodland over open to moderately dense mixed low trees, dense *A. tumida* regrowth and *Triodia schinzii/Sorghum stipoideum* grassland.**

Date:	15/04/2003
Location:	51K 0473803, UTM 8113727
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	20% cover, 2-3 cm depth
Distribution:	General
Wood litter:	Moderate
Condition:	Pristine
Fire History	Old

Vegetation Cover

Trees 5-15 m	10-30 %	*Brachychiton diversifolius, Corymbia dampieri, Hakea macrocarpa*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Gardenia pyriformis* subsp. *keartlanii, Grevillea pyramidalis, Hakea macrocarpa, Terminalia canescens, Ehretia saligna*
Shrubs >2 m	10-30 %	*Acacia tumida, Erythrophleum chlorostachys*
Shrubs 1-2 m	10-30 %	*Acacia tumida, Bauhinia cunninghamii, Clerodendrum floribundum, Clerodendrum floribundum* var. *ovatum, Erythrophleum chlorostachys, Flueggea virosa, Sida hackettiana*
Shrubs 0.5-1 m	<5 %	*Abutilon hannii, Clerodendrum floribundum, Erythrophleum chlorostachys, Wrightiasaligna*
Shrubs 0-0.5	<5 %	*Clerodendrum floribundum, Crotalaria ramosissima, Solanum cunninghamii, Tephrosia rosea* var. *rosea*
Soft Grasses	10-30 %	*Aristida hygrometrica, Eriachne obtusa, Sehima nervosum, Sorghum stipoideum, Eriachne ciliata*
Hummock Grasses	30-70 %	*Triodia schinzii*
Herbs	<5 %	*Cleome tetrandra* var. *tetrandra, Murdannia graminea, Goodenia sepalosa, Heliotropium leptaleum, Phyllanthus virgatus, Polygala tepperi, Polymeria linearis, Ptilotus corymbosus, Stackhousia intermedia, Striga curviflora, Velleia panduriformis, Mitrasacme connata*
Vines/Creepers	<5 %	*Cassytha capillaris, Glycine tomentella, Polymeria ambigua, Trianthema pilosa, Tinospora smilacina*
Sedges	<5 %	*Haemodorum gracile*

Site 21: **Open to moderately dense *Eucalyptus tectifica/Corymbia dampieri* woodland over *A. tumida* dominated shrubland over *Triodia schinzii* and mixed herbs.**

Date:	11/04/2003
Location:	51K 0476791, UTM 8112990
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Loam
Rock type:	N/A
Leaf litter:	50-60% cover, 2-4 cm depth
Distribution:	General
Wood litter:	Plentiful
Condition:	Pristine
Fire History	None evident

Vegetation Cover

Trees 5-15 m	30-70 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Grevillea refracta, Melaleuca cajuputi, Terminalia canescens, Terminalia latipes* subsp. *latipes*
Shrubs >2 m	5-10 %	*Acacia tumida, Bauhinia cunninghamii, Erythrophleum chlorostachys*
Shrubs 1-2 m	<5 %	*Acacia tumida, Bauhinia cunninghamii, Wrightia saligna, Carissa spinarum, Flueggea virosa, Tephrosia leptoclada*
Shrubs 0.5-1 m	<5 %	*Abutilon hannii, Acacia tumida, Bauhinia cunninghamii, Clerodendrum floribundum, Sida hackettiana, Solanum cunninghamii, Corchorus* sp.
Shrubs 0-0.5	<5 %	*Abutilon hannii, Bauhinia cunninghamii, Phyllanthus maderaspatensis, Sida rohlenae* subsp. *occidentalis, Solanum cunninghamii, Tephrosia remotiflora*
Soft Grasses	<5 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa, Panicum effusum*
Hummock Grasses	30-70 %	*Triodia schinzii*
Herbs	<5 %	*Cleome tetrandra* var. *tetrandra, Goodenia sepalosa, Heliotropium leptaleum, Polygala tepperi, Ptilotus corymbosus, Sebastiania chamaelea, Spermacoce auriculata, Velleia panduriformis, Crotalaria ramosissima, Dicliptera armata, Evolvulus alsinoides, Sebastiania chamaelea, Trachymene didiscoides*
Vines/Creepers	<5 %	*Cassytha capillaris, Polymeria ambigua, Tinospora smilacina*

Site 22: **Open *Eucalyptus tectifica/Corymbia dampieri* woodland over mixed low trees over *Acacia tumida* regrowth over *Sorghum* grassland and mixed herbs.**

Date:	16/04/2003
Location:	51K 0463058, UTM 8114677
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	10-25% cover, 1-3 cm depth
Distribution:	General
Wood litter:	Plentiful
Condition:	Pristine
Fire History	Recent

Vegetation Cover

Trees 5-15 m	10-30 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Gardenia pyriformis* subsp. *keartlanii, Terminalia latipes* subsp. *latipes*
Trees <5 m	5-10 %	*Brachychiton diversifoliusm, Gardenia pyriformis* subsp. *keartlanii, Grevillea refracta, Terminalia canescens*
Shrubs >2 m	5-10 %	*Acacia tumida, Ficus opposita*
Shrubs 1-2 m	<5 %	*Acacia tumida, Bauhinia cunninghamii, Clerodendrum floribundum, Distichostemon hispidulus, Ficus opposita, Gossypium rotundifolium, Flueggea virosa, Gyrostemon tepperi*
Shrubs 0.5-1 m	<5 %	*Abutilon hannii, Acacia tumida, Bauhinia cunninghamii, Wrightia saligna*
Shrubs 0-0.5	<5 %	*Abutilon hannii, Acacia platycarpa, Solanum cunninghamii, Wrightia saligna,* ?*Corchorus* sp.
Soft Grasses	30-70 %	*Chrysopogon pallidus, Eriachne obtusa, Sorghum stipoideum, Panicum effusum*
Hummock Grasses	30-70 %	*Triodia schinzii*
Herbs	<5 %	*Calandrinia strophiolata, Cleome tetrandra* var. *tetrandra, Crotalaria ramosissima, Murdannia graminea, Evolvulus alsinoides, Goodenia sepalosa, Heliotropium leptaleum, Hybanthus aurantiacus, Polycarpaea corymbosa, Polygala tepperi, Ptilotus corymbosus, Spermacoce auriculata, Stackhousia intermedia, Portulaca bicolor, Goodenia* ?*sepalosa, Phyllanthus virgatus, Portulaca pilosa*
Sedges	<5 %	*Bulbostylis barbata*
Vines/Creepers	<5 %	*Cassytha capillaris, Glycine tomentella, Tribulopis angustifolia*

Site 23: **Moderately dense *Eucalyptus tectifica/ Corymbia dampiera* woodland over *Acacia tumida/ Distichostemon hispidulus/ Erythropleum chlorostachys* shrubland over mixed grassland.**

Date:	16/04/2003
Location:	51K 0473581, UTM 8118579
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam-loam
Leaf litter:	90% cover, 3-5 cm depth
Distribution:	General
Wood litter:	Sparse
Condition:	Pristine
Fire History	None evident

Vegetation Cover

Trees 5-15 m	30-70 %	*Corymbia dampieri, Eucalyptus tectifica*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Gardenia pyriformis* subsp. *keartlanii, Grevillea refracta*
Shrubs >2 m	10-30 %	*Acacia tumida, Erythrophleum chlorostachys*
Shrubs 1-2 m	5-10 %	*Acacia holosericea, Acacia platycarpa, Acacia tumida Distichostemon hispidulus, Erythrophleum chlorostachys*
Shrubs 0.5-1 m	5-10 %	*Abutilon hannii, Distichostemon hispidulus, Sida hackettiana, Wrightia saligna*
Shrubs 0-0.5	5-10 %	*Sida rohlenae, Sida rohlenae* subsp. *occidentalis, Solanum cunninghamii*
Soft Grasses	30-70 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa*
Hummock Grasses	10-30 %	*Triodia schinzii*
Herbs	<5 %	*Calandrinia quadrivalvis, Evolvulus alsinoides, Goodenia sepalosa, Ptilotus corymbosus, Spermacoce auriculata, Crotalaria crispata*
Vines/Creepers	<5 %	*Cassytha capillaris, Glycine tomentella, Mukia maderaspatana, Polymeria ambigua, Bonamia linearis, Tinospora smilacina*
Sedges	<5 %	*Fimbristylis macrantha*

Site 24: **Open scattered Pindan woodland (*Eucalyptus tectifica* and *Corymbia dampiera*) woodland over scattered low *Brachychiton diversifolius/ Hakea/ Grevillea* trees over *Sorghum* grassland.**

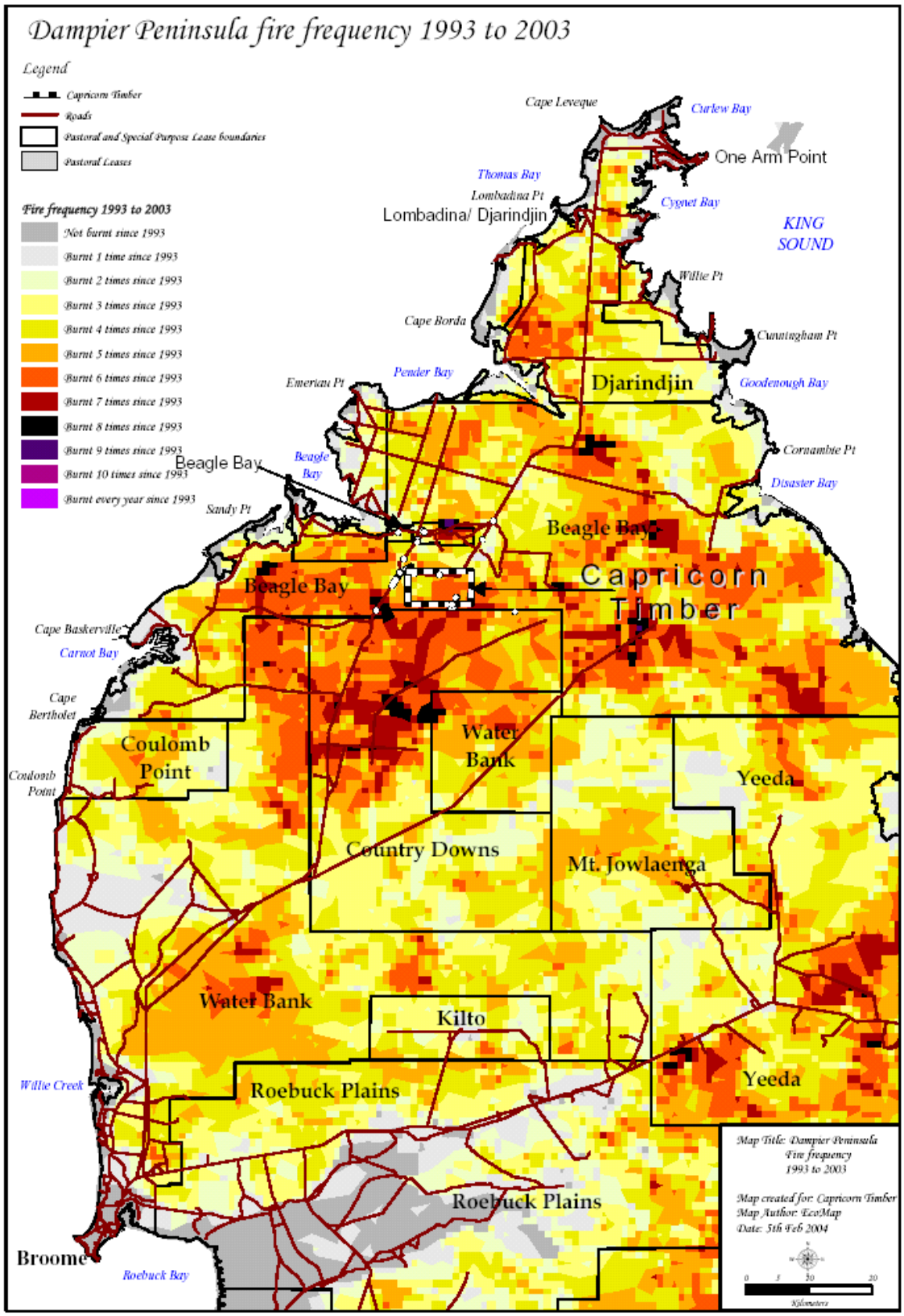
Date:	16/04/2003
Location:	51K 0467773, UTM 8113317
Topography:	Sandy plain
Slope:	Flat
Surface soil:	Sandy loam
Leaf litter:	20-40% cover, 1-2 cm depth
Distribution:	Mainly under shrubs
Wood litter:	Moderate
Condition:	Pristine
Fire History	Old

Vegetation Cover

Trees 5-15 m	5-10 %	*Brachychiton diversifolius, Corymbia dampieri, Eucalyptus tectifica, Hakea macrocarpa, Persoonia falcata*
Trees <5 m	5-10 %	*Brachychiton diversifolius, Gardenia pyriformis* subsp. *keartlanii, Grevillea pyramidalis, Hakea macrocarpa, Terminalia canescens*
Shrubs >2 m	5-10 %	*Acacia platycarpa, Bauhinia cunninghamii*
Shrubs 1-2 m	5-10 %	*Acacia platycarpa, Acacia platycarpa, Bauhinia cunninghamii, Clerodendrum floribundum*
Shrubs 0.5-1 m	5-10 %	*Acacia platycarpa, Carissa spinarum, Wrightiasaligna, Jasminum molle*
Shrubs 0-0.5	5-10 %	*Gossypium rotundifolium, Jasminum molle*
Soft Grasses	70-100 %	*Aristida hygrometrica, Chrysopogon pallidus, Eriachne obtusa, Panicum effusum, Sorghum stipoideum, Chrysopogon fallax*
Hummock Grasses	5-10%	*Triodia schinzii*
Herbs	<5 %	*Calandrinia strophiolata, Murdannia graminea, Goodenia sepalosa, Heliotropium leptaleum, Polycarpaea corymbosa, Polymeria linearis, Polygala tepperi*
Vines/Creepers	<5 %	*Cajanus marmoratus, Marsdenia angustata, Polymeria ambigua*

APPENDIX D

Dampier Peninsula
Fire History, 1993 - 2003


Dampier Peninsula fire frequency 1993 to 2003
Legend
Capricorn Timber
Roads
Pastoral and Special Purpose Lease boundaries
Pastoral Leases
Fire frequency 1993 to 2003
Not burnt since 1993
Burnt 1 time since 1993
Burnt 2 times since 1993
Burnt 3 times since 1993
Burnt 4 times since 1993
Burnt 5 times since 1993
Burnt 6 times since 1993
Burnt 7 times since 1993
Burnt 8 times since 1993
Burnt 9 times since 1993
Burnt 10 times since 1993
Burnt every year since 1993
Cape Leveque
Curlew Bay
One Arm Point
Thomas Bay
Lombadina Pt
Lombadina/ Djarindjin
Cygnet Bay
KING SOUND
Willie Pt
Cape Borda
Cunningham Pt
Emeriau Pt
Pender Bay
Djarindjin
Goodenough Bay
Beagle Bay
Beagle Bay
Coronambe Pt
Disaster Bay
Sandy Pt
Beagle Bay
Capricorn Timber
Cape Baskerville
Carnot Bay
Cape Berthelot
Coulomb Point
Water Bank
Yeeda
Coulomb Point
Country Downs
Mt. Jowlaenga
Water Bank
Kilto
Willie Creek
Roebuck Plains
Yeeda
Roebuck Plains
Broome
Roebuck Bay
Map Title: Dampier Peninsula Fire frequency 1993 to 2003
Map created for: Capricorn Timber
Map Author: EcoMap
Date: 5th Feb 2004
0 5 10 20
Kilometers