Spinifex Ridge Molybdenum Project

Vegetation and Flora

Baseline Surveys

(2005-2006)

November 2006

MOLY MINES LIMITED

eutback ecology

Baseline Surveys (2005-2006)
Vegetation and Flora

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EXECUTIVE SUMMARY

Moly Mines Limited (Moly Mines) is currently undertaking a Bankable Feasibility Study (BFS) in respect to developing a project consisting of the design, construction, and operation of a molybdenum mine in the Pilbara region of Western Australia. Spinifex Ridge is the proposed project, situated approximately 50 kilometres north-east of Marble Bar within the pastoral lease of Yarrie Station. Moly Mines currently holds an Exploration Licence (E45/2226) of approximately 20km².

Moly Mines Limited commissioned Outback Ecology Services (OES) to undertake a baseline flora and vegetation survey over the Exploration Licence (E45/2226) project area during July 2005, and an extended footprint area within EA45/2825 (to the immediate north) in April 2006. The flora surveys were one component of a broader assessment undertaken concurrently by OES that also considered vertebrate fauna, aquatic ecology and stygofauna, and soils.

The project area lies in the Pilbara biogeographic region of the Interim Biogeographic Regionalisation for Australia (IBRA). The Pilbara biogeographic region includes four major components; Hamersley, Fortescue Plains, Chichester and Roebourne. The Spinifex Ridge project lies within the Chichester Subregion (PIL1) which comprises the northern section of the Pilbara Craton, and is located across four land systems (Capricorn, Macroy, Rocklea and Talga) as described by the Western Australian Department of Agriculture.

The 2005 flora survey was undertaken over a six day period between the 25th and 30th July. The region received a significant rainfall event two weeks prior to the survey with Marble Bar receiving 93.4mm over a 24 hour period. A general greening of the vegetation was evident, however, prior to July the area had recorded 13 months of below-average rainfall. The 2006 survey was undertaken between the 28th April and the 3rd May after a significant cyclone season, with, more than 650mm of rain falling between December and April, and over 110mm recorded for April (the annual average for Marble Bar is 360mm).

A total of 62 floristic survey sites were assessed across the various geographical, geomorphologic and floristic variations within the study area. A total of 188 plant taxa were collected from 101 genera and 42 families. No Declared Rare or Priority Flora species were identified within the survey area. The most dominant families included Poaceae (28 taxa), Papilionaceae (27 taxa), Mimosaceae (14 taxa), with *Acacia* being the most common genus. The most widespread species across the survey area included *Triodia epactia, T. wiseana, Acacia inaequilatera, Grevillea wickhamii* ssp. *hispidula, Goodenia stobbsiana* and *Bulbostylis barbata.* The floristic sites that displayed the highest level of species richness were associated with the drainage areas and creekline, while the remaining sites were predominantly spinifex steppes and displayed lower levels of species diversity.

Twenty-four vegetation types were identified and grouped according to landform/location (drainage flat/creekline, stony plains, sandy plains, stony hills/ridgeline). From the correlation with land system information, it appears that the vegetation types described in the Spinifex Ridge survey are relatively

widespread across the Pilbara region. However, it is recognised that the vegetation associated with Coppin Gap and the creeklines are an important refuge for native fauna. Coppin Gap also possesses important scenic and ecological qualities, including semi-permanent standing water.

The project area appears to have been subject to four fires within the last nine years. A January 2002 fire burnt the majority of the *Triodia* hummock grassland of E45/2226, while approximately 20% of this Licence had also been burnt in February 2005. Cattle grazing occurs across the project area, most evidently in the drainage flats and creeklines. Eight weed species were identified across the survey area with the most dominant being **Cenchrus ciliaris* (Buffel grass). This species was widespread within the main creekline (Coppin Creek). In general, the vegetation of the project area is not prone to grazing-induced changes, but frequent fire has the propensity to modify botanical composition and vegetation structure. The condition of the floristic survey plots was generally considered to be 'very good' to 'excellent' using the condition scale of Keighery (1994), with some areas (upper slope of Talga Range) considered 'pristine'.

Recommendations are suggested to minimise potential impacts of the proposed construction and operation of a molybdenum mine. These include minimising vegetation clearance, monitoring and assessing groundwater drawdown and implementing standard management guidelines for dust, noise, weeds, fire, and feral animals.

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1.0 INTRODUCTION

1.1 Project Background

Moly Mines Limited (Moly Mines) is currently undertaking a Bankable Feasibility Study (BFS) in respect to developing a project consisting of the design, construction, and operation of a molybdenum mine in the Pilbara region of Western Australia. Spinifex Ridge is the proposed location for the development, situated approximately 50kms north-east of Marble Bar within the pastoral lease of Yarrie Station, where Moly Mines currently holds an Exploration Licence of approximately 20km² (E45/2226).

Moly Mines commissioned Outback Ecology Services (OES) to undertake a baseline vegetation and flora survey over Exploration Licence E45/2226 during 2005, and an extended footprint area immediately to the north, within EA45/2825, during 2006.

The botanical surveys were one component of a broader assessment undertaken concurrently by OES that also considered vertebrate fauna, aquatic ecology and stygofauna, and soils.

1.2 Scope and Objectives of the Study

This report documents the results of two botanical surveys over the project area known as Spinifex Ridge, incorporating Exploration Licence (E45/2226) and an extended footprint area immediately to the north (EA45/2825). Both surveys were planned and implemented as far as practicable in accordance with the Environmental Protection Authority (EPA) Position Statement No 3. “Terrestrial Biological Surveys as an Element of Biodiversity Protection” (EPA, 2002), and Guidance Statement No 51 “Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004).

The overall objectives of the baseline botanical survey were to:

- Develop an inventory of terrestrial flora species identified across the project area and identify and map the vegetation associations;
- Undertake a review of significant flora species (including Declared Rare and Priority Flora) located within the survey area;
- Provide an initial assessment of the regional and local conservation value of the vegetation; and
- Provide quantitative data that can provide a baseline against which future impacts and rehabilitation can be assessed, and the basis of a monitoring programme.

The botanical survey undertaken in July 2005 was of the Exploration Licence E45/2226, within which the molybdenum deposit is located. In April 2006, a section of Exploration Licence EA45/2825 (located to the north of E45/2226) was surveyed within a proposed extended footprint area. This survey occurred within what is perceived to be the most favourable season for the region (ie. the season following the season of maximum rainfall). Representative sites located within the vegetation types of E45/2226 were re-surveyed during this period to augment the original baseline data.

1.3 Location of Project Area

The Spinifex Ridge Project area is located approximately 50km north-east of Marble Bar in the north-east Pilbara (Figure 1).

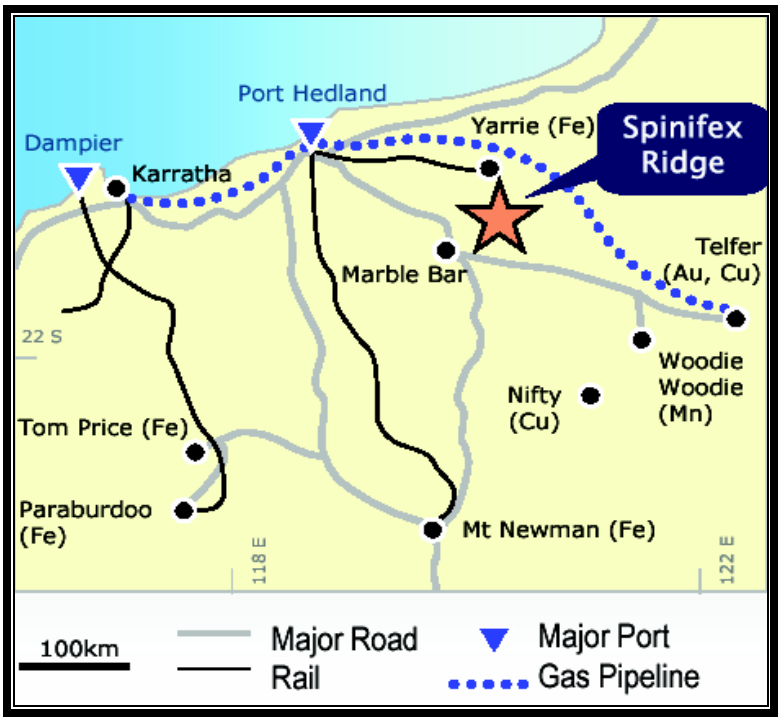


Figure 1 Locality map of the Spinifex Ridge project area (Moly Mines Limited, 2005)

1.4 Land Use

1.4.1 Pastoral

The Spinifex Ridge Project is situated within the Yarrie Pastoral Lease with cattle grazing occurring across the Exploration Licences E45/2226 and EA45/2825. A bore (Kitty's Well) is located within the south-west corner of E45/2226, while natural watering points at Kitty Gap and the northern end of Coppin Gap are also used by stock.

1.4.2 Mining

A molybdenum/copper deposit was first discovered at Spinifex Ridge in 1971 and explored through to 1982 by a succession of major international companies whose extensive exploration included drilling on a broad grid pattern of 35 diamond drill holes and 4 percussion holes for a total of 12,934m drilled.

A geological review of the deposit by Moly Mines has significantly enhanced the understanding of the deposit and the dimensions of the mineralised zone (1,000m x 600m), and has led to a revised resource calculation being undertaken. Once in full production, plant throughput is expected to be up to 15 Million tonnes per annum (Mtpa) of ore which will yield in excess of 19,000 tpa of molybdenum concentrate and 33,000 tpa of copper concentrate (co-product). The project has a nominal 10 year life of mine (Moly Mines, 2005).

The Spinifex Ridge Molybdenum Project is located on Yarrie Station, which also includes infrastructure associated with the Goldsworthy mining operations (BHP Billiton Iron Ore), including the Yarrie Mine and associated extension sites less than 50kms to the north of the project site.

1.4.3 Tourism and Access

Coppin Gap is located in a range that runs east-west through the northern end of Exploration Licence E45/2226. The Gap itself is located just outside of the Licence (north-east corner). This naturally-occurring geological formation contains a semi-permanent water source that attracts tourists for swimming and picnicking. The main access to the Gap is currently via a vehicle track that runs through E45/2226 and connects to the Bamboo Creek Road, which links to the Marble Bar Road.

Another rocky gorge area, Kitty Gap, is located on E45/2226 and can be accessed by a track heading west from Coppin Gap, or from the north via Warrawagine Road.

2.0 EXISTING ENVIRONMENT

2.1 Climate

The northern Pilbara region of Western Australia experiences a climate described as semi-desert-tropical, with two distinct seasons; a hot summer from October to April (which contains the wet season from December to March) and a mild winter from May to September. The climate is characterised by seasonally low but unreliable rainfall, with an annual average of 300mm combined with very high temperatures and high diurnal temperature variations (Kendrick and McKenzie, 2001). Rainfall within the Pilbara follows a roughly inland to coastal and southern to northern increasing trend however, topography affects rainfall patterns with the Hamersley Ranges having higher rainfall than the adjacent lower plains areas. The rainfall of areas to the north (such as Shay Gap) is more peripherally influenced by the northern monsoon of the Kimberley (Van Vreeswyk *et al.* 2004).

While the southern half of WA receives rainfall during Winter/Spring as a result of the slow movement of high pressure systems from west to east along mean latitude of 29º, the Pilbara region receives little rainfall from these events. During the winter months, the limited rainfall typically comes from either elongated southern latitude fronts or from the interaction of these fronts with mid-level moisture from the Indian Ocean (Van Vreeswyk *et al.* 2004). The majority of annual rainfall is received between December to March. During this period, a semi-permanent heat low forms over the Pilbara. When this interacts with low-level moisture, afternoon thunderstorms will often form and bring varying rainfall. Cyclones may also occur during these months which may bring heavy rain and widespread flooding (Van Vreeswyk *et al.* 2004).

The nearest Bureau of Meteorology (BOM) weather station to the Spinifex Ridge Project is located at Marble Bar, approximately 50km to the south-west. Mean monthly rainfall for Marble Bar ranges from 1mm in September to 88mm in February (Figure 2) with the annual average being 360mm. The mean daily maximum temperature varies from 27.1º in June to 41.6º in December while the mean minimum daily temperature ranges from 11.8ºC in July to 26.1ºC in January (BOM, 2005). Over the whole year, Marble Bar averages 98 days above 40ºC and 275 days above 30ºC (Van Vreeswyk *et al.* 2004).

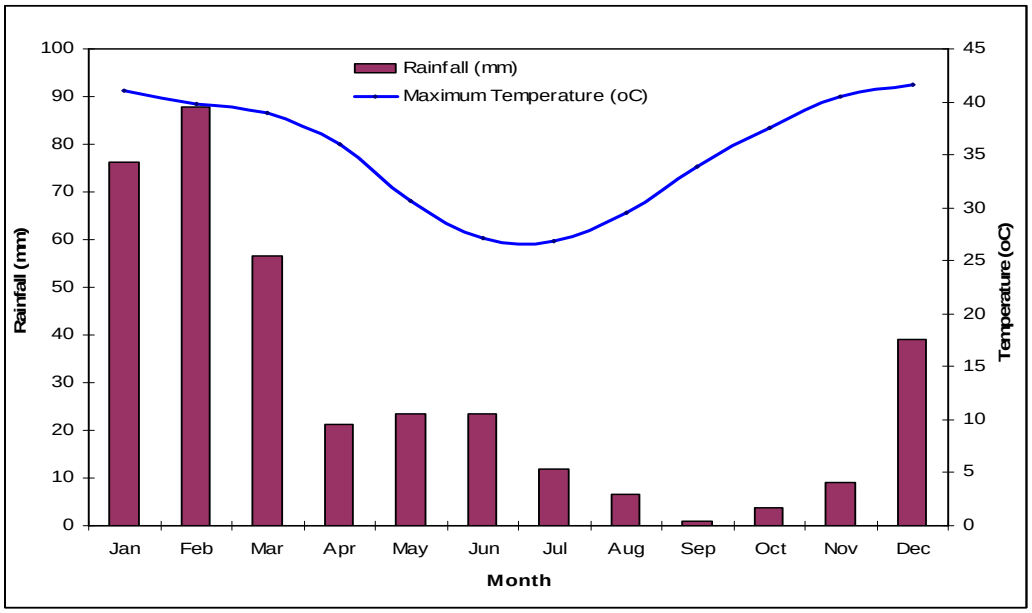


Figure 2 Climate data for Marble Bar (BOM, 2005).

2.2 IBRA Region - Pilbara Biogeographic Region

The project area lies in the Pilbara biogeographic region of the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell, 1995). This is a system of 85 biogeographic regions covering the whole of Australia (Environment Australia, 2000), and is the result of collaboration between all State conservation agencies with co-ordination by the Australian Government Department of the Environment and Heritage. Bioregions are defined on the basis of climate, geology, landforms, vegetation and fauna.

The Pilbara biogeographic region includes four major components; Hamersley, Fortescue Plains, Chichester and Roebourne. The Chichester subregion (PIL1) comprises the northern section of the Pilbara Craton and is summarised by Kendrick and McKenzie (2001) as follows:

> "Undulating archean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges".

There are 21 vegetation associations within the Chichester subregion (PIL1) that are listed as having a high priority for reservation (Table 1) (Kendrick and McKenzie, 2001).

Table 1 Vegetation Associations of the Chichester subregion that are listed as a high priority for conservation (Kendrick and McKenzie, 2001).

Beard Veg. Assoc.	Ecosystem Description
11	Medium woodland; coolabahs (*Eucalyptus microtheca*)
18	Low woodland; mulga (*Acacia aneura*)
28	Open low woodland; mulga
29	Sparse low woodland; mulga, discontinuous in scattered groups
39	Shrublands; mulga scrub
41	Shrublands; teatree scrub
43	Thicket; mangroves
127	Bare areas; mudflats
134	Mosaic: Hummock grasslands, open low tree steppe; desert bloodwood and feathertop spinifex (on) sandhills/Hummock grasslands, shrub steppe; mixed shrubs over spinifex between sandhills.
136	Hummock grasslands, shrub steppe; mixed shrubs over spinifex between sandhills.
175	Short bunch grassland – savannah/grass plain
188	Shrublands; mulga and *Acacia sclerosperma* scrub
197	Sedgeland; sedges with scattered medium trees; coolabahs over various sedges and forbes.
589	Mosaic: Short bunch grassland – savannah/grass plain/hummock grasslands, shrub steppe; kanji over soft spinifex.
601	Mosaic: Sedgeland; various sedges with very sparse snakewood/hummock grasslands, shrub-steppe; kanji over soft spinifex.
619	Medium woodland; river gum (*Eucalyptus camaldulensis*)
629	Mosaic: Short bunch grassland – savannah grass plain/hummock grasslands, grass steppe; hard spinifex *Triodia wiseana.*
640	Sedgeland; sedges with scattered medium trees; coolabahs and river gum over various sedges.
641	Medium woodland; coolabahs and river gum
649	Sedgeland; Various sedges with very sparse snakewood
699	Shrublands; pindan; *Acacia eriopoda* shrubland with scattered low bloodwood (*Eucalyptus dicromophloia*) and *E. setosa* over soft and curly spinifex on sandplain.

The Pilbara is increasingly being viewed as a centre for biodiversity at the state and national scale, and the 'Hamersley-Pilbara' has been listed by the Federal Minister for Environment as one of 15 biodiversity hotspots in Australia, due to high levels of diversity and endemism, as well as the level of threat (DEH, 2003). Examples of diversity include hummock grassland reptile and small mammal communities (Kendrick and McKenzie, 2001). Dominant limiting factors and constraints for the Pilbara bioregion listed by Thackway and Cresswell (1995) include the effects of wildfire, feral animals, weeds, and grazing or pastoral activities.

Within the Chichester subregion (PIL1) there is one wetland of National significance, - the De Grey, and two wetlands of subregional significance - Carawine Gorge on the Oakover River and Running Waters and Skull Springs on the Davis River (Kendrick and McKenzie, 2001). The riparian zone vegetation that occurs within the PIL1 bioregion is considered to be of a degraded condition, with recovery unlikely in the medium term. The main threatening processes are considered to be grazing pressure from cattle, donkeys, camels and horses, the spread of weed species including buffel grass (**Cenchrus ciliaris*), Parkinsonia (**Parkinsonia aculeata*), mesquite (**Prosopis* spp.) and mexican poppy (**Argemone ochroleuca*), along with erosion (Kendrick and McKenzie, 2001).

2.3 Land Systems of the Project Area

A regional survey of land in the Pilbara region was undertaken between 1995 and 1999 by the Department of Agriculture and the Department of Land Administration (now known as the Department of Land Information). The purpose of this rangeland survey was to provide a comprehensive description of the biophysical resources of the region along with an evaluation of the condition of the soils and vegetation (Van Vreeswyk *et al.* 2004). In the process, the land types, land systems and land units of the Pilbara region were mapped.

A total of 102 land systems have been identified within the Pilbara region. Of these, 53 were described for the first time within the Pilbara survey while the remaining 49 have been identified previously in adjacent rangeland surveys (Van Vreeswyk *et al.* 2004).

The project area is located across four land systems: Capricorn, Macroy, Rocklea and Talga, which vary in regard to landform, geology, vegetation, and their proportions within the Pilbara region and the project area (Table 2).

Table 2 Summary of Land Systems over the project area (Van Vreeswyk *et al.* 2004)

Land System	Total Pilbara	Proportion of Pilbara	Description and general distribution.	Predominant location over project area
Capricorn	5,296km^2	2.9%	Hills and ridges of sandstone and dolomite supporting shrubby hard and soft spinifex grasses. Widespread, common.	Talga Range and areas immediately adjacent
Macroy	13,095km^2	7.2%	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex grasslands. Central north, very common.	Extensive plains both to the north and south of the Talga Range
Rocklea	22,993km^2	12.7%	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands. Widespread, very	Basalt hills immediately south of Capricorn system to the eastern side of the project area. The deposit is
Talga	2,124km^2	1.2%	Hills and ridges of greenstone and chert and stony plains supporing hard and soft spinifex grasslands. North-central, common.	Hills immediately south of Capricorn system to the western side of the project area.

2.4 Geology

2.4.1 Regional

Geologically, the Pilbara Craton can be divided into the Proterozoic Hamersley Basin in the south and the Archaean granite-greenstone terrane in the north. Approximately 40% of the latter is covered by greenstone sequences which comprise metasedimentary and volcanic rocks intruded by significant granitoid bodies. To the south, the Hamersley Basin overlies the older Archaean Pilbara Craton and is comprised of mafic and felsic volcanics, shale, siltstone, sandstone and conglomerate along with dolomite and banded iron formation (Van Vreeswyk *et al.* 2004). The Chichester subregion, PIL1 (IBRA) is characterised by undulating Archaean granite and basalt plains and significant areas of basaltic ranges (McKenzie *et al.* 2002).

2.2.2 Local

Based on the Muccan, WA Sheet 2956: Western Australia Geological Survey, 1:100,000 (Williams, 1998), the Spinifex Ridge project area includes a number of geological types, ranging from massive granodiorite to colluvial fans (Table 3).

Table 3 Simplified localised geology of the Spinifex Ridge project area

Geological Elements	Primary Local Examples	Predominant location over project area
Mt Edgar Granitoid Complex Four well-exposed coalescing, bulbous-shaped plutons	*Coppin Gap Granodiorite (Ag Eco)*: Massive to seriate cream to pinkish, biotite, granodiorite, and tonalite. Medium grained and weakly foliated.	Plains to the south of the Talga Range
Gorge Creek Group Epiclastic rocks and BIF, as well as mafic volcanic units	*Nimingarra Iron Formation (AGna)* Basal metasandstones. Medium to coarse-grained with subangular to subrounded quartz grains set in a fine-grained recrystallised groundmass	Talga Range, and hills immediately to the south
Warrawoona Group *Salgash Subgroup* Mafic and ultramafic rocks	*Eurobasalt (AWe)* Basalt, pillow basalt, high-Mg basalt and intercalated thin-bedded chert; metamorphosed. *Panorama Formation (AWp)* Felsic volcanic rocks, mainly rhyolite, quartz-feldspar, porphyry and felsic tuff; metamorphosed	Basalt hills and plains immediately south of Talga Range. Area of deposit Thin band in hills south of deposit, running east-west.
Muccan Granitoid Complex Xenolith-rich granitoids of mixed granodiorite, tonalite and minor quartz diorite.	*Wolline Monzogranite (AgMwo)* Pink-grey porphoritic to seriate, medium to coarse-grained monzogranite.	Plains to the north of the Talga Range
Dykes	*Dolerite dykes (d)* *Horneblende-feldspar-biotite porphyry dykes (Pph)*	Within Mt Edgar and Muccan Granitoid Complexes Within Muccan Granitoid Complex
Cainozoic Rocks	*Calcrete (Czak)* Massive, nodular and cavernous limestone, variably silicified; dissected valley calcrete.	Component of Gorge Creek Group
Quarterny Deposits	*Colluvium(QC)* Sand, silt and gravel on outwash fans; scree, talus; proximal mass wasting deposits. *Alluvium (Qaoc)* Allucial sand silt and clay; Mixed floodplain deposits	Sandplain area north of Kitty's Well Adjacent to Coppin Creek, north of Talga Range

2.5 Conservation Areas in the Region

The Pilbara bioregion has 7.75% of its surface under some form of conservation tenure. The Chichester subregion (PIL1) within which the project area is located, has 6.56% of its area reserved (Kendrick and McKenzie, 2001). The Chichester subregion contains one national park (Millstream-Chichester National Park), one conservation park (Meentheena) and one large nature reserve (Mungaroona Nature Reserve).

The Millstream-Chichester National Park (199,736ha) is located approximately 180km west-south-west of E45/2226. The Mungaroona Nature Reserve (105,842ha) is located approximately 230km south-west of the survey area.

The Meentheena Conservation Park (225,700ha) was formerly a pastoral station that was purchased by CALM in 1998 and has been de-stocked for a number of years. This Conservation Park is of particular significance to the flora survey as it borders the Yarrie pastoral station within which the project area is located. Meentheena is comprised predominantly of the same land systems as the project area, namely: Capricorn, Macroy and Rocklea, along with areas of Granitic, Taylor, McKay, Billygoat and Calcrete land systems. There has been some fire management undertaken, but there are no resident staff. The weed **Cenchrus ciliaris* (buffel grass) is well established within this nature reserve (Kendrick and McKenzie, 2001).

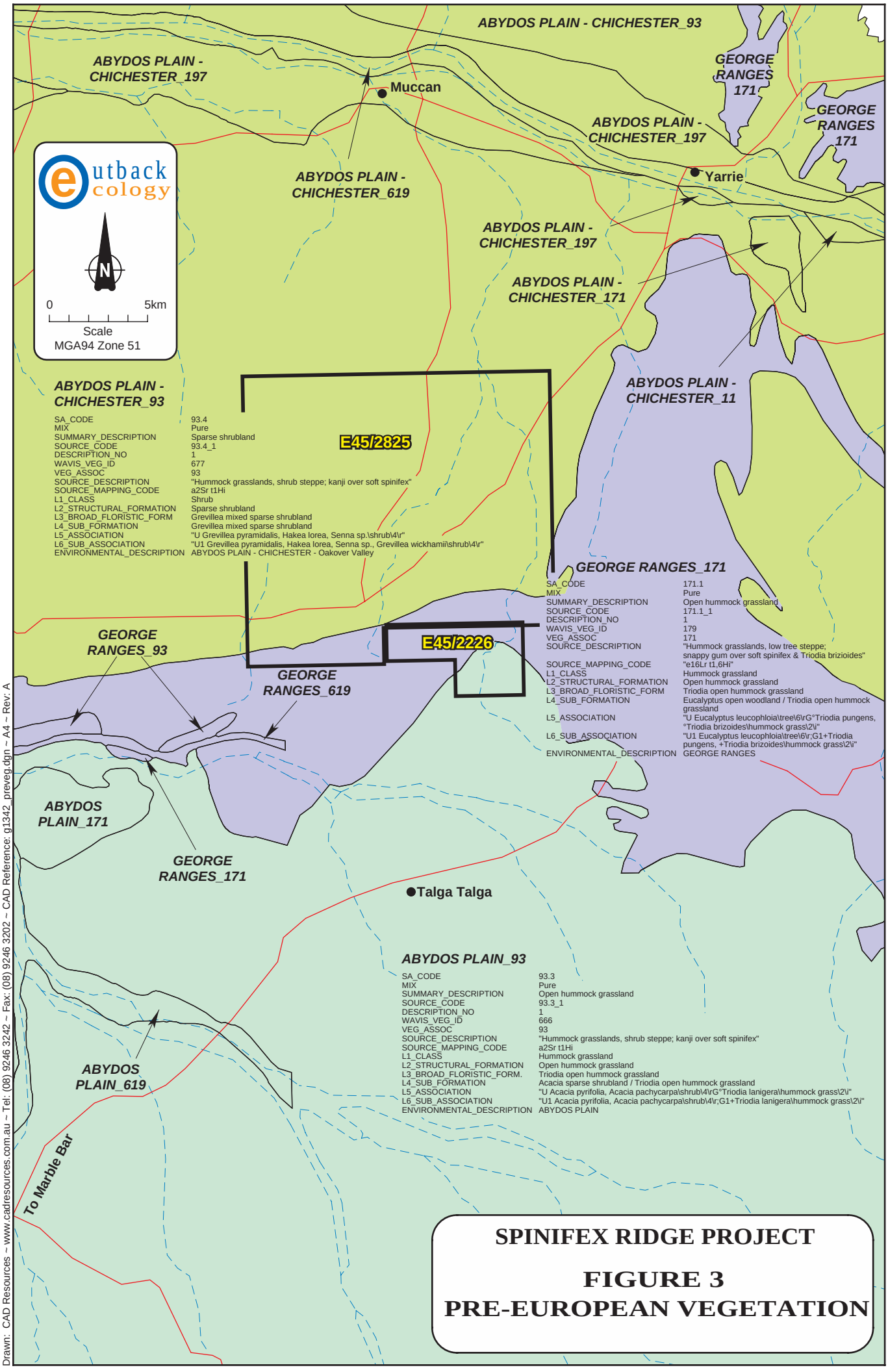
There are three 'reserves' located on E45/2226. These include Water Reserve No. 12757 which lies within Timber Reserve No. 13649 (no current management) within the south-west corner of E45/2226. A 'Reserve for the Preservation of Natural Formations' (No. 31047) managed by the East Pilbara Shire encompasses Coppin Gap and its environs (Tengraph, 2006).

2.6 Previous Botanical Surveys of the Region

Broad-scale vegetation mapping within the Pilbara region was first conducted by Burbidge (1945) for the de Grey – Coongan area. In 1975, Beard mapped the vegetation of the entire Pilbara at a scale of 1:1,000,000. The Spinifex Ridge project lies within the Fortescue Botanical District of the Pilbara region, as defined by Beard (1975). The district is characterized by tree and shrubb-steppe communities with *Eucalyptus* trees, *Acacia* shrubs, *Triodia pungens* and *T. wiseana*. Mulga occurs in valleys with short-grass plains on alluvia (Beard, 1990).

Examination of the Department of Agriculture's Pre-European Vegetation NVIS database which is based primarily on the published and unpublished mapping of J.S. Beard at the 1:250,000 scale, indicates that E45/2226 is located within two vegetation systems. The northern area of the Licence is situated within the George Ranges_171 System, characterized by *Eucalyptus leucophloia* open woodland over *Triodia pungens* and *Triodia brizoides* open hummock grassland. The southern area of the Licence lies within the Abydos Plain_93 system, characterized by *Acacia pyrifolia/Acacia pachycarpa* sparse shrubland over *Triodia lanigera* open hummock grassland. To the north of E45/2226, the extended footprint lies within the George Ranges_171 System and the Abydos Plain-Chichester_93 system. The latter is characterized by Grevillea *pyramidalis, Hakea lorea, Senna* spp.and *Grevillea wickhamii* sparse shrubland over *Triodia* spp. hummock grasslands (Figure 3).

The Western Australian Department of Agriculture has recently published (December 2004) an inventory and condition survey of the Pilbara region, based on field work undertaken from 1995-1999. Within this report, detailed accounts of geomorphology, soils, vegetation, land systems and resource condition (in terms of pastoral impact) are given (Van Vreeswyk *et al.* 2004).



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The Department of Environment and Conservation (DEC), with assistance from the Western Australian Museum, is currently undertaking a five year (2002 – 2007) biological survey of the Pilbara, examining 800 study sites across the region. Fieldwork is expected to continue until mid-2006 after which time 18 months will be spent analyzing the data prior to publishing the results.

Site specific floristic surveys conducted within the Pilbara region are predominantly the result of mineral resource development. The most recent and relevant study to the Spinifex Ridge survey is that of BHP Billiton Iron Ore Pty Ltd Goldsworthy Extension Biological Assessment Survey (BHPB, 2005) published as part of the Goldsworthy Extension Project Environmental Protection Statement. This project is located approximately 45km north of Spinifex Ridge and the survey encompassed the proposed Yarrie, Cattle Gorge, Nimingarra and Sunrise Hill extensions/developments. Surveys were conducted in June 1998 (Yarrie) and February/March 2004 (Cattle Gorge) and October 2004 (Nimingarra, Sunrise Hill). BHPB (2005) describes a number of unpublished botanical surveys conducted for BHP Billiton Iron Ore within the vicinity of the Goldsworthy project area.

Another recent, but less relevant, survey within the region is that of the proposed FMG Stage A Rail Corridor between Port Hedland and Mindy Mindy (Biota, 2004). At its closest point, this corridor is approximately 150km west-south-west of Spinifex Ridge.

2.7 Threatened Ecological Communities

Threatened Ecological Communities (TECs) are recognized on a national and state level. Commonwealth legislation protects native vegetation communities classified as threatened under Schedule 2 of the *Environmental Protection, Biodiversity and Conservation (EPBC) Act 1999.* Approval from the Minister for the Environment and Heritage must be sought to undertake any action that is likely to have a significant impact on a listed threatened ecological community. There are three categories of TECs under the *EPBC Act 1999* – 'Critically Endangered', 'Endangered' and 'Vulnerable'.

In Western Australia, the Department of Environment and Conservation (DEC) recognizes four categories of Threatened Ecological Communities (TECs) within WA, as developed by English and Blyth (1997). These include – 'Presumed Totally Destroyed', 'Critically Endangered', 'Endangered' and 'Vulnerable' (Table 4). Other ecological communities that are considered to possibly be under threat but do not meet the survey criteria associated with TECs, are listed under the Department's Priority Ecological Community List under Priorities1, 2 and 3. Those ecological communities that are considered to be adequately known and are rare but not threatened, or that have been recently removed from the threatened list, are classified as Priority 4 and require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (NatureBase, 2006).

Table 4 Definition of Threatened Ecological Community classifications (English, 2003)

TEC Classification	Description
Presumed Totally Destroyed	Community is unlikely to be able to be rehabilitated.
Critically Endangered	There are immediate threats throughout its range.
Endangered	Threatened throughout most of its range in near future.
Vulnerable	Vulnerable to threatening processes/may move into higher threat category.

Within the Pilbara bioregion there are two TECs, the Ethel Gorge stygobiont community, located within the Pilbara 2 (PIL2) Fortescue Plains subregion, and the *Themeda* grasslands of the Pilbara region (located with the Pilbara 3 (PIL3) Hamersley subregion (Kendrick, 2001). There are no TECs within the Pilbara 1 (PIL1) Chichester subregion. However, a number of ecosystems have been listed as 'at risk' as part of the Biodiversity Audit of Western Australia (Kendrick and McKenzie, 2001). At risk ecosysyems and the processes deemed to be threatening them are listed in Table 5.

Table 5 Ecosystems of the Pilbara 1 IBRA region listed as being at risk (Kendrick and McKenzie, 2001).

Ecosystem	Threatening Process
Heliotropium, Eragrostis community on seepages near Mt Montagu, Chichester Range (Trudgen and Casson 1998)	Grazing pressure, feral animals (cattle, donkey)
Cracking clay communities of the Chichester Range and Mungaroona Range (Trudgen and Casson, 1998: S. van Leeuwen and P. Kendrick pers. comm.; Andrew Mitchell's reports). Chichester tablelands cracking clays, grazed heavily at times in the past, still sometimes by feral and station cattle. Usually high in the landscape, sometimes perched on hill tops and on plateaus.	Grazing pressure, feral animals (cattle, donkey), mining infrastructure
Specific snakewood communities. Between Roy Hill and Marillana Stations (A. Mitchell pers. comm.) In Ag Dept Pilbara rangelands report.	Grazing pressure, feral animals (cattle)
Saltbush shrublands (de Grey River west side) (A. Mitchell pers. comm.) In Ag Dept Pilbara rangelands report.	Grazing pressure, feral animals (cattle)
Saltbush community of the duplex plains – Mosquito Creek series (Nullagine) (A. Mitchell pers. comm.) In Ag Dept Pilbara rangelands report.	Grazing pressure, feral animals (cattle)
Invertebrate assemblages (Errawallana Spring type) Coolawanya Station. Geologically distinct. – 213801, 1174625. Sherlock River system. Permanent spring fed creek. Has atypical invertebrate community. (W. Kay, M. Smith, M. Scanlon, S. Halse). Priority 4 (b)	Grazing pressure, feral animals (cattle)
Stygofauna of freshwater aquifers of the Pilbara region, Millstream type.	Groundwater drawdown, changed hydrology – salinity.

3.0 METHODOLOGY

3.1 Declared Rare and Priority Flora – Desktop Survey

Rare Flora are gazetted under subsection 2 of section 23F of the Western Australian Wildlife Conservation Act (1950) and as such it is an offence to damage rare flora. The Priority Flora list does not have the same legal status as the DRF Schedule, however Priority Flora are considered under the *Environmental Protection Act* 1986 as enforced by the *Environmental Protection (Clearing of Native Vegetation) Regulations* 2004, when determining biodiversity value of an area (DoIR, 2006). Definitions of Declared Rare and Priority Flora species are provided in **Table 6**.

Table 6 Definition of Declared Rare and Priority Flora Species (CALM, 2005)

Conservation Code	Category Description
R	*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, and have been gazetted as such."
P1	*Priority One – Poorly Known Taxa* "Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey."
P2	*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 (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora' but are in urgent need of further survey."
P3	*Priority Three – Poorly Known Taxa* "Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey."
P4	*Priority Four – Poorly Known Taxa* "Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia) are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years."

Prior to the field survey, a search was conducted of the Department of Conservation and Land Management's *Threatened (Declared Rare) Flora* database and the *Western Australian Herbarium Specimen* database for rare and priority species opportunistically collected within the provided coordinates of S 20^{O}10', E119 ^{O} 10' and S 22 ^{O}40' E 121 ^{O}. This covered a large area extending approximately 100km north, east and west of the Spinifex Ridge project area, and approximately 200km to the south. Within this area, 21 Priority and one Declared Rare Flora species (Table 7) have previously been collected and vouchered at the WA Herbarium. The locations of these Priority Flora species were entered into Mapinfo to determine their position in relation to the Spinifex Ridge Project area. The nearest collection point was *Euphorbia clementii* (P2) which had been identified approximately 17km west of the project area. Other Priority species located within a radius of 50km

include *Bulbostylis burbidgeae* (P3), *Fimbristylis* sp. Shay Gap (P1), *Gymnanthera cunninghamii* (P3) and *Phyllanthus aridus* (P3).

Table 7 Priority Flora Species identified within the coordinates S 20°10', E119° 10' and S 22°40' E 121°. (CALM, 2005)

Cons. Code	Species	Number of Records	Habitat	Nearest Pop. to Spinifex Ridge (approx)
P3	*Abutilon trudgenii*	2	Shallow soil interfluve over granite.	78km
P1	*Acacia aphanoclada*	23	Skeletal stony soils. Rocky hills, ridges and rises.	104km
P4	*Acacia balsamea*	2	Red earth & gravel. Rocky hills, granite breakaways.	166km
P1	*Acacia cyperophylla* var. *omearana*	14	Stony & gritty alluvium. Along drainage lines.	60km
P3	*Acacia glaucocaesia*	7	Red loam, sandy loam, clay. Floodplains	79km
P1	*Acacia levata*	12	Sand or sandy loam over granite. Hillslopes.	77km
P1	*Atriplex spinulosa*	7	Footslope and drainage floor in Mosquito Creek Geological Series.	110km
P3	*Bulbostylis burbidgeae*	5	Granitic soils. Granite outcrops, cliff bases.	43km
P1	*Eremophila spongiocarpa*	3	Weakly saline alluvial plain on margins of marsh.	181km
P3	*Eragrostis crateriformis*	1	Clayey loam or clay. Creek banks, depressions.	60km
P2	*Euphorbia clementii*	1	Gravelly hillsides, stony grounds.	17km
P1	*Fimbristylis* sp. Shay Gap	2	Sandy soil. Drainage line.	44km
P3	*Goodenia nuda*	2	Weeli Wolli Creek	204km
P1	*Goodenia omearana*	2	Clay soil, calcrete pebbles. Low undulating plain.	153km
P3	*Gymnanthera cunninghamii*	1	Sandy soils.	47km
P2	*Hibiscus brachysiphonius*	1	Clay. Creeklines, clay flats.	110km
P2	*Indigofera ixocarpa*	1	Skeletal red soils over massive ironstone.	109km
R	*Lepidium catapycnon*	1	Skeletal soils. Hillsides.	204km
P3	*Phyllanthus aridus*	1	Sandstone, gravel, red sand.	45km
P4	*Ptilotus mollis*	4	Stony hills and screes.	60km
P3	*Rostellularia adscendens* var. *latifolia*	2	Ironstone soils. Near creeks, rocky hills.	63km
P2	*Stylidium weeliwolli*	1	Gritty sand soil, sandy clay. Edge of watercourses.	210km

3.2 Vegetation Field Survey

3.2.1 Timing of Surveys

Two botanical surveys over the project area were undertaken, the first in July 2005 and the second in April 2006.

2005 Survey

A reconnaissance survey of the project area was undertaken between the 18th and 20th July, 2005. Field work for the flora and vegetation survey of E45/2226 was undertaken between the 25th and 30th July by:

Ms Belinda Jeanes	BSc. Env Biol	Botanist/Environmental Scientist
Ms Mandy Cross	BSc. Env. Biol.	Environmental Scientist

Specimen identifications were completed by:

Mrs Emma Holland	BSc. (Hons) Env Biol	Botanist

The region received a significant rainfall event on 11th July 2005 with Marble Bar recording 93.4mm over a 24 hour period. The survey occurred two weeks after this rainfall and a general greening of the vegetation was evident. However, prior to the July rainfall, the area had recorded 13 months of below average rainfall (Figure 4).

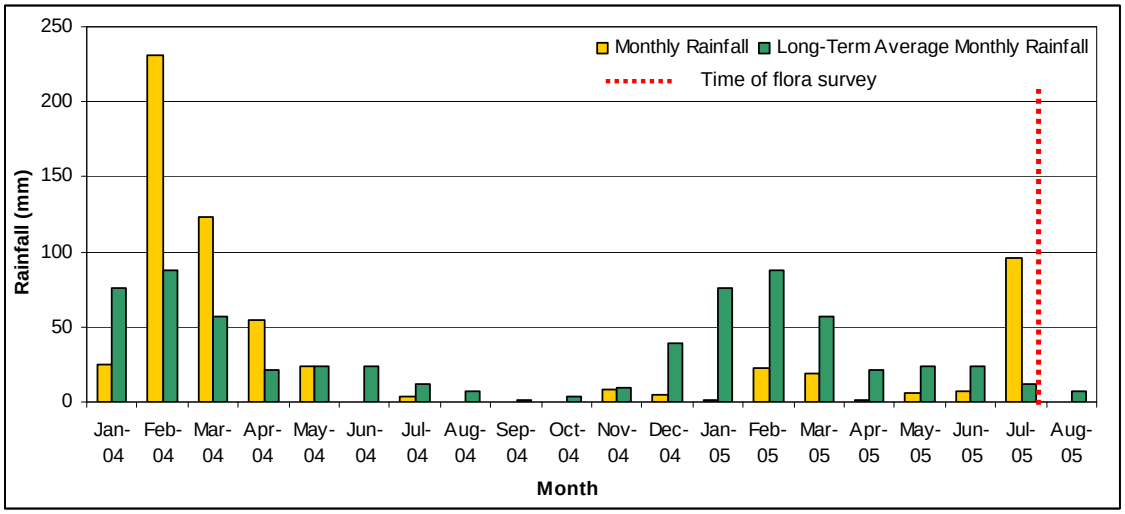


Figure 4 Monthly rainfall received at Marble Bar from January 2004 – August 2005 in comparison to the long-term monthly average.

2006 Survey

The flora and vegetation survey of the extended footprint area within EA45/2825 was undertaken between the 28th April and the 3rd May 2006 by:

Ms Belinda Jeanes	BSc. Env Biol	Botanist/Environmental Scientist
Mr Jarrad Donald	BSc. Env. Mgmt.	Environmental Scientist

Specimen identifications were completed by:

Ms Belinda Jeanes	BSc.Env Biol Botanist/Environmental Scientist
Mr Malcolm Trudgen	Contract Botanist (Pilbara Specialist) provided final species identification/clarification for all specimens collected from both the 2005 and 2006 surveys.

In April 2006, a separate flora baseline assessment of Coppin Creek, both upstream and immediately downstream of Coppin Gap, was undertaken in conjunction with a soil and aquatic invertebrate survey. The results of that survey are to be presented separately in another report (OES, 2006), however all plant species identified during the course of that survey have been included within the species inventory presented here (Appendix A).

The region received very significant rainfall during the 2005–2006 summer with over 650mm of rain falling between December and April, and over 110mm recorded for April alone (Figure 5). (The annual average for Marble Bar is 360mm). Profuse flowering and significant growth flushes were observed during the survey period and creeks and rivers were flowing throughout the region.

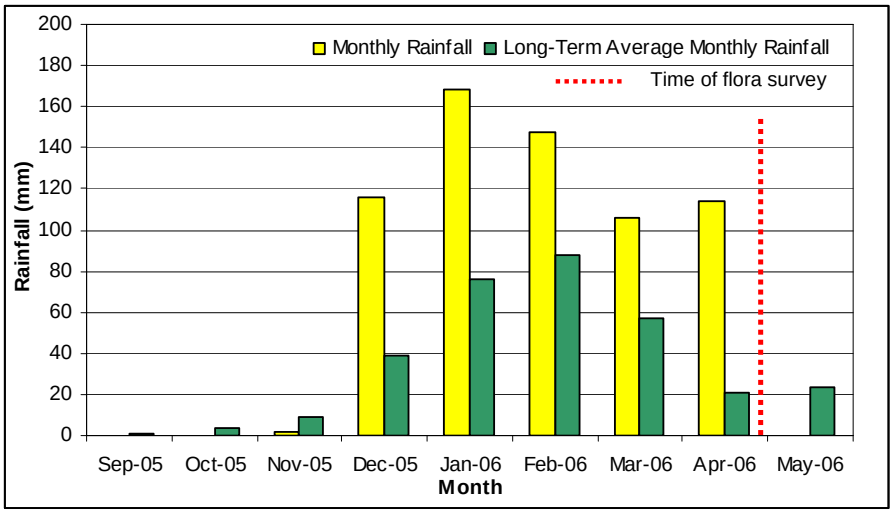


Figure 5 Monthly rainfall received at Marble Bar from September 2005 – May 2006 in comparison to the long-term monthly average.

3.2.2 Survey Methodology

The methodology adopted for the two surveys was formulated as far as practicable in context with the Environmental Protection Authority (EPA) Position Statement No 3. “Terrestrial Biological Surveys as an Element of Biodiversity Protection” (EPA, 2002), and Guidance Statement No 51 “Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia” (EPA, 2004).

A desktop review of vegetation communities present at the site was conducted prior to the flora surveys. Aerial photography, contour mapping, land systems mapping, and Beard (1975) mapping were used to determine preliminary site selection. Prior to the July 2005 survey, a reconnaissance visit was undertaken to verify the desktop study and assess site selection further, particularly in regard to topography, wildfire, vegetation condition, patchiness and variability amongst systems, as well as determine any local refugia. Site selection was further influenced by the proposed development with consideration given to the zone of direct impacts, zone of indirect impact and zone of wider interest.
A total of 33 floristic survey sites were selected during the 2005 survey to represent the various geographical, geomorphologic and floristic variations within E45/2226. The survey sites avoided the areas burnt during the February 2005 bushfire. During the 2006 survey, within EA45/2825, a further 28 floristic survey sites were assessed, giving a total of 62 survey sites across the combined project area.

Plots were 50m x 50m in size, the exception being in some drainage lines where the plot size and shape was changed to fit the habitat. A number of sites on the upper slopes of the hills/ridgeline were ‘plotless’ (ie. unbounded) due to the difficulty in safely traversing the terrain. Assessment of the vegetation at these sites was made for an area estimated to be 50m x 50m. Similarly, some sites within EA45/2825 were also plotless to allow for a greater number of sample sites to be assessed within the allocated survey time to assist in vegetation mapping. Opportunistic vegetation sampling was also undertaken, during which the areas surrounding and between plots were searched for additional species.

For each survey plot the height and percentage foliar cover of all flora species were recorded along with data on topographical position, slope, aspect, soil, percent bare ground, percent litter cover, percent exposed rock (where appropriate) and vegetation condition/disturbance. Topographical position was recorded as either: ridge/hill tops, upper slopes, mid-slopes, lower slopes, valley flats, small hills in valley, drainage areas, creeklines or plains. Slope was scored as either: flat ($0 – 5^{o}$), gentle ($5 – 15^{o}$) moderate ($15 – 45^{o}$) or steep ($>45^{o}$). The condition of each vegetation community was assessed using the vegetation condition scale outlined by Keighery (1994) (Appendix D).

Plant species were either identified in the field, or vouchered for later identification. A complete list of species identified during the surveys is presented in Appendix A. Nomenclature follows Paczkowska and Chapman (2000).

3.3 Analysis of Floristic Data

In order to assist in the description and subsequent mapping of the vegetation types of the survey area, a multivariate analysis was undertaken of the data using the PRIMER (Plymouth Routines in Multivariate Ecological Research) statistical package. Sample plots were grouped, according to landform, into five main classifications:

- Stony Plain;
- Sandy Plain;
- Drainage Flat/Creekline;
- Stony Hills; and
- Ridgeline.

Species data was presented as present/absent for each plot. A ranked lower triangular similarity matrix and dendogram was constructed using the Bray-Curtis similarity measure to assist in determining vegetation units. Ordination was by non-metric multidimensional scaling (MDS) (Kruskal and Wish, 1978; Clarke and Green, 1988). A formal significance test for differences between groups of samples was performed using the ANOSIM permutation test (Clark, 1993).

3.4 Vegetation Descriptions

Within each survey plot, the life-form strata and percentage cover of each stratum was described using the structural formation and height classes based on Specht (1970) with modification by Aplin (1979) and Trudgen (1991) (Appendix C). The multivariate analysis, aerial photography and field observations were used to group the floristic survey sites into like vegetation types based on dominant species, overall species richness and topography. These plot vegetation type descriptions are presented in Section 4.2 Vegetation Types – Descriptions.

3.5 Vegetation Mapping

Ground truthing and cluster analysis of the data (using PRIMER) were used to assist in determining vegetation types. The boundaries of vegetation types were identified and marked on aerial photography for plotting. Mapping of the vegetation types of E45/2226 and EA45/2825 was undertaken at a scale of 1:20,000. The location of floristic survey sites is presented along with the fire-scar boundary from the February 2005 bushfire that passed across the western section of E45/2226.

3.6 Limitation of Survey

The EPA (2004) lists a number of possible limitations and constraints that may impinge on the adequacy of flora and vegetation surveys. These are replicated in the table below with an assessment relating to the current survey undertaken by Outback Ecology Services.

Table 8 Summary of Potential Flora and Vegetation Survey Constraints

Aspect	Constraint?	Comment Regarding Current Survey
Competency/experience of consultants	No	Members of the survey team (field and specimen identification) were experienced flora specialists with previous Pilbara experience.
Scope	No	All vegetation types were sampled using a standardised and well known survey technique. Searches were undertaken for Priority and Rare Flora.
Proportion of flora identified	No	Of the specimens collected, very few remained identified only to genus. A very high proportion of the perennial flora across the project area was sampled. Annual/ephemeral species were not common at the time of the July 2005 survey. However, the April 2006 survey returned a high proportion of annual/ephemeral species.
Information sources (eg historic or recent)	No	Surveys have been conducted in the region predominantly for mining approvals. Recent flora survey work undertaken in close proximity to the survey site (50km).
Proportion of task achieved, and further work which might be needed	No	Task achieved through the assessment of 62 floristic survey sites across the project area on varying landforms/ topography.
Timing / weather / season / cycle	Limited	The survey of E45/2226 was conducted in late July 2005 during the 'dry season'. However, over 90mm of rainfall (in a 24 hour period) was recorded two weeks prior to the survey. A general greening of vegetation was noted but annual/ephemeral species were not common at the time of survey. Prior to this, the area had experienced 13 months of below average rainfall. The survey of the extended footprint area to the north of E45/2226 was conducted in late April 2006 after a significant cyclone season. Annual/ephemeral species were common. Sites from the E45/2226 survey were revisited to locate any annual/ephemeral species.
Disturbances	Limited	Inappropriate fire regimes (for biodiversity management), and recent/frequent burns in particular have impacted vegetation of the site. However, the survey results are a reflection of current land management practices
Intensity	No	Fieldwork was 18 person days with 62 floristic sites assessed and the survey is believed to have been of an adequate intensity.
Completeness	No	Survey was complete. Project area was adequately covered geographically
Resources	No	Resources were adequate to carry out the survey satisfactorily.
Remoteness / access problems	No	All representative areas to be sampled were accessible by vehicle or foot. Some survey sites on upper slopes of hills/ridges difficult to access safely. Southern face of basalt hills (located south of Talga Range) difficult to access (no vehicle access, steep terrain) however, visual assessment and aerial photography indicates vegetation of these s slopes is uniform with accessible areas surveyed.
Availability of contextual information	No	Information on the IBRA subregion and flora of the area available.

4.0 VEGETATION

4.1 Summary of Vegetation Types

The vegetation types presented here have generally been identified to "association level" with the dominant growth form, height, cover and species (three species) of the three traditional strata (upper, mid and ground) presented, as defined in the National Vegetation Information System (NVIS) by the Department of Environment and Heritage (DEH, 2003).

A total of 24 vegetation types were identified across the project area. These have been grouped according to landform/location and include: drainage flats and creeklines; plains (stony and sandy) and stony hills/ridgeline and are mapped in Figure 7. The latter landforms (stony hills and ridgeline) were grouped together after the cluster analysis determined the species composition of these areas to be very similar.

4.2 Vegetation Types – Descriptions

4.2.1 Drainage Flats and Creeklines

D1 *Triodia longiceps* hummock grassland. Occurred on shallow drainage lines and flats of the plains area and on the edge of Coppins Creek, north of Coppins Gap. (Sites SR2, SR5 and SR57). Other species: *Pluchea tetranthera, P. ferdinandi-muelleri, P. rubelliflora*, *Cyperus vaginatus, Cassytha filiformis*. **Cenchrus ciliaris* present in drainage lines.

D2 *Eucalyptus camaldulensis* var. *obtusa* open woodland to open forest over *Melaleuca argentea / M. glomerata / Atalaya hemiglauca / Terminalia canescens* and *Ficus brachypoda* low woodland to low open forest over mixed *Acacia* high open shrubland over *Cyperus vaginatus* open sedges. (Sites SR31 and SR33).

Vegetation associated with Coppins Gap and the creekline immediately south. Species include: *Acacia pyrifolia, A. trachycarpa, A. ampliceps* and *A. coriacea* ssp. *pendens, Sesbania formosa* and *Cymbopogon procerus*. **Cenchrus ciliaris* is also present.

D3 *Eucalyptus camaldulensis* var. *obtusa* / *E. vitrix* open woodland to woodland over *Melaleuca glomerata / Acacia ampliceps / Acacia coriacea* ssp. *pendens* and *Acacia tumida* var. *pilbarensis* low open woodland to woodland over *Cyperus vaginatus* very open sedges over *Triodia longiceps* hummock grassland. (Sites SR04, SR07 and SR51).

This vegetation occurs along Coppin Creek. *Triodia longiceps* occurs in patches along the creekline. **Cenchrus ciliaris* dominates the understorey of the creekline in areas north of Coppin Gap. Other species: *Acacia inaequilatera, A. pyrifolia* and *Hakea lorea* ssp. *lorea*.

D4 *Terminalia canescens* and *Corymbia hamersleyana* low woodland over *Acacia tumida* var. *pilbarensis* / *A. inaequilatera* / *A. pyrifolia* high shrubland over *Cymbopogon procerus* and *Eriachne mucronata* open tussock grassland. (Site SR28, Kittys Gap).

This vegetation occurs in the creekline of Kittys Gap. Other species: *Carissa spinarum, Petalostylis labichioides, Ficus brachypoda* and *Cyperus vaginatus.*

D5 *Corymbia hamersleyana* low open woodland over *Acacia tumida* var. *pilbarensis* / *A. pyrifolia* open scrub to high open shrubland over *Triodia epactia* hummock grassland. (Sites SR08, SR11 and SR25).

This vegetation is associated with the narrow drainage lines of the basalt hills. Other species: *Goodenia stobbsiana, Corchorus parviflorus, Indigofera monophylla, Cajanus cinereus, Stemodia viscosa* and *Grevillea wickhamii* ssp. *hispidula*. **Cenchrus ciliaris* present.

D6 *Eucalyptus camaldulensis* var. *obtusa* open woodland over *Corymbia hamersleyana* low open woodland over *Tephrosia rosea* var. *clementii* shrubland over *Stemodia viscosa* open herbs over *Triodia epactia* open hummock grassland. (Site SR18).

This vegetation is located in the main tributary of the creekline that runs east-west within the valley. Other species: *Pluchea tetranthera, Cyperus vaginatus, Isotropis atropurpurea, Cymbopogon procerus* and *Grevillea wickhamii* ssp. *hispidula*.

D7 *Acacia tumida* var. *pilbarensis* open scrub to high shrubland over *Triodia epactia* open hummock grassland along drainage lines. (Site SR38 and SR52). Other species: occasional *Corymbia hamersleyana*.

D8 *Corymbia flavescens* and *Bauhinia cunninghamii* low open woodland over mixed *Acacia* open scrub over *Cyperus vaginatus* sedges over **Cenchrus ciliaris* open tussock grassland over mixed very open herbs. (Site SR37).

D9 *Corymbia flavescens* low open woodland over *Acacia tumida* var. *pilbarensis* open scrub over *Sida rohlenae* ssp. *rohlenae* low open heath over *Triodia epactia* open hummock grassland. (Site SR40)

D10 *Acacia tumida* var. *pilbarensis* and *Crotalaria cunninghamii* high open shrubland over *Pluchea ferdinandi-muelleri* and *Pluchea tetranthera* low shrubland over scattered herbs and grasses. (Site SR35).

D11 *Acacia ampliceps* low closed woodland over *Triodia epactia* open hummock grassland (no survey site, described while traversing the creekline. Area is approximately 1hectare in size).

4.2.2 Plains

Stony Plains

P1 *Acacia inaequilatera* high shrubland to scattered shrubs over *Triodia epactia* hummock grassland. (Sites SR01, SR03, SR06, SR14, SR15, SR41, SR42 and SR43).

This vegetation is associated with the plains to the south and north of the Talga Range and includes areas containing granite boulders, rocky plains and sandy areas. Other species: *Acacia bivenosa, A. pyrifolia, Grevillea wickhamii* ssp. *hispidula, Pluchea tetranthera, Pluchea ferdinandi-muelleri, Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601) and *Bulbostylis barbata*.

P2 *Acacia inaequilatera* high open shrubland to scattered shrubs over *Triodia wiseana* hummock grassland with some *Triodia epactia*. (Sites SR34, SR46, SR53, SR55, SR58, SR59 and SR61). Other species: *Grevillea pyramidalis* ssp. *leucadendron, Grevillea wickhamii* ssp. *hispidul* and *Corchorus incanus.* This vegetation is located in areas with a covering of quartz fragments.

Sandy Plains

P3 *Acacia victoriae* open scrub to open shrubland over *Pluchea tetranthera* low open shrubland over *Triodia epactia* hummock grassland. (Sites SR50 and SR54). Other species: *Pluchea ferdinandi-muelleri.*

P4 *Acacia tumida* var. *pilbarensis* and *Grevillia pyramidalis* ssp. *leucadendron* open shrubland to scattered tall shrubs over *Corchorus sidoides* ssp. *sidoides* low open heath to shrubland over *Triodia epactia* hummock grassland. (Site SR39, SR45, SR49 and SR62). Other species: *Acacia trachycarpa, Acacia victoriae, Cullen pustulatum* and *Indigofera monophylla.*

P5 *Pluchea tetranthera* low open shrubland over *Triodia epactia* open hummock grassland over *Sporobolus actinocladus* tussock grassland. (Site SR48).

P6 *Pluchea tetranthera* low open shrubland over *Triodia epactia* hummock grassland. (Site SR44).

P7 Mixed annual tussock grasses in scald area. (Site SR60). Species include: *Chloris pectinata, Dactyloctenium radulans, Iseilema membranaceum* and *Sporobolus australasicus.*

P8 *Acacia stellaticeps* low open heath over *Triodia epactia* hummock grassland. (Site SR56).

P9 Mixed *Grevillea* and *Acacia* scattered tall shrubs over *Triodia epactia* hummock grassland. (Sites SR36 and SR47). Species include: *Grevillia pyramidalis* ssp*. leucadendron, Acacia tumida* var. *pilbarensis, A. inaequilatera* and *G.wickhamii* ssp. *hispidula.*

4.2.3 Stony Hills/Ridgeline

H1 *Acacia inaequilatera* scattered tall shrubs to high open shrubland over mixed *Corchorus parviflorus* / *Indigofera monophylla* / *Tephrosia* spp. / *Ptilotus calostachyus* low scattered shrubs to low open shrubland over *Triodia epactia* hummock grassland. (Sites SR09, SR10, SR12, SR13, SR16, SR19, SR20, SR21, SR22, SR23, SR26, SR27 and SR29).

Dominant vegetation type of the Talga Range and hills. Some variation in low shrubland composition across the survey site. Other species: *Grevillea wickhamii* ssp. *hispidula, Goodenia stobbsiana, Acacia ptychophylla*, *Sida ?calyxhymenia* and *Solanum lucani.*

H2 *Eucalyptus leucophloia* ssp. *leucophloia* scattered low trees to low open woodland with occasional *Corymbia hamersleyana* over *Acacia inaequilatera* open shrubland over *Triodia epactia* hummock grassland. (Sites SR24 and SR32).

Occurs on the southern faces of the Talga Range and basalt hills. Other species: *Indigofera monophylla, Corchorus parviflorus, Goodenia stobbsiana, Dampiera candicans* and *Triodia brizoides.*

H3 *Ficus brachypoda* / *Atalaya hemiglauca* low open woodland over *Dodonaea viscosa* ssp. *mucronata* scattered shrubs to open shrubland over *Cymbopogon procerus* / *Eriachne mucronata* open tussock grassland.

Occurs along the top of the Talga Range in areas where a rock face is present. (No survey sites were located within the vegetation type. Described during assessment of adjacent upper slope survey site. Other species: *Cheilanthes austrotenuifolia* and *Solanum lucani.*

H4 *Eucalyptus leucophloia* ssp. *leucophloia* low woodland over *Acacia inaequilatera* scattered shrubs to high open shrubland over *Acacia ptychophylla* / *Corchorus parviflorus* low open shrubland over *Triodia brizoides* / *T. epactia* hummock grassland. (Sites SR17 and SR30).

Occurs in sections along southern face of the Talga Range. Other species: *Grevillea wickhamii* ssp. *hispidula, Goodenia stobbsiana, Acacia pyrifolia, Triumfetta appendiculata* and *T. clementii.*

4.3 Statistical Analysis of Vegetation Data

In the multi-dimensional scaling (MDS) ordination of survey sites, the degree of similarity between sample sites is reflected in the distances between them, and therefore it is the position of sites relative to each other that is important and axes are not shown (Figure 6).

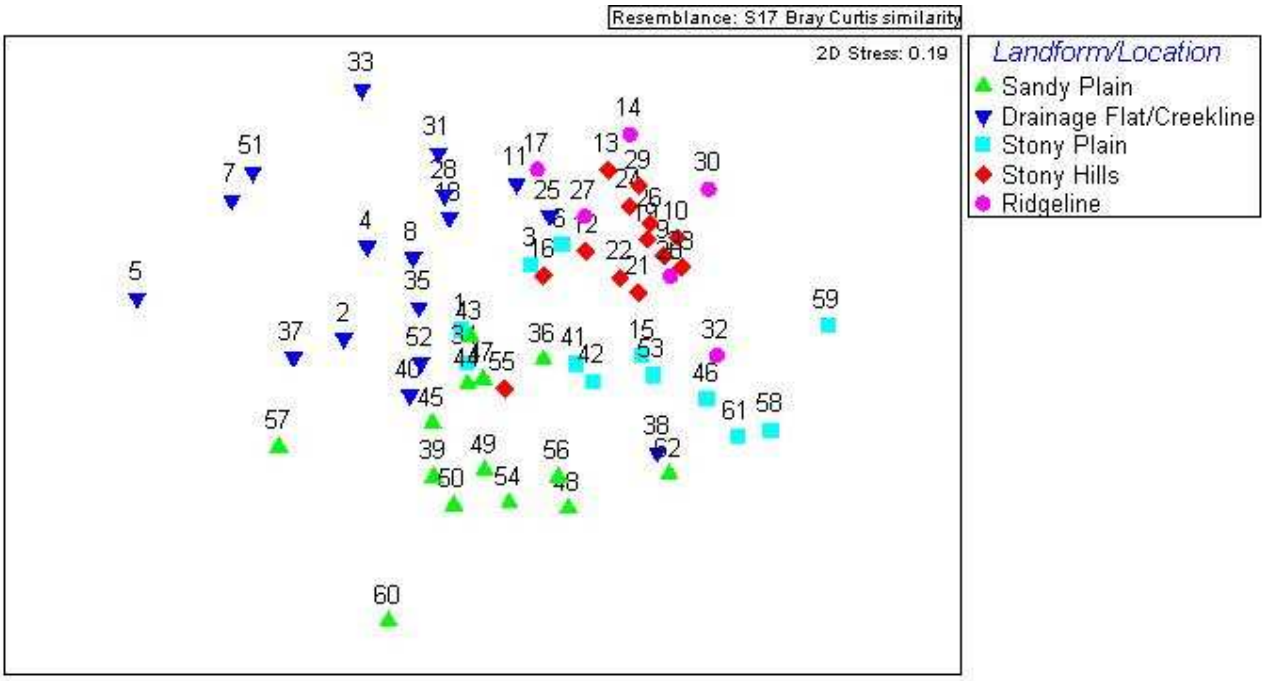


Figure 6 Multi-dimensional scaling (MDS) ordination of flora survey sites based on similarity of flora species composition. Symbols depict generalized landform/location types in which survey sites were placed.

ANOSIM confirms that the plots on the sandy plain in comparison to those of the stony hills and ridgeline displayed the highest level of variation in species composition. The most similar level of species composition of different landforms was between the plots of the stony hills and those of the ridgeline (Figure 6), resulting in their grouping together (Section 4.2.3 Stony Hills/Ridgeline). The data analyzed was limited to species presence/absence rather than density or cover values, hence the groupings indicated in Figure 6 and 7 are based on species composition rather than species dominance. The results of these analyses were used to assist in determining vegetation types.

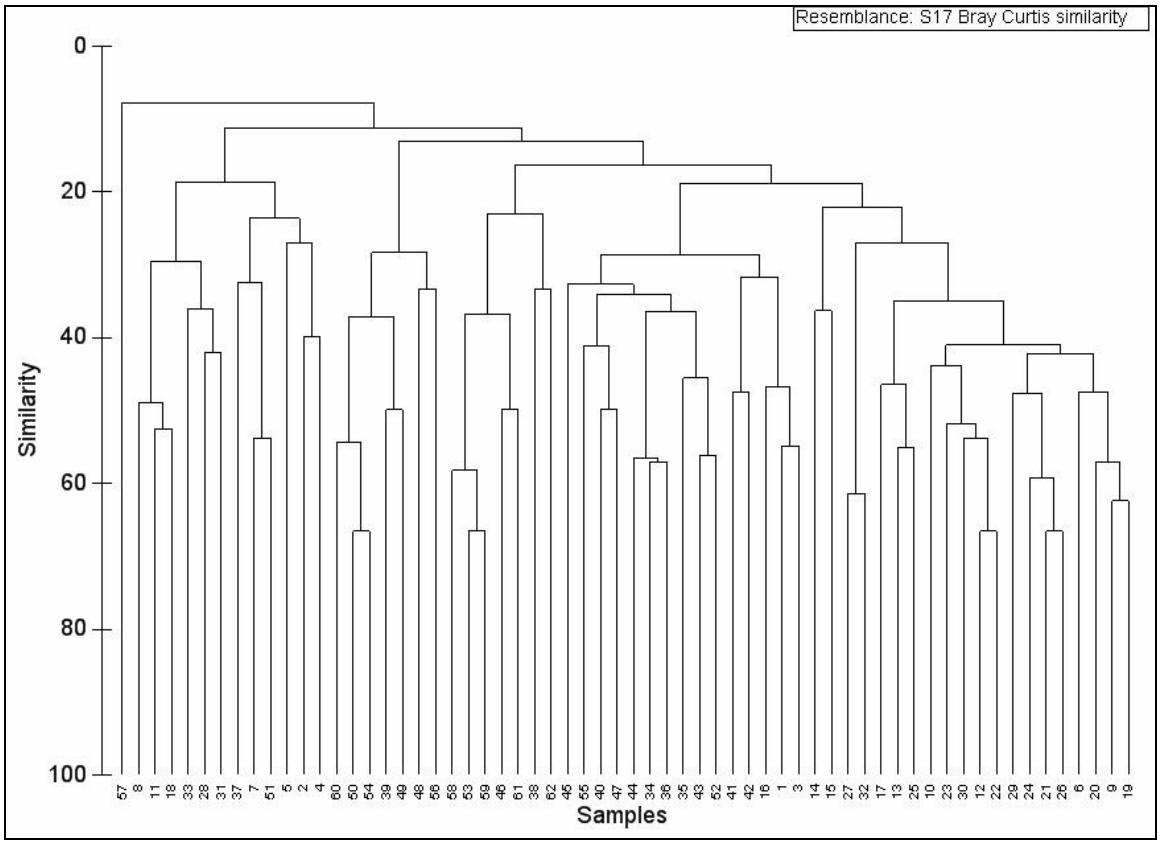
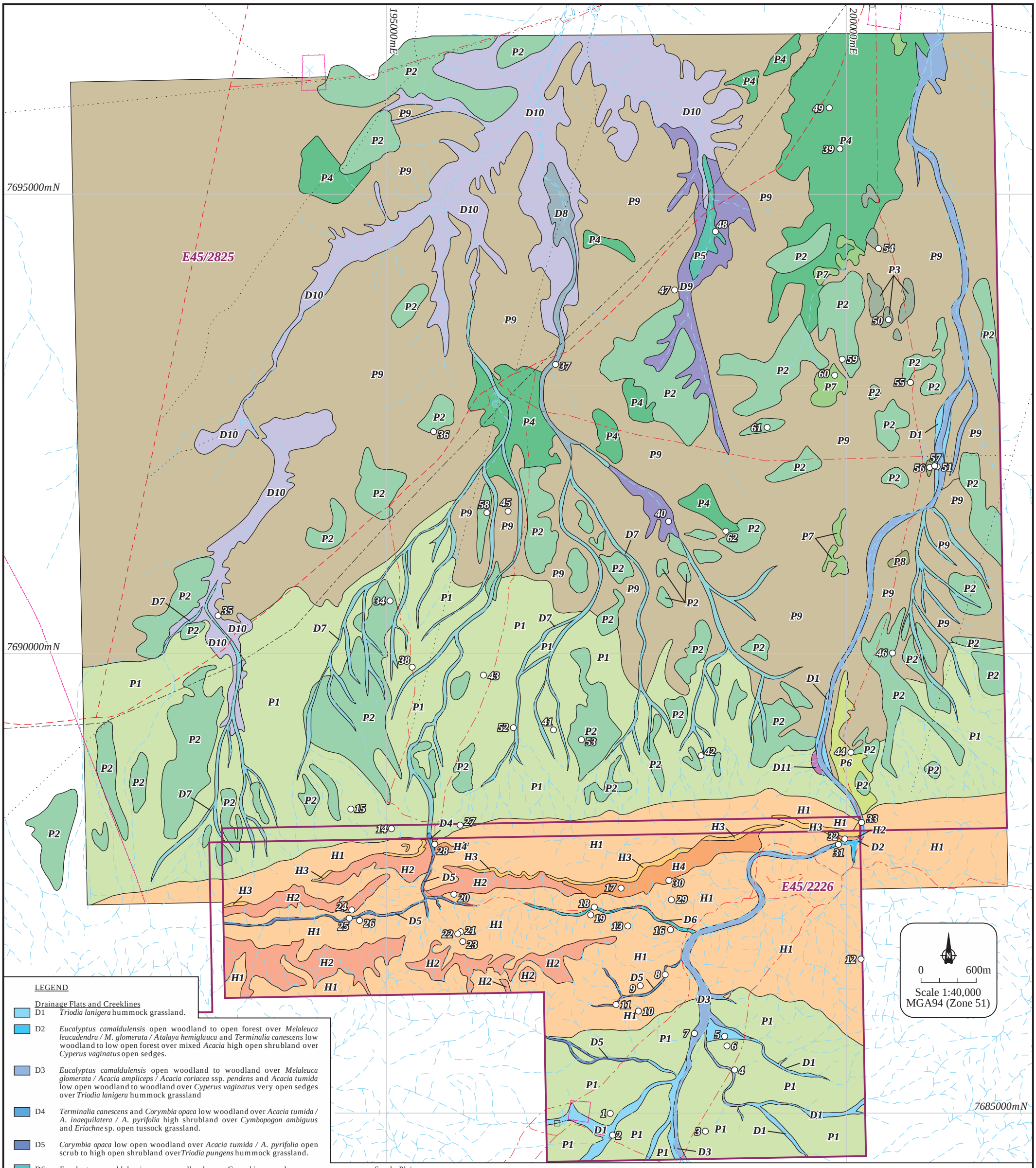


Figure 7 Dendrogram showing the relationship between survey sample sites based on species composition.



LEGEND

Drainage Flats and Creeklines

D1 *Triodia lanigera* hummock grassland.

D2 *Eucalyptus camaldulensis* open woodland to open forest over *Melaleuca leucadendra / M. glomerata / Atalaya hemiglauca* and *Terminalia canescens* low woodland to low open forest over mixed *Acacia* high open shrubland over *Cyperus vaginatus* open sedges.

D3 *Eucalyptus camaldulensis* open woodland to woodland over *Melaleuca glomerata / Acacia ampliceps / Acacia coriacea* ssp. *pendens* and *Acacia tumida* low open woodland to woodland over *Cyperus vaginatus* very open sedges over *Triodia lanigera* hummock grassland

D4 *Terminalia canescens* and *Corymbia opaca* low woodland over *Acacia tumida / A. inaequilatera / A. pyrifolia* high shrubland over *Cymbopogon ambiguus* and *Eriachne* sp. open tussock grassland.

D5 *Corymbia opaca* low open woodland over *Acacia tumida / A. pyrifolia* open scrub to high open shrubland over *Triodia pungens* hummock grassland.

D6 *Eucalyptus camaldulensis* open woodland over *Corymbia opaca* low open woodland over *Tephrosia rosea* shrubland over *Stemodia viscosa* open herbs over *Triodia pungens* open hummock grassland.

D7 *Acacia tumida* open scrub to high shrubland over *Triodia pungens* open hummock grassland along drainage lines.

D8 *Corymbia ?flavescens* and *Bauhinia cunninghamii* low open woodland over mixed *Acacia* open scrub over *Cyperus vaginatus* sedges over *Cenchrus ciliaris* open tussock grassland over mixed very open herbs.

D9 *Corymbia ?flavescens* low open woodland over *Acacia tumida* open scrub over *Sida rohlenae* ssp. *rohlenae* low open heath over *Triodia pungens* open hummock grassland.

D10 *Acacia tumida* and *Crotalaria cunninghamii* high open shrubland over *Pluchea ferdinandi-muelleri* and *Pluchea tetranthera* low shrubland over scattered herbs and grasses.

D11 *Acacia ampliceps* low closed woodland over *Triodia pungens* open hummock grassland (no survey site, described while traversing the creekline. Area is approximately 1hectare in size).

Plains

Stony Plains

P1 *Acacia inaequilatera* high shrubland to scattered shrubs over *Triodia pungens* hummock grassland.

P2 *Acacia inaequilatera* high open shrubland to scattered shrubs over *Triodia wiseana* hummock grassland with some *Triodia pungens.*

Sandy Plains

P3 *Acacia victoriae* open scrub to open shrubland over *Pluchea tetranthera* low open shrubland over *Triodia pungens* hummock grassland.

P4 *Acacia tumida* and *Grevillia pyramidalis* open shrubland to scattered tall shrubs over *Corchorus sidoides* low open heath to shrubland over *Triodia pungens* hummock grassland.

P5 *Pluchea tetranthera* low open shrubland over *Triodia pungens* open hummock grassland over *Sporobolus actinocladus* tussock grassland.

P6 Pluchea tetranthera low open shrubland over *Triodia pungens* hummock grassland.

P7 Mixed annual tussock grasses in scald area.

P8 *Acacia stellaticeps* low open heath over *Triodia pungens* hummock grassland.

P9 Mixed *Grevillea* and *Acacia* scattered tall shrubs over *Triodia pungens* hummock grassland.

Stony Hills / Ridgeline

H1 *Acacia inaequilatera* scattered tall shrubs to high open shrubland over mixed *Corchorus parviflorus / Indigofera monophylla / Tephrosia spp. / Ptilotus calostachyus* low scattered shrubs to low open shrubland over *Triodia pungens* hummock grassland.

H2 *Eucalyptus leucophloia* scattered low trees to low open woodland with occasional *Corymbia opaca* over *Acacia inaequilatera* open shrubland over *Triodia pungens* hummock grassland.

H3 *Ficus brachypoda / Atalaya hemiglauca* low open woodland over *Dodonaea lanceolata* scattered shrubs to open shrubland over *Cymbopogon ambiguus / Eriachne* sp. open tussock grassland.

H4 *Eucalyptus leucophloia* low woodland over *Acacia inaequilatera* scattered shrubs to high open shrubland over *Acacia ptychophylla / Corchorus parviflorus* low open shrubland over *Triodia brizoides / T. pungens* hummock grassland.

FLORA SURVEY SITE

VEGETATION SURVEY SPINIFEX RIDGE PROJECT AREA

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Drawn: CAD Resources ~ www.cadresources.com.au Tel: (08) 9246 3242 ~ Fax: (08) 9246 3202		Figure: 8
CAD Ref: g1342Fig1_Veg.dgn	Date: Sept 2006	Rev: A A3

4.4 Vegetation Condition

Approximately 20% of E45/2226 had been burnt in a February 2005 bushfire. This included a significant proportion of Coppin Creek which runs north-south and feeds into Coppin Gap, an area of the plains, and a section of the basalt hills lying south of the Talga Range. At the time of the July 2005 survey, some level of germination/resprouting was evident, mainly in Coppin Creek, but these areas were avoided during the positioning of floristic survey sites.

The project area as a whole has been subject to a possible four fires within the last eight years. Examination of the Department of Land Information Satellite Remote Sensing Services Fire Scar Database, which maps the boundaries of fires within WA (to an accuracy of 1km) that occurred from 1989 till present, indicates that fire may have passed through the survey area in January 2002, December 2000 and October 1997. The January 2002 fire appears to have burnt the majority of E45/2226 and an area of EA45/2825 immediately north of the Talga Range as most *Triodia* hummocks encountered within these areas were small (20cm x 20cm) with the vegetation having a low litter load. Exceptions within E45/2226 were Coppin Creek, small patches of the plain and sections of the southern face of the Talga Range.

An area surrounding the stock bore Kitty's Well, located in the south-west corner of E45/2226 was particularly degraded, as expected for a permanent stock watering point. Cattle grazing was most evident in the drainage flats and creekline where more palatable plant species occur. Included in this category is **Cenchrus ciliaris* (Buffel grass) which was widespread along Coppin Creek. Buffel grass was absent from the stony hills and ridgeline, where the stony substrate generally discourages the growth of weed species. Seven other weed species were recorded within the surveyed area, the majority of which were restricted to Coppin Creek (upstream of Coppin Gap).

The vegetation of the Capricorn, Rocklea and Talga land systems (which encompass the Talga Range and hills of the project area) are poorly accessible to livestock and support vegetation (*Triodia*) which is not preferred for grazing. Similarly, the mature spinifex on the plains of the Macroy land system is not preferred by grazing animals, but post-fire younger stands are palatable.

Vegetation occurring over the orebody has been cleared during ongoing drilling programmes within the last 23 years. Vehicle tracks are present over the project area, some of which are used not only by mining and station personnel, but also visiting tourists. These tracks are generally narrow.

The condition of the floristic survey plots was generally considered to be 'very good' to 'excellent' using the Keighery (1994) condition scale, with some areas (particularly the upper slope of Talga Range) considered 'pristine' (Appendix B). In general, the vegetation is not prone to grazing-induced changes, but frequent fire has the propensity to modify botanical composition and vegetation structure.

4.5 Conservation Significance of Vegetation Types

4.5.1 Corresponding Land System Vegetation Types

In order to determine approximately how widespread the vegetation types recorded within the Spinifex Ridge Project area are across the Pilbara region, a comparison was made with the vegetation site types of the rangeland survey of the Pilbara conducted by the Agriculture Department of WA (Van Vreeswyk *et al.* 2004) (Table 9). It is recognised that the land system vegetation site types contain a high degree of variation in the vegetation associations they represent, however, the vegetation types identified in the Spinifex Ridge survey fell within these descriptions.

The majority of vegetation types of the plains of the Spinifex Ridge survey area correlate to 'plain soft spinifex grassland' which is the second most widespread site type across the Pilbara. The exception is the P2 vegetation type which correlates with the 'plain hard spinifex grassland' which is the dominant site type of 20 land systems across the Pilbara. The hills and ridgeline vegetation types (H1 to H4) of Spinifex Ridge correlate with 'hill spinifex grassland' which is dominant across the Capricorn, Talga and Rocklea land systems (which account for 17% of the Pilbara survey region) and 11 other land systems of the Pilbara (Van Vreeswyk *et al.* 2004).

The vegetation types of the Spinifex Ridge drainage lines are more varied but still correlate with four vegetation site types of the rangeland survey. This includes 'alluvial plain hard spinifex' which is a minor site type of 14 land systems, and the major type of the Cheerawarra land system (which accounts for only 0.1% of the Pilbara survey area) and corresponds to the D1 vegetation type of the Spinifex Ridge survey. The D4 and D8 vegetation types best match that of the 'drainage eucalypt and acacia grassy woodland' which is the most extensive site type on the Coolibah land system (which accounts for 0.6% of the Pilbara survey area) and is common on the Fortescue land system (0.3% of the Pilbara). The D5 and D6 vegetation types correspond to 'drainage spinifex grassland with eucalypt overstorey' which occurs as a component on 12 land systems. The vegetation associated with Coppin Gap and Coppin Creek immediately south (D2 and D3) best matches that of the 'gallery melaleuca eucalypt woodland' which is described as occurring along the banks and channels of major rivers in the Pilbara. Although the creekline is not a major channel, the vegetation around the Coppin Gap, best matches this vegetation site type. 'Gallery melaleuca eucalypt woodland' is a minor component on the Cane, Fortescue, River and Yamerina land systems. The D5, D6 and D9 vegetation types best correlate with the 'drainage spinifex grassland with eucalypt overstorey' which occurs as a minor component on 12 land systems within the Pilbara. The D7 and D10 vegetation types match the 'drainage acacia hummock grass shrubland/woodland' which is widespread, occurring as a minor component on 36 land systems within the Pilbara (Van Vreeswyk *et al.* 2004).

From the correlation with land system information, it appears that the vegetation types described in the Spinifex Ridge survey are relatively widespread across the Pilbara region. All are present within the conservation reserves of the Pilbara. However, it is recognised that the vegetation associated with Coppin Gap and Coppin Creek is an important refuge for native fauna.

Table 9 Corresponding land system vegetation types (Van Vreeswyk *et al.* 2004) of the Spinifex Ridge vegetation descriptions.

Spinifex Ridge Survey Veg Type	Corresponding Veg Site Type (Van Vreeswyk, *et al.* 2004)		
	Code	Description	Distribution
P1 P3 P4 P5 P6 P7 P8 P9	PSSG	Plain soft spinifex grassland	Occurs extensively on stony plains and loamy plains throughout the Pilbara. Second most common site type. PSSG is well represented in conservation reserves (Karijini-Chichester National Parks, Cane River Nature Reserve and the Meentheena pastoral lease. Occurs extensively on unallocated crown land.
P2	PHSG	Plain hard spinifex grassland	Dominant site type of 20 land systems within the Pilbara. Co-dominant site type (with PSSG) within the Macroy land system. PHSG is well represented in conservation reserves (Karijini-Chichester National Parks, Cane River Nature Reserve and the Meentheena pastoral lease. Occurs extensively on unallocated crown land.
H1 H2 H3 H4	HSPG	Hill spinifex grassland	Dominant site type of Capricorn, Talga and Rocklea land systems and 11 other land systems of the Pilbara. HSPG is represented in conservation reserves (Karijini National Park and Meentheena). Occurs extensively on unallocated crown land.
D1	AHSG	Alluvial plain hard spinifex grassland	Major site type on Cheerawarra land system and a minor site type on 14 others. Minor component of Cane, Fortescue River and Yamerina land systems. Recorded on Cane River Nature Reserve and on Meentheena and on unallocated crown land.
D2 D3	GMEW	Gallery melaleuca eucalypt woodland	Minor component on Cane, Fortescue, River and Yamerina land systems. Represented in the Karijini and Millstream-Chichester National Parks. Well represented on unallocated crown land.
D4 D8	DEGW	Drainage eucalypt and acacia grassy woodland	Minor component of 16 land systems. Represented in national parks and other reserves in the Pilbara and is common on unallocated crown land.
D5 D6 D9	DESG	Drainage spinifex grassland with eucalypt overstorey	Occurs as a minor component on 12 land systems. Represented in Millstream-Chichester National Park and Meentheena and on unallocated crown land.
D7 D10	DAHW	Drainage acacia hummock grass shrubland/woodland	Widespread and occurs as a minor component on 36 land systems (1/3 of all land systems in the Pilbara). Well represented in conservation reserves (Karijini National Park and Meentheena) and on unallocated crown land.

4.5.2 Corresponding Vegetation Types of Regional Surveys

A comparison of the vegetation types of the Spinifex Ridge survey was also made with those of the BHP Billiton Goldsworthy Extension Project Biological Assessment Survey (BHPB, 2005) which was located less than 50km north of Spinifex Ridge. Due to the detailed description of vegetation types to association level, there was no exact match between the vegetation descriptions. However, on a more broad scale, there was some correlation between the vegetation community types of the four survey areas (Yarrie, Nimingarra, Cattle Gorge and Sunrise Hill) and those of Spinifex Ridge.

A total of 188 taxa were recorded within the Spinifex Ridge project area. Across the Goldsworthy Extension Project area, a total of 444 taxa were identified. However, the total survey area of these sites was much larger than that of the Spinifex Ridge survey. In addition to the Capricorn and Macroy land systems, which are common to the Spinifex Ridge project area, the Goldsworthy Extension Project also appears to encompass two other land systems (Boolgeeda and Callawa), with a distance of approximately 40km between the Nimingarra and Yarrie survey sites. Individually, the four survey areas (Yarrie, Nimingarra, Cattle Gorge and Sunrise Hill) reported levels of species richness comparable to that of the Spinifex Ridge project area (Table 10).

In total, 65% (122) of the taxa recorded within the Spinifex Ridge project area were also recorded within one or more of the Goldsworthy Extension Project surveys. An individual comparison with each of these surveys indicates that between 31 - 42% of the taxa identified at Spinifex Ridge were also recorded at each of the Yarrie, Nimingarra, Cattle Gorge and Sunrise Hill surveys which may be a reflection of the different land systems occurring there.

Table 10 Species richness of Goldsworthy Extension Project surveys in comparison to the Spinifex Ridge survey.

Survey area	Number of taxa	Number of taxa common to Spinifex Ridge	% of Spinifex Ridge taxa common to survey area
Yarrie	209	68	36%
Sunrise Hill	201	80	42%
Nimingarra	183	74	40%
Cattle Gorge	126	58	31%

5.0 FLORA

5.1 Summary of Flora

A total of 188 plant taxa (including subspecies and varieties) were identified within the Spinifex Ridge project area. Of the 188 taxa, 58 species (approximately 31%) were considered annual (as listed by FloraBase, 2006). The 188 taxa were from 42 families and 101 genera. Due to an absence of reproductive material or poor vegetation condition, six taxa were identified only to family or genus level. The Poaceae, Papilionaceae and Mimosaceae families were dominant across the survey area (Table 11) with *Acacia* being the most common genus (Table 12).

Table 11 Summary of dominant plant families within the Spinifex Ridge survey area.

Family	Number of Taxa
Poaceae	28
Papilionaceae	27
Mimosaceae	14
Euphorbiaceae	9
Amaranthaceae	9
Convolvulaceae	8
Myrtaceae	8

Across the survey area the most widespread species included: *Triodia epactia, T. wiseana, Acacia inaequilatera, Grevillea wickhamii* ssp. *hispidula, Goodenia stobbsiana* and *Bulbostylis barbata.* The floristic sites that displayed the highest level of species richness were associated with the drainage areas and creekline while the remaining sites were predominantly spinifex steppes, and as expected, displayed lower levels of species diversity.

Table 12 Summary of dominant genera within the Spinifex Ridge survey area.

Genus	Number of Taxa
Acacia	13
Tephrosia	5
Ptilotus	6
Corchorus	5
Eriachne	5
Euphorbia	5
Tephrosia	5

5.2 Introduced Flora

A total of eight weed species were located within the surveyed project area, one of which is a Declared Plant species (as listed by the Department of Agriculture and Food, WA). **Datura leichhardtii* (Native Thornapple) is classified as either Priority 1, 3 or 4 across much of the state, the exception being the Pilbara region where it appears relatively widespread. This species was not common across the survey site with a single plant recorded within the area surveyed along Coppin Creek.

As discussed in Section 4.4, **Cenchrus ciliarus* (Buffel grass) was widespread within Coppin Creek. This species is known to be well established in the adjacent Meentheena Conservation Park (Kendrick and McKenzie, 2001). Other weed species included **Aerva javanica* (Kapok bush) which was identified along Coppin Creek, a tributary and on an isolated small outcrop north of the Talga Range.

Also located along Coppin Creek (south of Coppin Gap) was **Citrullus colyocynthis* (a melon weed), **Passiflora foetida* (Stinking Passion Flower), **Malvastrum americanum* (Spiked Malvastrum) and **Chloris virgata* (Feathertop Rhodes Grass). These species did not appear widespread at the time of assessment. The species **Echinochloa colona* (Awnless Barnyard Grass) was identified along a drainage line to the north of the ridgeline. This species is native to Africa and Asia and is a widespread weed of creeks, swamps and irrigated crops in the Kimberley and Pilbara regions (Hussey, *et al.* 1997).

5.3 Conservation Significance of Flora

5.3.1 Declared Rare and Priority Flora

No Rare or Priority Flora species were identified during the survey of the Spinifex Ridge project area. However, it is recognised that much of E45/2226 is recovering from the effects of recent fires which may have caused short term changes in botanical composition. There are 21 Priority and 1 Declared Rare Flora that have been previously sampled within a radius of 210km of the project area (Table 6). This includes five Priority species that have been collected within 50km of the project area.

The closest previously sampled Priority species is *Euphorbia clementii* (P2), identified approximately 17km west of Spinifex Ridge. This species favours gravelly hillsides and stony grounds and is described as an erect herb to 0.6m high. The species has the potential to occur within the vicinity of the project area. *Bulbostylis burbidgeae* (P3) has been previously sampled approximately 43km from Spinifex Ridge and favours granitic soils and granite outcrops. Given that the plains of the project area are of granitic origin, there is potential for this species to occur. *Fimbristylis* sp. Shay Gap (P2) has been identified 44km north of the project area on sandy soils of drainage lines and again, there is potential for this species to occur over the project area. *Gymnanthera cunninghamii* (P3) has previously been sampled 47km from Spinifex Ridge in sandy soils. There are both sandy and stony plains within the project area. *Phyllanthus aridus* (P3) favours sandstone, gravel and red sand with the nearest population being 45km from the project area. Given the preferred habitat, and that the majority of specimens have been sampled from the Kimberley region, there appears a reduced likelihood of this species occurring over the project area.

5.3.2 Species of Interest

One species of interest was collected from the project area, *Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601). This species has yet to be formerly described but is identified as a spreading, bushy shrub, 0.1 – 0.6 (0.9) m high with orange/red flowers that occur from April to September. It favours red sand, stony sandy soils, plains, sand dunes and low rocky ridges (WA Herbarium, 2005). This species has been identified within the Vegetation and Flora Survey of the Brockman Syncline 4 Project Area, near Tom Price (Biota, 2005) and during the survey of the proposed Goldsworthy Extension Project (BHPB, 2005).

Triumfetta maconochieana ms, formerly a Priority 2 species but now removed from priority listings, was identified during the survey.

6.0 ENVIRONMENTAL IMPACTS AND MANAGEMENT

6.1 Potential Impacts of Proposal

The Spinifex Ridge Molybdenum Project is in an early design stage of development and detail of location, design, scale and management are preliminary. However, five elements are being considered, with an expected footprint of approximately 1,400ha. That is, the establishment of:-

- An open cut mine at the identified ore body;
- A mining camp;
- Associated mine plant and infrastructure including airstrip;
- A tailings storage facility (TSF);
- Waste landforms; and
- A watercourse diversion, of approximately 900 metres, to Coppin Creek

Impacts to vegetation may include:-

- Direct clearance or disturbance of vegetation;
- Alterations to hydrology (including groundwater drawdown);
- Affects of dust;
- Potential to introduce weeds and exotics; and
- Secondary impacts, such as off-road vehicles, increased access to bat caves, and fire.

Clearance of vegetation

The proposed mine is to be located predominantly within the Rocklea (basalt ridges and plains) and Macroy (stony and sandy plains) Land Systems which make up about 13% and 7% of the Pilbara region respectively. Tailings dam, plant site, waste landforms and associated camp and infrastructure are likely to be placed on the relatively flat stony plains and sandplains of the Macroy Land System, widespread in the region. The proposed pit location was not sampled during the survey due to its completely degraded state from past and present exploration disturbance and recent fire (very little vegetation currently occurs over the planned pit site). Direct clearance of vegetation is likely to have minimal effects because the land systems and vegetation units affected appear widespread and common in the region.

Alteration to Hydrology

Surface Hydrology

The proposed diversion of Coppin Creek has the potential to impact the riparian vegetation of the diverted area and that of the downstream area (including Coppin Gap). Increased erosion and sediment deposition from the diversion particularly during cyclonic events and flooding may have a detrimental impact on vegetation downstream, leading to changes in species composition and assemblages. The vegetation of the diverted section of the creek may also suffer adversely with water no longer pooling after creekline flow.

Hydrogeology

Groundwater levels can change seasonally. However, from recent field work undertaken by Outback Ecology Services the current groundwater level above the orebody appears to range from 5m (southern lower end) to 30m (northern end, located up slope). Pit de-watering may be required to lower the water table to enable mining of the orebody. Although the possible size of the 'cone of depression' is currently unknown it is not expected to affect the dominant vegetation type of the project area – '*Acacia inaequilatera* shrubland over *Triodia pungens* hummock grassland', as these species are not phreatophytic. However, the vegetation of the adjacent creekline may be adversely affected. *Eucalyptus camaldulensis* (River Red Gum) and *Melaleuca* species are known to be partly or wholly dependent on groundwater (depending on location). Studies in the Pilbara indicate that *Eucalyptus camaldulensis* trees present within creeklines have access to groundwater at least 21m below the surface (Landman, 2001).

It is recommended that a study be undertaken of possible effects upon vegetation when the proposed creekline diversion route is finalized and the expected groundwater drawdown is calculated.

Dust

Dust generated during construction and operation has the potential to impact surrounding vegetation, but can be mitigated against using standard suppression methods.

Secondary impacts

An increased human presence can also lead to secondary impacts such as off-road vehicle use (spinifex communities are particularly susceptible to vehicle damage and may take many years to recover), increased fire and the spread of weeds. The potential to introduce, or exacerbate the effects of weeds and exotic species is exacerbated with increased human presence and greater vehicle movements. An increased road network has the potential to introduce new weed species, and/or facilitate the spread of those already present, into new areas. *Acetosa vesicaria* (Ruby dock) and *Aerva javanica* (Kapok bush) are common minesite weed species in the Pilbara. The latter is present along the creekline south of Coppin Gap and around the exploration camp while Ruby dock is currently absent. All reasonable care should be taken to avoid the spread of such species to and within, the Spinifex Ridge project area.

6.2 Recommendations

The Moly Mines Spinifex Ridge Molybdenum Project is in its early design stage of development and detail of location, design, scale and management has not yet been established. The management guidelines below are suggested to minimise potential impacts to the vegetation of the project area.

- Reduce vegetation clearance to an absolute minimum, particularly in areas adjacent to vegetation of higher conservation significance, such as drainage lines and riparian zones.

- Minimise impacts to surface hydrology by avoiding drainage features wherever possible, through innovative mine planning, or where unavoidable, implement appropriate strategies such as sufficient culverting to maintain hydrological cycles.
- Assess the likely impact of any groundwater drawdown on phreatophytic vegetation, particularly that associated with nearby riparian zones and drainage lines, and implement mitigation measures as necessary.
- Implement standard dust suppression methods across the project area, particularly during construction but also during operation, to reduce impacts to surrounding vegetation.
- With appropriate stakeholders, develop weed management guidelines to prevent the establishment of new weed species, and the further spread of existing weed species.
- With appropriate stakeholders, consider the preparation and implementation of a succinct Fire Management Plan, not only to reduce the risk of further unplanned fire emanating from the project area, but also to mitigate against wildfire from offsite ignition sources.

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Appendix A

Flora Species Recorded over the Project Area

Family	Genus	species	subspecies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Adiantaceae (007)	*Cheilanthes*	*austrotenuifiolia*																	
Aizoaceae (110)	*Trianthema*	*triquetra*																	
Amaranthaceae (106)	**Aerva*	*javanica*																	
	Amaranthus	aff. *pallidiflorus*									■								
	Gomphrena	*cunninghamii*																	■
	Ptilotus	*astrolasius*									■								
	Ptilotus	*axillaris*																■	
	Ptilotus	*calostachyus*										■	■	■	■				■
	Ptilotus	*clementii*																	
	Ptilotus	*macrocephalus*																	■
	Ptilotus	*obovatus*																	
Apiaceae (281)	*Trachymene*	*oleracea*																	■
Apocynaceae (304)	*Carissa*	*spinarum*																	
Asclepiadaceae (305)	*Cynanchum*	*floribundum*																	
Asteraceae (345)	*Flaveria*	*australasica*																	
	Pentalepis	*trichodesmoides*												■					
	Pluchea	*ferdinandi-muelleri*		■		■	■	■	■										
	Pluchea	*rubelliflora*				■	■												
	Pluchea	*tetranthera*		■		■					■			■					■
	Pterocaulon	*sphaeranthoides*																	
Boraginaceae (310)	*Heliotropium*	*ammophilum*																	
	Heliotropium	*skeleton*																	
	Trichodesma	*zeylanicum*	var. *zeylanicum*											■					
Caesalpinaceae (164)	*Bauhinia*	*cunninghamii*																	
	Senna	*glutinosa*	ssp. *glutinosa*								■			■	■				
	Senna	*glutinosa*	ssp. *pruinosa*												■				
	Senna	*notabilis*		■		■	■				■							■	■
	Senna	*symonii*									■								
	Petalostylis	*labichioides*																	
Capparaceae (137A)	*Capparis*	*spinosa*	var. *nummularia*																
	Cleome	*uncifera*	ssp. *uncifera*						■		■								
	Cleome	*viscosa*					■		■		■								■
Caryophyllaceae (113)	*Polycarpaea*	*corymbosa*	var. *corymbosa*	■															
	Polycarpaea	*holtzei*																	
Chenopodiaceae (105)	*Salsola*	*tragus*																	
Combretaceae (272)	*Terminalia*	*canescens*																	
Convolvulaceae (307)	*Bonamia*	*linearis*																	
	Bonamia	*media*	var. *villosa*																
	Bonamia	*rosea*																	
	Bonamia	sp.										■							
	Ipomoea	*coptica*			■						■								
	Ipomoea	*muelleri*			■		■							■					
	Polymeria	*ambigua*		■		■					■								■

Family	Genus	species	subspecies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Polymeria	*calycina*																	
Cucurbitaceae (337)	**Citrullus*	*colyocynthis*																	
	Mukia	*maderaspatana*																	
Cyperaceae (032)	*Bulbostylis*	*barbata*																	
	Bulbostylis	*turbinata*																	
	Cyperus	*vaginatus*																	
	Fimbristylis	*simulans*																	
	Schoenoplectus	*subulatus*																	
Euphorbiaceae (185)	*Adriana*	*urticoides*	var. *urticoides*																
	Euphorbia	*australis*																	
	Euphorbia	*coghlanii*																	
	Euphorbia	*drummondii*	ssp. *drummondii*																
	Euphorbia	*schultzii*																	
	Euphorbia	*tannensis*	ssp. *eremophila*																
	Leptopus	*decassnei*	var *decassnei*																
	Phyllanthus	*maderaspatensis*																	
	Euphorbiaceae	sp.																	
	Dampiera	*candicans*																	
Goodeniaceae (341)	*Goodenia*	*muelleriana*																	
	Goodenia	*stobbsiana*																	
Lauraceae (131)	*Cassytha*	*capillaris*																	
	Cassytha	*filiformis*																	
Lythraceae (265)	*Ammannia*	*baccifera*																	
Loranthaceae (097)	*Amyema*	*preissii*																	
Malvaceae (221)	*Abutilon*	*cunninghamii*																	
	Hibiscus	*austrinus*																	
	**Malvastrum*	*americanum*																	
	Sida	*?calyxhymenia*																	
	Sida	*pilbarensis*																	
	Sida	*rohlenae*	ssp. *rohlenae*																
	Sida	sp. (090, 2006)																	
Menispermaceae (122)	*Tinospora*	*smilacina*																	
	Acacia	*ampliceps*																	
Mimosaceae (163)	*Acacia*	*ancistrocarpa*																	
	Acacia	*bivenosa*																	
	Acacia	*coriacea*	ssp. *pendens*																
	Acacia	*farnesiana*																	
	Acacia	*inaequilatera*																	
	Acacia	*orthocarpa*																	
	Acacia	*ptychophylla*																	
	Acacia	*pyrifolia*																	
	Acacia	*stellaticeps*																	
	Acacia	*trachycarpa*																	

Family	Genus	species	subspecies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Acacia	*tumida*	var. *pilbarensis*								■			■					
	Acacia	*victoriae*																	
	Neptunia	*dimorphantha*																	
Molluginaceae (110A)	*Mollugo*	*molluginea*		■		■											■	■	■
Moraceae (087)	*Ficus*	*brachypoda*																	
	Ficus	*opposita*	var. *indecora*								■								
Myrtaceae (273)	*Corymbia*	*ferriticola*	ssp. *ferriticola*																
	Corymbia	*flavescens*																	
	Corymbia	*hamersleyana*					■				■			■					
	Eucalyptus	*camaldulensis*	var. *obtusa*				■			■									
	Eucalyptus	*leucophloia*	ssp. *leucophloia*																
	Eucalyptus	*victrix*					■			■									
	Melaleuca	*glomerata*					■			■									
	Melaleuca	*argentea*																	
Nyctaginaceae (107)	*Boerhavia*	*paludosa*										■		■		■			■
	Boerhavia	sp.		■							■								
Papilionaceae (165)	*Alysicarpus*	*muelleri*																	
	Cajanus	*cinereus*									■								
	Crotalaria	*cunninghamii*																	
	Crotalaria	*ramosissima*																	
	Cullen	*leucochaites*																	
	Cullen	*pustulatum*																	
	Cullen	*stipulaceum*		■															
	Indigofera	*colutea*		■	■														
	Indigofera	*linifolia*				■													
	Indigofera	*linnaei*																	
	Indigofera	*monophylla*				■									■	■			■
	Indigofera	*trita*			■														
	Isotropis	*atropurpurea*									■								
	Kennedia	*prorepens*																	
	Rhynchosia	*minima*	var. *australis*				■				■				■				
	Sesbania	*cannabina*																	
	Sesbania	*formosa*																	
	Swainsona	*formosa*																	■
	Swainsona	*kingii*																	
	Swainsona	*stenodonta*																	■
	Templetonia	*hookeri*																	
	Tephrosia	aff. *supina*											■	■	■	■			
	Tephrosia	*rosea*	var. *clementii*										■						
	Tephrosia	*rosea*	var. *rosea*										■						
	Tephrosia	*spechtii*											■			■			
	Tephrosia	sp. *Bungaroo Creek*															■	■	
		(M.E Trudgen 11601)																	
	Zornia	*muelleriana*	ssp. *congesta*																

Family	Genus	species	subspecies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Passifloraceae (248)	**Passiflora*	*foetida*																	
Poaceae (031)	*Aristida*	*contorta*																	
	Aristida	*?holathera*																	
	**Cenchrus*	*ciliaris*			■			■		■	■								
	Chloris	*pectinata*			■														
	**Chloris*	*virgata*					■												
	Cymbopogon	*procerus*									■			■					
	Dactyloctenium	*radulans*			■		■												
	Dichanthium	*sericeum*																	
	**Echinochloa*	*colona*																	
	Enneapogon	*caerulescens*																	
	Eragrostis	*cumingii*			■														
	Eragrostis	aff. *eriopoda*																	
	Eragrostis	*tenellula*			■		■												
	Eriachne	*aristidea*																	
	Eriachne	*obtusa*																	
	Eriachne	*mucronata*	(typical form)											■		■			
	Eriachne	*pulchella*	ssp. *dominii*																
	Eriachne	sp. (083, 2006)																	
	Iseilema	*membranaceum*																	
	Leptochloa	*fusca*	ssp. *fusca*																
	Perotis	*rara*																	
	Setaria	*dielsii*																	
	Sporobolus	*actinocladus*					■												
	Sporobolus	*australasicus*		■			■				■								
	Triodia	*brizoides*														■	■		
	Triodia	*longiceps*		■	■		■	■		■									
	Triodia	*epactia*		■		■			■		■	■	■	■	■	■	■	■	■
	Triodia	*wiseana*																	
Portulaceae (111)	*Calandrinia*	sp.																	
	Portulaca	*oleracea*																	
Proteaceae (090)	*Grevillea*	*wickhamii*	ssp. *hispidula*								■		■	■	■			■	■
	Grevillea	*pyramidalis*	ssp. *leucadendron*	■		■													
	Hakea	*lorea*	ssp. *lorea*				■		■	■									
Rubiaceae (331)	*Oldenlandia*	*crouchiana*			■														■
	Synaptantha	*tillaeacea*	var. *tillaeacea*																
Sapindaceae (207)	*Atalaya*	*hemiglauca*														■			
	Dodonaea	*viscosa*	ssp. *mucronata*																
Scrophulariaceae (316)	*Peplidium*	sp. E																	
	Stemodia	*grossa*																	
	Stemodia	*viscosa*								■	■			■					
Solanaceae (315)	**Datura*	*leichhardtii*																	
	Solanum	*diversiflorum*		■															

Family	Genus	species	subspecies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Solanum	*lasiophyllum*																	
	Solanum	*lucani*																	
	Solanum	*?phlomoides*																	
Sterculiaceae (223)	*Melhania*	*oblongifolia*																	
Tiliaceae (220)	*Corchorus*	*incanus*																	
	Corchorus	*parviflorus*																	
	Corchorus	*sidoides*																	
	Corchorus	*sidoides*	ssp. *sidoides*																
	Corchorus	sp. (075, 2006)																	
	Triumfetta	*appendiculata*																	
	Triumfetta	aff. *chaetocarpa*																	
	Triumfetta	*clementii*																	
	Triumfetta	*maconochieana ms*																	
Typhaceae (020)	*Typha*	*domingensis*																	
Violaceae (243)	*Hybanthus*	*aurantiacus*																	
Zygophylaceae (173)	*Tribulus*	*platypterus*																	

Family	Genus	species	subspecies	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Adiantaceae (007)	*Cheilanthes*	*austrotenuifiolia*																	
Aizoaceae (110)	*Trianthema*	*triquetra*																	
Amaranthaceae (106)	**Aerva*	*javanica*																	
	Amaranthus	aff. *pallidiflorus*																	
	Gomphrena	*cunninghamii*																	
	Ptilotus	*astrolasius*																	
	Ptilotus	*axillaris*																	
	Ptilotus	*calostachyus*																	
	Ptilotus	*clementii*																	
	Ptilotus	*macrocephalus*																	
	Ptilotus	*obovatus*																	
Apiaceae (281)	*Trachymene*	*oleracea*																	
Apocynaceae (304)	*Carissa*	*spinarum*																	
Asclepiadaceae (305)	*Cynanchum*	*floribundum*																	
Asteraceae (345)	*Flaveria*	*australasica*																	
	Pentalepis	*trichodesmoides*																	
	Pluchea	*ferdinandi-muelleri*																	
	Pluchea	*rubelliflora*																	
	Pluchea	*tetranthera*																	
	Pterocaulon	*sphaeranthoides*																	
Boraginaceae (310)	*Heliotropium*	*ammophilum*																	
	Heliotropium	*skeleton*																	
	Trichodesma	*zeylanicum*	var. *zeylanicum*																
Caesalpinaceae (164)	*Bauhinia*	*cunninghamii*																	
	Senna	*glutinosa*	ssp. *glutinosa*																
	Senna	*glutinosa*	ssp. *pruinosa*																
	Senna	*notabilis*																	
	Senna	*symonii*																	
	Petalostylis	*labichioides*																	
Capparaceae (137A)	*Capparis*	*spinosa*	var. *nummularia*																
	Cleome	*uncifera*	ssp. *uncifera*																
	Cleome	*viscosa*																	
Caryophyllaceae (113)	*Polycarpaea*	*corymbosa*	var. *corymbosa*																
	Polycarpaea	*holtzei*																	
Chenopodiaceae (105)	*Salsola*	*tragus*																	
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Convolvulaceae (307)	*Bonamia*	*linearis*																	
	Bonamia	*media*	var. *villosa*																
	Bonamia	*rosea*																	
	Bonamia	sp.																	
	Ipomoea	*coptica*																	
	Ipomoea	*muelleri*																	
	Polymeria	*ambigua*																	

Family	Genus	species	subspecies	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	Polymeria	*calycina*																	
Cucurbitaceae (337)	**Citrullus*	*colyocynthis*																	
	Mukia	*maderaspatana*																	
Cyperaceae (032)	*Bulbostylis*	*barbata*																	
	Bulbostylis	*turbinata*																	
	Cyperus	*vaginatus*																	
	Fimbristylis	*simulans*																	
	Schoenoplectus	*subulatus*																	
Euphorbiaceae (185)	*Adriana*	*urticoides*	var. *urticoides*																
	Euphorbia	*australis*																	
	Euphorbia	*coghlanii*																	
	Euphorbia	*drummondii*	ssp. *drummondii*																
	Euphorbia	*schultzii*																	
	Euphorbia	*tannensis*	ssp. *eremophila*																
	Leptopus	*decassnei*	var *decassnei*																
	Phyllanthus	*maderaspatensis*																	
	Euphorbiaceae	sp.																	
Goodeniaceae (341)	*Dampiera*	*candicans*																	
	Goodenia	*muelleriana*																	
	Goodenia	*stobbsiana*																	
Lauraceae (131)	*Cassytha*	*capillaris*																	
	Cassytha	*filiformis*																	
Lythraceae (265)	*Ammannia*	*baccifera*																	
Loranthaceae (097)	*Amyema*	*preissii*																	
Malvaceae (221)	*Abutilon*	*cunninghamii*																	
	Hibiscus	*austrinus*																	
	**Malvastrum*	*americanum*																	
	Sida	*?cardiophylla*																	
	Sida	*pilbarensis*																	
	Sida	*rohlenae*	ssp. *rohlenae*																
	Sida	sp. (090, 2006)																	
Menispermaceae (122)	*Tinospora*	*smilacina*																	
Mimosaceae (163)	*Acacia*	*ampliceps*																	
	Acacia	*ancistrocarpa*																	
	Acacia	*bivenosa*																	
	Acacia	*coriacea*	ssp. *pendens*																
	Acacia	*farnesiana*																	
	Acacia	*inaequilatera*																	
	Acacia	*orthocarpa*																	
	Acacia	*ptychophylla*																	
	Acacia	*pyrifolia*																	
	Acacia	*stellaticeps*																	
	Acacia	*trachycarpa*																	

Family	Genus	species	subspecies	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
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	Euphorbia	*coghlanii*																	
	Euphorbia	*drummondii*	ssp. *drummondii*																
	Euphorbia	*schultzii*																	
	Euphorbia	*tannensis*	ssp. *eremophila*																
	Leptopus	*decassnei*	var *decassnei*																
	Phyllanthus	*maderaspatensis*																	
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	Hibiscus	*austrinus*																	
	**Malvastrum*	*americanum*																	
	Sida	*?cardiophylla*																	
	Sida	*pilbarensis*																	
	Sida	*rohlenae*	ssp. *rohlenae*																
	Sida	sp. (090, 2006)																	
Menispermaceae (122)	*Tinospora*	*smilacina*																	
Mimosaceae (163)	*Acacia*	*ampliceps*																	
	Acacia	*ancistrocarpa*																	
	Acacia	*bivenosa*																	
	Acacia	*coriacea*	ssp. *pendens*																
	Acacia	*farnesiana*																	
	Acacia	*inaequilatera*																	
	Acacia	*orthocarpa*																	
	Acacia	*ptychophylla*																	
	Acacia	*pyrifolia*																	
	Acacia	*stellaticeps*																	
	Acacia	*trachycarpa*																	

Family	Genus	species	subspecies	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Passifloraceae (248)	**Passiflora*	*foetida*																	
Poaceae (031)	*Aristida*	*contorta*																	
	Aristida	*?holathera*																	
	**Cenchrus*	*ciliaris*																	
	Chloris	*pectinata*																	
	**Chloris*	*virgata*																	
	Cymbopogon	*procerus*																	
	Dactyloctenium	*radulans*																	
	Dichanthium	*sericeum*																	
	**Echinochloa*	*colona*																	
	Enneapogon	*caerulescens*																	
	Eragrostis	*cumingii*																	
	Eragrostis	aff. *eriopoda*																	
	Eragrostis	*tenellula*																	
	Eriachne	*aristidea*																	
	Eriachne	*obtusa*																	
	Eriachne	*mucronata*																	
	Eriachne	*pulchella*	ssp. *dominii*																
	Eriachne	sp. (083, 2006)																	
	Iseilema	*membranaceum*																	
	Leptochloa	*fusca*	ssp. *fusca*																
	Perotis	*rara*																	
	Setaria	*dielsii*																	
	Sporobolus	*actinocladus*																	
	Sporobolus	*australasicus*																	
	Triodia	*brizoides*																	
	Triodia	*longiceps*																	
	Triodia	*epactia*																	
	Triodia	*wiseana*																	
Portulaceae (111)	*Calandrinia*	sp.																	
	Portulaca	*oleracea*																	
Proteaceae (090)	*Grevillea*	*wickhamii*	ssp. *hispidula*																
	Grevillea	*pyramidalis*	ssp. *leucadendron*																
	Hakea	*lorea*	ssp. *lorea*																
Rubiaceae (331)	*Oldenlandia*	*crouchiana*																	
	Synaptantha	*tillaeacea*	var. *tillaeacea*																
Sapindaceae (207)	*Atalaya*	*hemiglauca*																	
	Dodonaea	*viscosa*	ssp. *mucronata*																
Scrophulariaceae (316)	*Peplidium*	sp. E																	
	Stemodia	*grossa*																	
	Stemodia	*viscosa*																	
Solanaceae (315)	**Datura*	*leichhardtii*																	
	Solanum	*diversiflorum*																	

Family	Genus	species	subspecies	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	Solanum	*lasiophyllum*																	
	Solanum	*lucani*																	
	Solanum	*?phlomoides*																	
Sterculiaceae (223)	*Melhania*	*oblongifolia*																	
Tiliaceae (220)	*Corchorus*	*incanus*																	
	Corchorus	*parviflorus*																	
	Corchorus	*sidoides*																	
	Corchorus	*sidoides*	ssp. *sidoides*																
	Corchorus	sp. (075, 2006)																	
	Triumfetta	*appendiculata*																	
	Triumfetta	aff. *chaetocarpa*																	
	Triumfetta	*clementii*																	
	Triumfetta	*maconochieana ms*																	
Typhaceae (020)	*Typha*	*domingensis*																	
Violaceae (243)	*Hybanthus*	*aurantiacus*																	
Zygophylaceae (173)	*Tribulus*	*platypterus*																	

Family	Genus	species	subspecies	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Adiantaceae (007)	*Cheilanthes*	*austrotenuifiolia*																	
Aizoaceae (110)	*Trianthema*	*triquetra*			■														
Amaranthaceae (106)	**Aerva*	*javanica*				■													
	Amaranthus	aff. *pallidiflorus*						■			■								
	Gomphrena	*cunninghamii*											■						
	Ptilotus	*astrolasius*																	
	Ptilotus	*axillaris*																	
	Ptilotus	*calostachyus*										■							
	Ptilotus	*clementii*																	
	Ptilotus	*macrocephalus*																	
	Ptilotus	*obovatus*																	
Apiaceae (281)	*Trachymene*	*oleracea*																	
Apocynaceae (304)	*Carissa*	*spinarum*																	
Asclepiadaceae (305)	*Cynanchum*	*floribundum*																	
Asteraceae (345)	*Flaveria*	*australasica*																	
	Pentalepis	*trichodesmoides*																	
	Pluchea	*ferdinandi-muelleri*				■		■						■		■			
	Pluchea	*rubelliflora*																	
	Pluchea	*tetranthera*			■	■	■							■	■			■	■
	Pterocaulon	*sphaeranthoides*				■									■				
Boraginaceae (310)	*Heliotropium*	*ammophilum*																	
	Heliotropium	*skeleton*														■			
	Trichodesma	*zeylanicum*	var. *zeylanicum*		■														
Caesalpinaceae (164)	*Bauhinia*	*cunninghamii*						■											
	Senna	*glutinosa*	ssp. *glutinosa*	■															
	Senna	*glutinosa*	ssp. *pruinosa*																
	Senna	*notabilis*			■	■		■			■								
	Senna	*symonii*																	
	Petalostylis	*labichioides*																	
Capparaceae (137A)	*Capparis*	*spinosa*	var. *nummularia*																
	Cleome	*uncifera*	ssp. *uncifera*															■	
	Cleome	*viscosa*				■						■							■
Caryophyllaceae (113)	*Polycarpaea*	*corymbosa*	var. *corymbosa*															■	
	Polycarpaea	*holtzei*											■	■					
Chenopodiaceae (105)	*Salsola*	*tragus*																	
Combretaceae (272)	*Terminalia*	*canescens*		■															
Convolvulaceae (307)	*Bonamia*	*linearis*														■			
	Bonamia	*media*	var. *villosa*																
	Bonamia	*rosea*															■		
	Bonamia	sp.																	
	Ipomoea	*coptica*																	
	Ipomoea	*muelleri*						■											
	Polymeria	*ambigua*				■												■	

Family	Genus	species	subspecies	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	Polymeria	*calycina*																	
Cucurbitaceae (337)	**Citrullus*	*colyocynthis*																	
	Mukia	*maderaspatana*																	
Cyperaceae (032)	*Bulbostylis*	*barbata*																	
	Bulbostylis	*turbinata*																	
	Cyperus	*vaginatus*																	
	Fimbristylis	*simulans*																	
	Schoenoplectus	*subulatus*																	
Euphorbiaceae (185)	*Adriana*	*urticoides*	var. *urticoides*																
	Euphorbia	*australis*																	
	Euphorbia	*coghlanii*																	
	Euphorbia	*drummondii*	ssp. *drummondii*																
	Euphorbia	*schultzii*																	
	Euphorbia	*tannensis*	ssp. *eremophila*																
	Leptopus	*decassnei*	var *decassnei*																
	Phyllanthus	*maderaspatensis*																	
	Euphorbiaceae	sp.																	
Goodeniaceae (341)	*Dampiera*	*candicans*																	
	Goodenia	*muelleriana*																	
	Goodenia	*stobbsiana*																	
Lauraceae (131)	*Cassytha*	*capillaris*																	
	Cassytha	*filiformis*																	
Lythraceae (265)	*Ammannia*	*baccifera*																	
Loranthaceae (097)	*Amyema*	*preissii*																	
Malvaceae (221)	*Abutilon*	*cunninghamii*																	
	Hibiscus	*austrinus*																	
	**Malvastrum*	*americanum*																	
	Sida	*?cardiophylla*																	
	Sida	*pilbarensis*																	
	Sida	*rohlenae*	ssp. *rohlenae*																
	Sida	sp. (090, 2006)																	
Menispermaceae (122)	*Tinospora*	*smilacina*																	
Mimosaceae (163)	*Acacia*	*ampliceps*																	
	Acacia	*ancistrocarpa*																	
	Acacia	*bivenosa*																	
	Acacia	*coriacea*	ssp. *pendens*																
	Acacia	*farnesiana*																	
	Acacia	*inaequilatera*																	
	Acacia	*orthocarpa*																	
	Acacia	*ptychophylla*																	
	Acacia	*pyrifolia*																	
	Acacia	*stellaticeps*																	
	Acacia	*trachycarpa*																	

Family	Genus	species	subspecies	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	Acacia	*tumida*	var. *pilbarensis*			■		■	■	■	■					■		■	
	Acacia	*victoriae*								■									
	Neptunia	*dimorphantha*																	
Molluginaceae (110A)	*Mollugo*	*molluginea*			■		■				■	■	■			■		■	
Moraceae (087)	*Ficus*	*brachypoda*		■															
	Ficus	*opposita*	var. *indecora*					■			■								
Myrtaceae (273)	*Corymbia*	*ferriticola*	ssp. *ferriticola*																
	Corymbia	*flavescens*						■			■								
	Corymbia	*hamersleyana*							■										
	Eucalyptus	*camaldulensis*	var. *obtusa*	■															
	Eucalyptus	*leucophloia*	ssp. *leucophloia*																
	Eucalyptus	*victrix*																	
	Melaleuca	*glomerata*		■															
	Melaleuca	*argentea*		■															
Nyctaginaceae (107)	*Boerhavia*	*paludosa*																	
	Boerhavia	sp.				■		■			■	■						■	
Papilionaceae (165)	*Alysicarpus*	*muelleri*			■		■	■		■				■	■				
	Cajanus	*cinereus*																	
	Crotalaria	*cunninghamii*				■					■								
	Crotalaria	*ramosissima*																	
	Cullen	*leucochaites*																	
	Cullen	*pustulatum*								■									
	Cullen	*stipulaceum*																	
	Indigofera	*colutea*				■	■			■	■					■		■	
	Indigofera	*linifolia*				■								■					
	Indigofera	*linnaei*														■			
	Indigofera	*monophylla*				■				■									
	Indigofera	*trita*																■	
	Isotropis	*atropurpurea*																	
	Kennedia	*prorepens*																	
	Rhynchosia	*minima*	var. *australis*		■	■	■	■			■			■	■	■		■	
	Sesbania	*cannabina*																	
	Sesbania	*formosa*		■															
	Swainsona	*formosa*																	
	Swainsona	*kingii*																	
	Swainsona	*stenodonta*																	
	Templetonia	*hookeri*																	
	Tephrosia	aff. *supina*																	
	Tephrosia	*rosea*	var. *clementii*							■	■							■	
	Tephrosia	*rosea*	var. *rosea*																
	Tephrosia	*spechtii*																	
	Tephrosia	sp. *Bungaroo Creek*																	
		(M.E Trudgen 11601)																	
	Zornia	*muelleriana*	ssp. *congesta*															■	

Family	Genus	species	subspecies	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Passifloraceae (248)	**Passiflora*	*foetida*																	
Poaceae (031)	*Aristida*	*contorta*																	
	Aristida	*?holathera*																	
	**Cenchrus*	*ciliaris*																	
	Chloris	*pectinata*																	
	**Chloris*	*virgata*																	
	Cymbopogon	*procerus*																	
	Dactyloctenium	*radulans*																	
	Dichanthium	*sericeum*																	
	**Echinochloa*	*colona*																	
	Enneapogon	*caerulescens*																	
	Eragrostis	*cumingii*																	
	Eragrostis	aff. *eriopoda*																	
	Eragrostis	*tenellula*																	
	Eriachne	*aristidea*																	
	Eriachne	*obtusa*																	
	Eriachne	*mucronata*																	
	Eriachne	*pulchella*	ssp. *dominii*																
	Eriachne	sp. (083, 2006)																	
	Iseilema	*membranaceum*																	
	Leptochloa	*fusca*	ssp. *fusca*																
	Perotis	*rara*																	
	Setaria	*dielsii*																	
	Sporobolus	*actinocladus*																	
	Sporobolus	*australasicus*																	
	Triodia	*brizoides*																	
	Triodia	*longiceps*																	
	Triodia	*epactia*																	
	Triodia	*wiseana*																	
Portulaceae (111)	*Calandrinia*	sp.																	
	Portulaca	*oleracea*																	
Proteaceae (090)	*Grevillea*	*wickhamii*	ssp. *hispidula*																
	Grevillea	*pyramidalis*	ssp. *leucadendron*																
	Hakea	*lorea*	ssp. *lorea*																
Rubiaceae (331)	*Oldenlandia*	*crouchiana*																	
	Synaptantha	*tillaeacea*	var. *tillaeacea*																
Sapindaceae (207)	*Atalaya*	*hemiglauca*																	
	Dodonaea	*viscosa*	ssp. *mucronata*																
Scrophulariaceae (316)	*Peplidium*	sp. E																	
	Stemodia	*grossa*																	
	Stemodia	*viscosa*																	
Solanaceae (315)	**Datura*	*leichhardtii*																	
	Solanum	*diversiflorum*																	

Family	Genus	species	subspecies	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	Solanum	*lasiophyllum*																	
	Solanum	*lucani*																	
	Solanum	*?phlomoides*																	
Sterculiaceae (223)	*Melhania*	*oblongifolia*																	
Tiliaceae (220)	*Corchorus*	*incanus*																	
	Corchorus	*parviflorus*																	
	Corchorus	*sidoides*																	
	Corchorus	*sidoides*	ssp. *sidoides*																
	Corchorus	sp. (075, 2006)																	
	Triumfetta	*appendiculata*																	
	Triumfetta	aff. *chaetocarpa*																	
	Triumfetta	*clementii*																	
	Triumfetta	*maconochieana ms*																	
Typhaceae (020)	*Typha*	*domingensis*																	
Violaceae (243)	*Hybanthus*	*aurantiacus*																	
Zygophylaceae (173)	*Tribulus*	*platypterus*																	

Family	Genus	species	subspecies	49	50	51	52	53	54	55	56	57	58	59	60	61	62	CK
Adiantaceae (007)	*Cheilanthes*	*austrotenuifiolia*																
Aizoaceae (110)	*Trianthema*	*triquetra*																
Amaranthaceae (106)	**Aerva*	*javanica*																
	Amaranthus	aff. *pallidiflorus*																
	Gomphrena	*cunninghamii*																
	Ptilotus	*astrolasius*																
	Ptilotus	*axillaris*																
	Ptilotus	*calostachyus*																
	Ptilotus	*clementii*																
	Ptilotus	*macrocephalus*																
	Ptilotus	*obovatus*																
Apiaceae (281)	*Trachymene*	*oleracea*																
Apocynaceae (304)	*Carissa*	*spinarum*																
Asclepiadaceae (305)	*Cynanchum*	*floribundum*																
Asteraceae (345)	*Flaveria*	*australasica*																
	Pentalepis	*trichodesmoides*																
	Pluchea	*ferdinandi-muelleri*																
	Pluchea	*rubelliflora*																
	Pluchea	*tetranthera*																
	Pterocaulon	*sphaeranthoides*																
Boraginaceae (310)	*Heliotropium*	*ammophilum*																
	Heliotropium	*skeleton*																
	Trichodesma	*zeylanicum*	var. *zeylanicum*															
Caesalpinaceae (164)	*Bauhinia*	*cunninghamii*																
	Senna	*glutinosa*	ssp. *glutinosa*															
	Senna	*glutinosa*	ssp. *pruinosa*															
	Senna	*notabilis*																
	Senna	*symonii*																
	Petalostylis	*labichioides*																
Capparaceae (137A)	*Capparis*	*spinosa*	var. *nummularia*															
	Cleome	*uncifera*	ssp. *uncifera*															
	Cleome	*viscosa*																
Caryophyllaceae (113)	*Polycarpaea*	*corymbosa*	var. *corymbosa*															
	Polycarpaea	*holtzei*																
Chenopodiaceae (105)	*Salsola*	*tragus*																
Combretaceae (272)	*Terminalia*	*canescens*																
Convolvulaceae (307)	*Bonamia*	*linearis*																
	Bonamia	*media*	var. *villosa*															
	Bonamia	*rosea*																
	Bonamia	sp.																
	Ipomoea	*coptica*																
	Ipomoea	*muelleri*																
	Polymeria	*ambigua*																

Family	Genus	species	subspecies	49	50	51	52	53	54	55	56	57	58	59	60	61	62	CK
	Polymeria	*calycina*																
Cucurbitaceae (337)	**Citrullus*	*colyocynthis*				■												
	Mukia	*maderaspatana*																
Cyperaceae (032)	*Bulbostylis*	*barbata*					■	■			■	■						
	Bulbostylis	*turbinata*																
	Cyperus	*vaginatus*				■												
	Fimbristylis	*simulans*																
	Schoenoplectus	*subulatus*																■
Euphorbiaceae (185)	*Adriana*	*urticoides*	var. *urticoides*															
	Euphorbia	*australis*				■				■								
	Euphorbia	*coghlanii*					■											
	Euphorbia	*drummondii*	ssp. *drummondii*															
	Euphorbia	*schultzii*																
	Euphorbia	*tannensis*	ssp. *eremophila*															■
	Leptopus	*decassnei*	var *decassnei*															■
	Phyllanthus	*maderaspatensis*																■
	Euphorbiaceae	sp.																
Goodeniaceae (341)	*Dampiera*	*candicans*																
	Goodenia	*muelleriana*																
	Goodenia	*stobbsiana*																
Lauraceae (131)	*Cassytha*	*capillaris*																
	Cassytha	*filiformis*										■						
Lythraceae (265)	*Ammannia*	*baccifera*																■
Loranthaceae (097)	*Amyema*	*preissii*																
Malvaceae (221)	*Abutilon*	*cunninghamii*																
	Hibiscus	*austrinus*																
	**Malvastrum*	*americanum*																■
	Sida	*?cardiophylla*																
	Sida	*pilbarensis*		■														
	Sida	*rohlenae*	ssp. *rohlenae*															
	Sida	sp. (090, 2006)													■			
Menispermaceae (122)	*Tinospora*	*smilacina*																
Mimosaceae (163)	*Acacia*	*ampliceps*				■												
	Acacia	*ancistrocarpa*				■												
	Acacia	*bivenosa*																
	Acacia	*coriacea*	ssp. *pendens*															
	Acacia	*farnesiana*																
	Acacia	*inaequilatera*						■		■			■	■				
	Acacia	*orthocarpa*																
	Acacia	*ptychophylla*																
	Acacia	*pyrifolia*																
	Acacia	*stellaticeps*									■							
	Acacia	*trachycarpa*				■												

Family	Genus	species	subspecies	49	50	51	52	53	54	55	56	57	58	59	60	61	62	CK
	Acacia	*tumida*	var. *pilbarensis*															
	Acacia	*victoriae*																
	Neptunia	*dimorphantha*																
Molluginaceae (110A)	*Mollugo*	*molluginea*																
Moraceae (087)	*Ficus*	*brachypoda*																
	Ficus	*opposita*	var. *indecora*															
Myrtaceae (273)	*Corymbia*	*ferriticola*	ssp. *ferriticola*															
	Corymbia	*flavescens*																
	Corymbia	*hamersleyana*																
	Eucalyptus	*camaldulensis*	var. *obtusa*															
	Eucalyptus	*leucophloia*	ssp. *leucophloia*															
	Eucalyptus	*victrix*																
	Melaleuca	*glomerata*																
	Melaleuca	*argentea*																
Nyctaginaceae (107)	*Boerhavia*	*paludosa*																
	Boerhavia	sp.																
Papilionaceae (165)	*Alysicarpus*	*muelleri*																
	Cajanus	*cinereus*																
	Crotalaria	*cunninghamii*																
	Crotalaria	*ramosissima*																
	Cullen	*leucochaites*																
	Cullen	*pustulatum*																
	Cullen	*stipulaceum*																
	Indigofera	*colutea*																
	Indigofera	*linifolia*																
	Indigofera	*linnaei*																
	Indigofera	*monophylla*																
	Indigofera	*trita*																
	Isotropis	*atropurpurea*																
	Kennedia	*prorepens*																
	Rhynchosia	*minima*	var. *australis*															
	Sesbania	*cannabina*																
	Sesbania	*formosa*																
	Swainsona	*formosa*																
	Swainsona	*kingii*																
	Swainsona	*stenodonta*																
	Templetonia	*hookeri*																
	Tephrosia	aff. *supina*																
	Tephrosia	*rosea*	var. *clementii*															
	Tephrosia	*rosea*	var. *rosea*															
	Tephrosia	*spechtii*																
	Tephrosia	sp. *Bungaroo Creek*																
		(M.E Trudgen 11601)																
	Zornia	*muelleriana*	ssp. *congesta*															

Family	Genus	species	subspecies	49	50	51	52	53	54	55	56	57	58	59	60	61	62	CK
Passifloraceae (248)	**Passiflora*	*foetida*																■
Poaceae (031)	*Aristida*	*contorta*		■														
	Aristida	*?holathera*					■											
	**Cenchrus*	*ciliaris*				■				■								
	Chloris	*pectinata*		■	■				■						■			
	**Chloris*	*virgata*																
	Cymbopogon	*procerus*		■			■											
	Dactyloctenium	*radulans*		■	■				■		■				■			■
	Dichanthium	*sericeum*			■													
	**Echinochloa*	*colona*																
	Enneapogon	*caerulescens*								■								
	Eragrostis	*cumingii*																
	Eragrostis	aff. *eriopoda*																
	Eragrostis	*tenellula*			■													
	Eriachne	*aristidea*					■											
	Eriachne	*obtusa*																
	Eriachne	*mucronata*																
	Eriachne	*pulchella*	ssp. *dominii*															
	Eriachne	sp. (083, 2006)																■
	Iseilema	*membranaceum*			■										■			
	Leptochloa	*fusca*	ssp. *fusca*															■
	Perotis	*rara*																
	Setaria	*dielsii*																■
	Sporobolus	*actinocladus*																
	Sporobolus	*australasicus*		■	■		■		■	■	■				■			■
	Triodia	*brizoides*																
	Triodia	*longiceps*										■						
	Triodia	*epactia*		■	■		■	■	■	■	■					■	■	
	Triodia	*wiseana*						■		■			■	■		■		
Portulaceae (111)	*Calandrinia*	sp.																■
	Portulaca	*oleracea*		■	■				■									■
Proteaceae (090)	*Grevillea*	*wickhamii*	ssp. *hispidula*															
	Grevillea	*pyramidalis*	ssp. *leucadendron*	■									■				■	
	Hakea	*lorea*	ssp. *lorea*															■
Rubiaceae (331)	*Oldenlandia*	*crouchiana*																
	Synaptantha	*tillaeacea*	var. *tillaeacea*															
Sapindaceae (207)	*Atalaya*	*hemiglauca*																■
	Dodonaea	*viscosa*	ssp. *mucronata*															
Scrophulariaceae (316)	*Peplidium*	sp. E																■
	Stemodia	*grossa*																
	Stemodia	*viscosa*																
Solanaceae (315)	**Datura*	*leichhardtii*																■
	Solanum	*diversiflorum*																

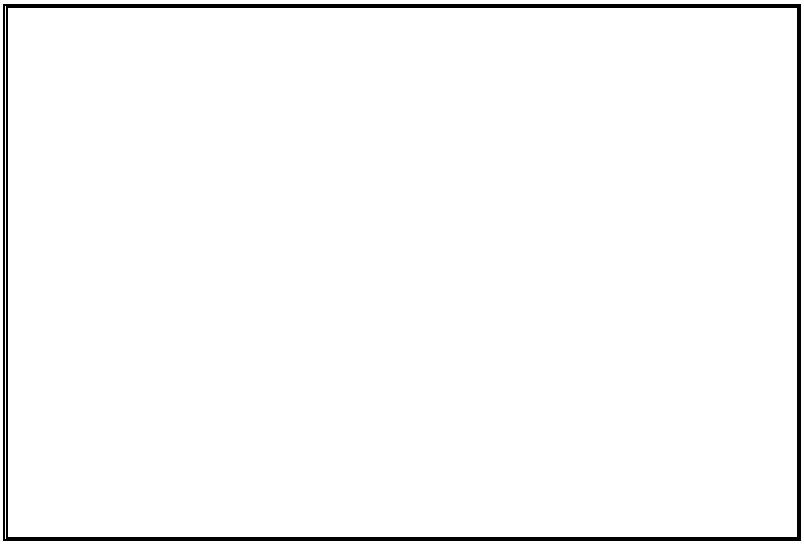
Family	Genus	species	subspecies	49	50	51	52	53	54	55	56	57	58	59	60	61	62	CK
	Solanum	*lasiophyllum*																
	Solanum	*lucani*																
	Solanum	*?phlomoides*																
Sterculiaceae (223)	*Melhania*	*oblongifolia*																
Tiliaceae (220)	*Corchorus*	*incanus*																
	Corchorus	*parviflorus*																
	Corchorus	*sidoides*																
	Corchorus	*sidoides*	ssp. *sidoides*															
	Corchorus	sp. (075, 2006)																
	Triumfetta	*appendiculata*																
	Triumfetta	aff. *chaetocarpa*																
	Triumfetta	*clementii*																
	Triumfetta	*maconochieana ms*																
Typhaceae (020)	*Typha*	*domingensis*																
Violaceae (243)	*Hybanthus*	*aurantiacus*																
Zygophylaceae (173)	*Tribulus*	*platypterus*																

Appendix B

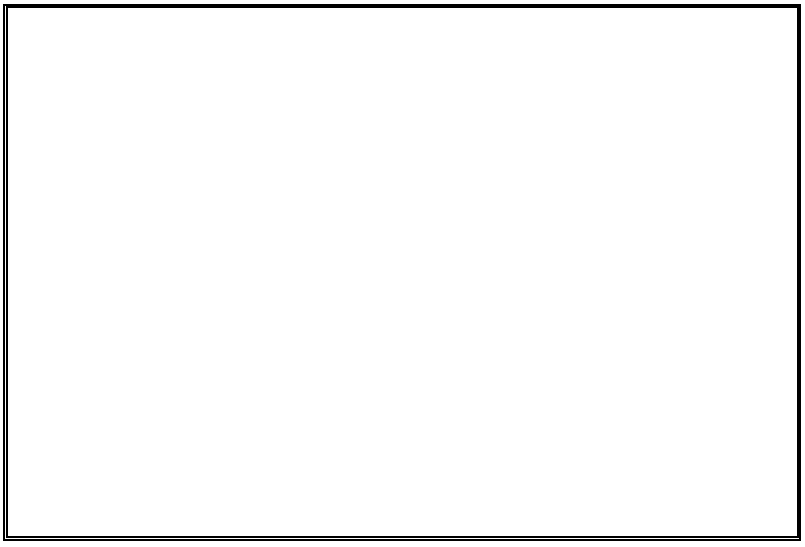
Summary of Vegetation Site Descriptions (July 2005 and April-May 2006)

Summary of Vegetation Site Descriptions

Site 1 (SRO1)		
Date	25/07/05	
Coordinates	Lat: S 20°54' 43.2" Long: E 120°05' 24.1"	
Description	*Acacia inaequilatera*/*Grevillea pyramidalis* ssp. *leucadendron* high shrubland over *Corchorus parviflorus*/*Cullen stipulaceum* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plain	
Slope	0 - 5°	
Soil	Red-brown sandy loam	
Exposed rock type (%)	Granite boulders, 20%	
% Litter cover	5 – 10%	
Total vegetation cover (%)	40%	
Condition	Excellent	
Disturbance Details	Signs of grazing by cattle.	
Fire History	Section of plot and surrounds burnt within approximately last 2 – 5 years.	
Weeds	None	
Shrubs >2m	10 - 30%	*Acacia inaequilatera, Grevillea pyramidalis* ssp. *leucadendron*
Shrubs 1 – 2m	10 - 30%	*Acacia inaequilatera, Grevillea pyramidalis ssp. leucadendron*
Shrubs < 1m	2 - 10%	*Corchorus parviflorus, Cullen stipulaceum, Acacia inaequilatera, Grevillea pyramidalis* ssp. *leucadendron, Pluchea tetranthera, Senna notabilis*
Hummock Grass	30 - 70%	*Triodia epactia*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Goodenia muelleriana*
Species near plot		*Tinospora smilacina, Acacia pyrifolia, Triodia longiceps, Pluchea ferdinandi-muelleri, Solanum diversiflorum*
Additional species recorded April/May 2006		*Indigofera colutea, Polycarpaea corymbosa* var. *corymbosa, Mollugo molluginea, Corchorus incanus, Polymeria ambigua, Boerhavia sp., Sporobolus australasicus*



Site 2 (SRO2)		
Date	25/07/05	
Coordinates	Lat: S 20°54' 50.9" Long: E 120°05' 24.9"	
Description	*Pluchea tetranthera/Pluchea ferdinandi-muelleri/Pluchea rubelliflora* low scattered shrubs over *Triodia longiceps* hummock grassland with scattered sedges of *Cyperus vaginatus.*	
Plot Size	50m x 50m	
Topography	Drainage Flat	
Slope	0 - 5°	
Soil	Red-brown loamy sand	
Exposed rock type (%)	-	
% Litter cover	5 – 10%	
Total vegetation cover (%)	60%	
Condition	Good	
Disturbance Details	Grazed, especially seedlings along drainage line	
Fire History	Old (more than 5 years ago)	
Weeds	**Cenchrus ciliaris* (Buffel grass) butts and seedlings present along drainage line. Butts have been heavily grazed.	
Shrubs < 1m	2 - 10%	*Pluchea ferdinandi-muelleri, Pluchea tetranthera*
Hummock Grass	30 - 70%	*Triodia longiceps*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Pluchea rubelliflora*
Additional species recorded April/May 2006		*Ipomoea muelleri, Ipomoea coptica, Ammania baccifera, Eragrostis cumingii, Indigofera colutea, Goodenia stobbsiana, Chloris pectinata, Indigofera trita, Dactyloctenium radulans, Oldenlandia crouchiana, Eragrostis tenellula*

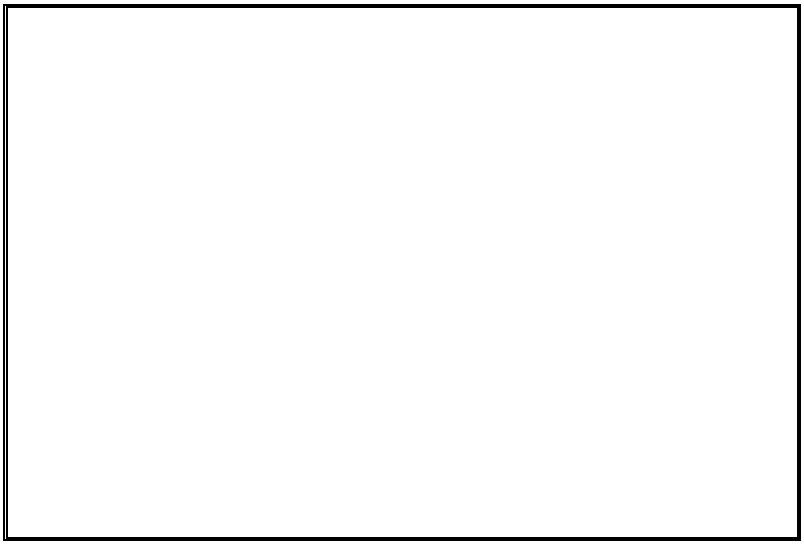


Site 3 (SRO3)		
Date	25/07/05	
Coordinates	Lat: S 20°54' 50.1" Long: E 120°05' 59.7"	
Description	*Acacia inaequilatera* high open shrubland over *Corchorus parviflorus* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plains/low hills	
Slope	5 - 15°	
Aspect	North-east	
Soil	Red clayey sand	
Exposed rock type (%)	Granite and quartz pebbles, 60 – 70% cover. 100% in patches. Few granite boulders.	
% Litter cover	5%	
Total vegetation cover (%)	50%	
Condition	Excellent	
Disturbance Details	Limited grazing.	
Fire History	Moderate (2 – 5yrs ago).	
Weeds	-	
Shrubs >2m	2 – 10%	*Acacia inaequilatera, Grevillea pyramidalis* ssp. *leucadendron, Acacia pyrifolia*
Shrubs < 1m	2 - 10%	*Corchorus parviflorus, Acacia inaequilatera, Corchorus sidoides* ssp. *sidoides, Solanum lasiophyllum, Indigofera monophylla, Senna notabilis,*
Hummock Grass	30 - 70%	*Triodia epactia*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Amyema preissii*
Other species near plot		*Acacia bivenosa, Polymeria ambigua*
Additional species recorded April/May 2006		*Corchorus incanus, Indigofera colutea, Hybanthus auranticus, Goodenia stobbsiana, Mollugo molluginea, Senna notabilis, Indigofera linifolia, Polymeria ambigua, Bulbostylis turbinata*

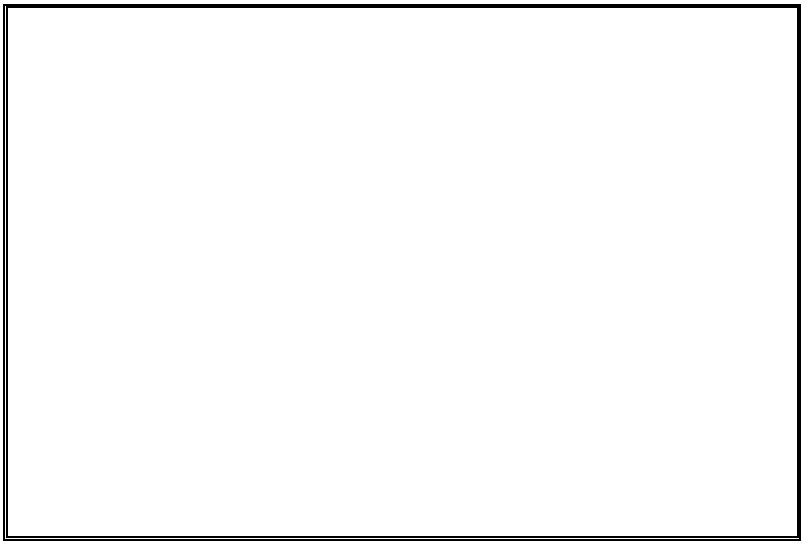
Site 4 (SRO4)		
Date	26/07/05	
Coordinates	Lat: S 20°54' 28.6" Long: E 120°06' 11.1"	
Description	*Eucalyptus camaldulensis* var. *obtusa/E. victrix* woodland over *Acacia ampliceps* low woodland over *Triodia longiceps* hummock grassland.	
Plot Size	50m x 50m	
Topography	Drainage line and adjacent plain.	
Slope	Flat (0 - 5°)	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	-	
% Litter cover	40% among thick *Triodia*. 2% along drainage line.	
Total vegetation cover (%)	70%	
Condition	Very Good	
Disturbance Details	Grazing, cattle tracks across plot.	
Fire History	Old (more than 5 years ago)	
Weeds	*Cenchrus ciliaris* (Buffel grass) along edge of drainage line. Thick in patches.	
Trees < 10m	10 – 30%	*Eucalyptus camaldulensis* var. *obtusa , E. victrix, Corymbia hamersleyana, Acacia ampliceps,*
Shrubs >2m	2 – 10%	*Acacia ampliceps* (dominant), *Acacia pyrifolia, Hakea lorea* ssp. *lorea, Acacia inaequilatera, Melaleuca glomerata*
Shrubs 1 – 2m	<2%	*Pluchea ferdinandi-muelleri*
Herbs/creepers	<2%	*Pluchea rubelliflora*
Hummock Grass	30 - 70%	*Triodia longiceps*
Sedges	<2%	*Cyperus vaginatus*
Other species near plot		*Senna notabilis, Ipomoea muelleri*
Additional species recorded April/May 2006		*Dactyloctenium radulans, Goodenia stobbsiana, *Chloris virgata, Sporobolus australasicus, Eragostis tenellula, Rhynchosia minima* var. *australis, Cleome viscosa, Sporobolus actinocladus*

Site 5 (SRO5)		
Date	26/07/05	
Coordinates	Lat: S 20°54’ 16.7”	
	Long: E 120°06’ 07.6”	
Description	*Pluchea ferdinandi-muelleri* low shrubland over *Triodia longiceps* hummock grassland.	
Plot Size	50m x 50m	
Topography	Drainage flat/plain.	
Slope	0 - 5°	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Granite and quartz pebbles, < 10%	
% Litter cover	20%	
Total vegetation cover (%)	60%	
Condition	Very Good	
Disturbance Details	Grazing of *Cenchrus ciliaris* by cattle.	
Fire History	Old (more than 5 years ago)	
Weeds	**Cenchrus ciliaris* (Buffel grass) along edge of drainage line.	
Shrubs < 1m	10 - 30%	*Pluchea ferdinandi-muelleri,*
Hummock Grass	30 - 70%	*Triodia longiceps*
Herbs/creepers	<2%	*Cassytha capillaris*

Site 6 (SRO6)		
Date	26/07/05	
Coordinates	Lat: S 20°54’ 20.1” Long: E 120°06’ 08.4”	
Description	*Acacia inaequilatera* shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plains	
Slope	0 - 5°	
Soil	Moderate reddish orange clayey sand	
Exposed rock type (%)	Granite, quartz and laterite pebbles, 30% cover, sandy in places	
% Litter cover	5 - 10%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Cattle tracks present	
Fire History	Moderate (2 to 5 years ago)	
Weeds	-	
Shrubs > 2m	2 - 10%	*Acacia inaequilatera*
Shrubs 1 - 2m	10 – 30%	*Acacia inaequilatera*
Shrubs < 1m	<2%	*Corchorus parviflorus, Pluchea ferdinandi-muelleri, Acacia inaequilatera*
Hummock Grass	30 - 70%	*Triodia epactia*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Amyema preissii*
Other species near plot		*Hakea lorea* ssp. *lorea, Acacia bivenosa, Cleome uncifera* ssp. *uncifera, Cleome viscosa, Solanum lasiophyllum*



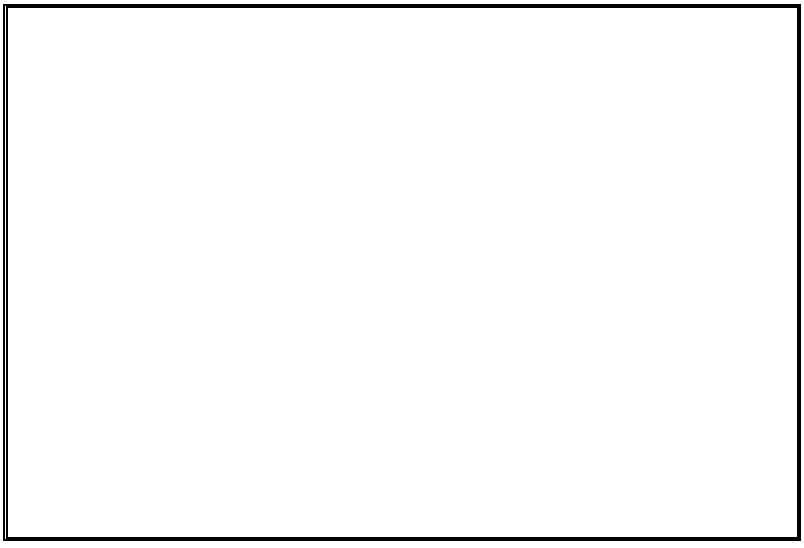
Site 7 (SRO7)		
Date	26/07/05	
Coordinates	Lat: S 20°54' 15.4" Long: E 120°05' 56.3"	
Description	*Eucalyptus camaldulensis* var. *obtusa/E. victrix* woodland over *Melaleuca glomerata/ Acacia ampliceps/Acacia coriacea* ssp. *pendens* low woodland over *Triodia longiceps* hummock grassland and *Cyperus vaginatus* very open sedges.	
Plot Size	50m x 50m	
Topography	Major Drainage Line	
Slope	0 - 5°	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Granite, quartz and laterite pebbles, 30% cover, sandy in places	
% Litter cover	25%	
Total vegetation cover (%)	60%	
Condition	Very Good	
Disturbance Details	Cattle grazing, tracks present.	
Fire History	None evident	
Weeds	*Cenchrus ciliaris*, very dense patches along drainage line.	
Trees 10 – 30m	10 – 30%	*Eucalyptus camaldulensis* var. *obtusa, E. victrix*
Trees <10m	10 - 30%	*Acacia coriacea* ssp *pendens, Acacia ampliceps, Melaleuca glomerata*
Shrubs > 2m	<2%	*Acacia farnesiana*
Hummock Grass	30 - 70%	*Triodia longiceps*
Sedges	2 - 10%	*Cyperus vaginatus*
Other species near plot		*Hakea lorea* ssp. *lorea, Acacia trachycarpa, Acacia pyrifolia, Cassytha filiformis, Pluchea ferdinandi-muelleri, Stemodia viscosa*



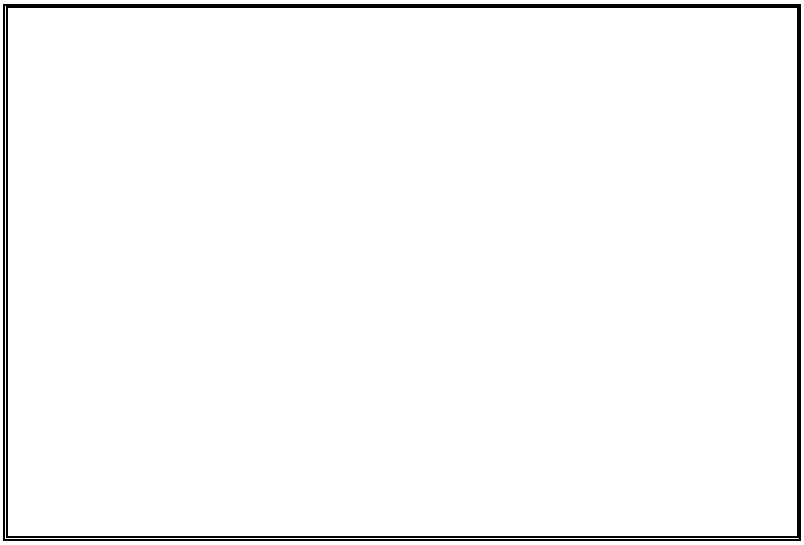
Site 8 (SRO8)		
Date	26/07/05	
Coordinates	Lat: S 20°53' 54.6" Long: E 120°05' 45.7"	
Description	*Corymbia hamersleyana* low open woodland over *Acacia tumida var. pilbarensis* open scrub over Mixed open shrubland over *Triodia epactia* open hummock grassland.	
Plot Size	20m x 125m	
Topography	Drainage Line	
Slope	0 - 5°	
Soil	Light brown loamy sand	
Exposed rock type (%)	Basalt pebbles and fragments, 60% in drainage line	
% Litter cover	25%	
Total vegetation cover (%)	50%	
Condition	Very Good	
Disturbance Details	Cattle grazing, tracks present.	
Fire History	Moderate (2 – 5 years ago). Burnt within last 3 years on west side of drainage line.	
Weeds	**Cenchrus ciliaris*, dense along flat drainage area adjacent to channel.	
Trees <10m	2 - 10%	*Corymbia hamersleyana, Acacia tumida* var. *pilbarensis*
Shrubs > 2m	<2%	*Grevillea wickhamii* ssp. *hispidula*
Shrubs 1 – 2m	<2%	*Ficus opposita* var. *indecora, Senna symonii*
Shrubs <1m	2 – 10%	*Isotropis atropurpurea., Abutilon cunninghamii, Melhania oblongifolia, Pluchea tetranthera, Acacia pyrifolia, Corchorus parviflorus, Corchorus sidoides* ssp. *sidoides, Senna notabilis, Cajanus cinereus, Ptilotus astrolasius*
Hummock Grass	10 - 30%	*Triodia epactia*
Tussock Grass	<2%	*Cymbopogon procerus*
Sedges	<2%	*Cyperus vaginatus*
Herbs	<2%	*Stemodia viscosa, Cleome viscosa, Ipomoea muelleri, Rhynchosia minima* var. *australis, Cleome uncifera* ssp. *uncifera*
Other species near plot		*Senna glutinosa* ssp. *glutinosa*
Additional species recorded April/May 2006		**Cenchrus ciliaris, Rhynchosia minima* var. *australis, Ipomoea coptica, Euphorbia australis, Euphorbia coghlanii, Polymeria ambigua, Senna notabilis, Goodenia stobbsiana, Boerhavia sp., Amaranthus* aff. *pallidiflorus, Triumfetta* aff. *chaetocarpa, Sporobolus australasicus*

Site 9 (SRO9)		
Date	27/07/05	
Coordinates	Lat: S 20°53' 58.3" Long: E 120°05' 36.2"	
Description	*Acacia inaequilatera* high shrubland over *Corchorus parviflorus/Corchorus sidoides* ssp. *sidoides/Ptilotus calostachyus* low scattered shrubs over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Upper slope of basalt hills	
Slope	Moderate (15 – 45°)	
Aspect	South west	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt and quartz pebbles and fragments, 90%.	
% Litter cover	2%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.2m). Cattle dung present.	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs > 2m	10 - 30%	*Acacia inaequilatera*
Shrubs 1 – 2m	2 - 10%	*Acacia inaequilatera*
Shrubs <1m	<2%	*Corchorus parviflorus, Ptilotus calostachyus, Corchorus sidoides* ssp. *sidoides*
Hummock Grass	30 - 70%	*Triodia epactia*
Herbs	<2%	*Goodenia muelleriana, Bonamia* sp., *Boerhaevia paludosa, Goodenia stobbsiana*
Other species near plot		*Polymeria ambigua, Ptilotus calostachyus, Corchorus incanus*

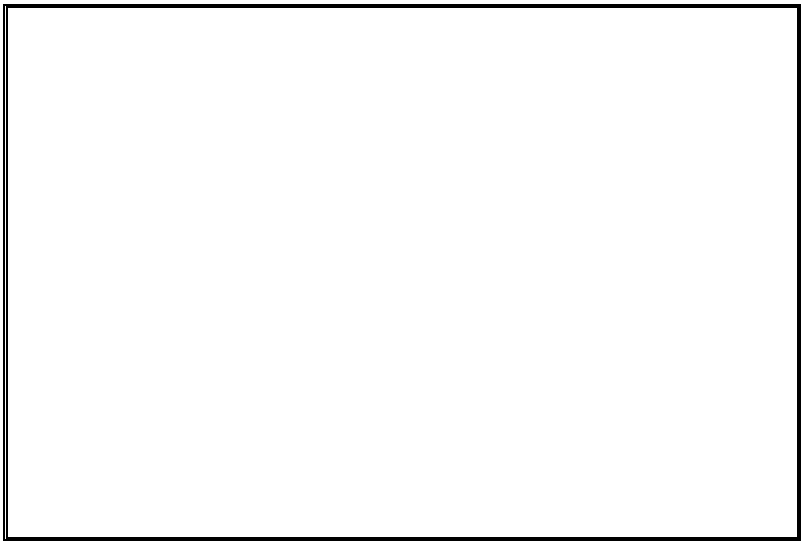
Site 10 (SR10)		
Date	27/07/05	
Coordinates	Lat: S 20°54' 07.2" Long: E 120°05' 35.3"	
Description	*Acacia inaequilatera* high open shrubland over *Dampiera candicans, Tephrosia rosea, Tephrosia spechtii, Ptilotus calostachyus, Solanum lasiophyllum* and *Triumfetta maconochieana* low scattered shrubs over *Triodia epactia* hummock grassland.	
Plot Size	Plotless	
Topography	Top of basalt hills	
Slope	Gentle (5 – 15°)	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, 90%.	
% Litter cover	5%.	
Total vegetation cover (%)	50%	
Condition	Excellent	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.2m	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs > 2m	2 - 10%	*Acacia inaequilatera, Grevillea wickhamii ssp. hispidula*
Shrubs 1 – 2m	2 - 10%	*Acacia inaequilatera, Sida ?calyxhymenia*
Shrubs <1m	<2%	*Dampiera candicans, Tephrosia rosea* var. *rosea, Tephrosia spechtii, Ptilotus calostachyus, Solanum lasiophyllum, Triumfetta maconochieana,*
Hummock Grass	30 - 70%	*Triodia epactia*
Herbs/creepers	<2%	*Goodenia stobbsiana*
Other species near plot		*Corchorus parviflorus, Corchorus sidoides* ssp. *sidoides, Tephrosia* aff. *supina, Tribulus platypterus*



Site 11 (SR11)		
Date	27/07/05	
Coordinates	Lat: S 20°54' 04.7" Long: E 120°05' 27.0"	
Description	*Corymbia hamersleyana* low open woodland over *Acacia tumida var. pilbarensis*/*A. pyrifolia* high open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Drainage line/flat	
Slope	Flat (0 – 5°)	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, 60%.	
% Litter cover	10%.	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.3m)	
Fire History	Moderate (2 – 5 years ago).	
Trees < 10m	2 – 10%	*Corymbia hamersleyana, Acacia tumida* var. *pilbarensis, Grevillea pyramidalis* ssp. *leucadendron*
Shrubs > 2m	2 - 10%	*Acacia pyrifolia, Grevillea wickhamii* ssp. *hispidula*
Shrubs 1 – 2m	<2%	*Senna glutinosa* ssp. *glutinosa*
Shrubs <1m	<2%	*Corchorus sidoides* ssp. *sidoides, Grevillea pyramidalis* ssp. *leucadendron, Acacia tumida* var. *pilbarensis, Pluchea tetranthera, Tephrosia* aff. *supina, Ptilotus calostachyus, Tephrosia spechtii* (ferruginous form)
Hummock Grass	30 - 70%	*Triodia epactia*
Tussock Grass	<2%	*Cymbopogon procerus, Eriachne mucronata*
Herbs	2 - 10%	*Trichodesma zeylanicum* var. *zeylanicum, Pentalepis trichodesmoides, Boerhaevia paludosa, Ipomoea muelleri, Stemodia viscosa, Goodenia stobbsiana*
Other species near plot		*Acacia orthocarpa*



Site 12 (SR12)		
Date	27/07/05	
Coordinates	Lat: S 20°53' 50.3" Long: E 120°06' 59.4"	
Description	*Acacia inaequilatera* scattered tall shrubs over *Corchorus parviflorus* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Drainage line/flat	
Slope	Moderate (15 – 45°)	
Aspect	North	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, 95%	
% Litter cover	2 - 5%.	
Total vegetation cover (%)	50%	
Condition	Excellent	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.2m)	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs > 2m	<2%	*Acacia inaequilatera, Grevillea wickhamii* ssp *hispidula*
Shrubs <1m	2 - 10%	*Corchorus parviflorus* (dominant), *Acacia ptychophylla, Tephrosia* aff. *supina, Solanum lucani, Solanum lasiophyllum*
Hummock Grass	30 - 70%	*Triodia epactia*
Herbs	<2%	*Goodenia stobbsiana*
Pther species near plot		*Bulbostylis barbata, Ptilotus calostachyus, Indigofera monophylla, Rhynchosia minima var australis, Senna glutinosa* ssp *glutinosa, Senna glutinosa* ssp. *pruinosa.*



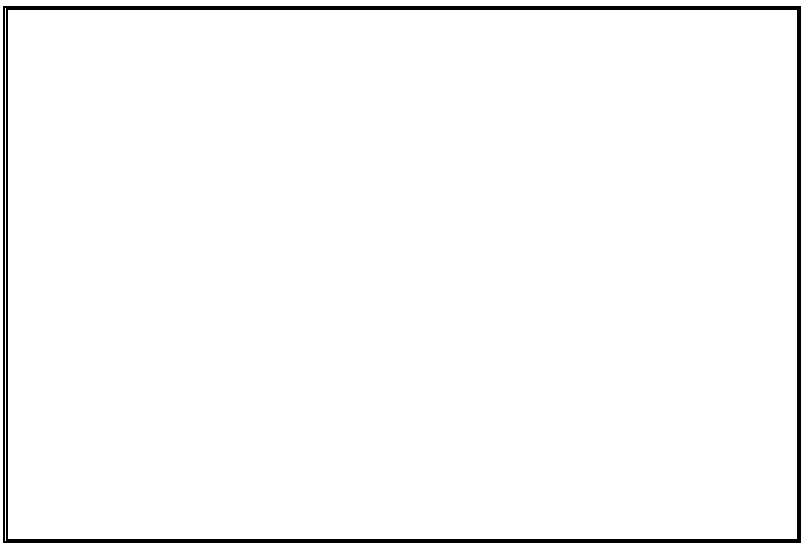
#indicates species located on very upper slope amongst ridge outcrop.

Site 13 (SR13)		
Date	27/07/05	
Coordinates	Lat: S 20°53' 37.0" Long: E 120°05' 31.9"	
Description	*Acacia inaequilatera* high open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	Plotless	
Topography	Upper slope of ridge (Talga Land System), south of BIF ridgeline	
Slope	Moderate (15 - 45°) to Steep (>45°)	
Aspect	North	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, 95%	
% Litter cover	10%.	
Total vegetation cover (%)	50%	
Condition	Excellent	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.2m)	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs > 2m	2 - 10%	*Acacia inaequilatera, Atalaya hemiglauca*
Shrubs 1 – 2m	2 - 10%	*Acacia inaequilatera*
Shrubs <1m	<2%	*Indigofera monophylla, Tephrosia* aff. *supina, Corchorus parviflorus, #Tephrosia spechtii* (ferruginous form)*, #Solanum lucani*
Hummock Grass	30 - 70%	*Triodia epactia, #Triodia brizoides (on very upper slope only, cover of less than 2%).*
Tussock Grass	<2%	*#Eriachne* mucronata
Herbs	<2%	*Boerhaevia paludosa, #Euphorbia drummondii* ssp. *drummondii*

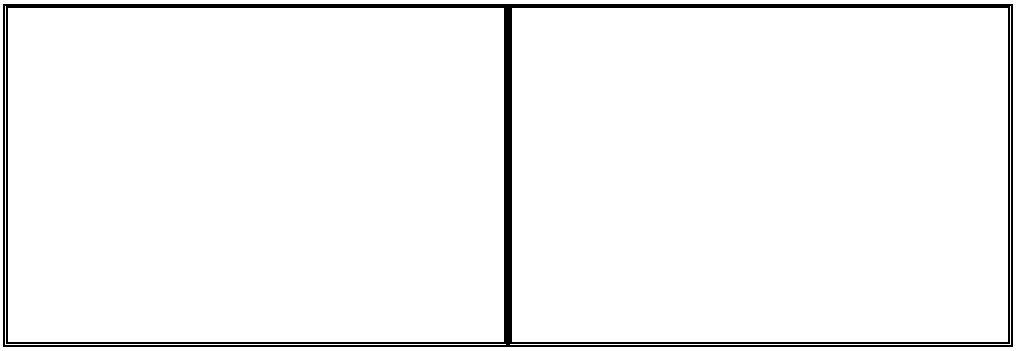
Site 14 (SR14)		
Date	27/07/05	
Coordinates	Lat: S 20°53’ 01.1” Long: E 120°04’ 03.8”	
Description	*Corchorus parviflorus* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Lower slope BIF ridgeline	
Slope	Gentle (5 – 15°)	
Aspect	North	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Ironstone and basalt, 95 – 100%	
% Litter cover	2%.	
Total vegetation cover (%)	40%	
Condition	Excellent	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.2m)	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs <1m	2 - 10%	*Corchorus parviflorus, Corchorus sidoides* ssp*. sidoides, Tephrosia* sp*. Bungaroo Creek* (M.E. Trudgen 11601*), Solanum lucani, Sida pilbarensis*
Hummock Grass	30 - 70%	*Triodia epactia, Triodia brizoides (less than 2% cover)*
Other species near plot		*Tephrosia rosea* var. *clementii, Mollugo molluginea, Euphorbia drummondii* ssp*. drummondii*

Site 15 (SR15)		
Date	27/07/05	
Coordinates	Lat: S 20°52' 54.0" Long: E 120°03' 48.6"	
Description	*Acacia inaequilatera* scattered tall shrubs over scattered shrubs over a Mixed Low Open Shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plains	
Slope	Flat (0 – 5°)	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, quartz and some ironstone, 60 – 100%	
% Litter cover	2%.	
Total vegetation cover (%)	40 - 50%	
Condition	Excellent	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.2m)	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs >2m	<2%	*Acacia inaequilatera*
Shrubs <1m	2 - 10%	*Acacia inaequilatera, Grevillea wickhamii* ssp. *hispidula, Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601), *Senna notabilis, Corchorus sidoides* ssp. *sidoides*
Hummock Grass	30 - 70%	*Triodia epactia*
Herbs	<2%	*Euphorbia schultzii, Bonamia rosea, Goodenia muelleriana, Mollugo molluginea,*
Other species near plot		*Ptilotus axillaris, Sida pilbarensis*

Site 16 (SR16)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 38.6" Long: E 120°05' 47.9"	
Description	*Acacia inaequilatera* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Lower slope basalt hills	
Slope	Moderate (15 – 45°)	
Aspect	North east	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, 60 – 100%	
% Litter cover	2%	
Total vegetation cover (%)	40 - 50%	
Condition	Excellent	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.15m)	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs >2m	<2%	*Acacia inaequilatera*
Shrubs <1m	2 - 10%	*Acacia inaequilatera* (dominant), *Ptilotus calostachyus, Corchorus parviflorus, Pluchea tetranthera, Grevillea wickhamii* ssp *hispidula*
Hummock Grass	30 - 70%	*Triodia epactia*
Herbs	<2%	*Boerhaevia paludosa, Goodenia stobbsiana*
Additional species recorded April/May 2006 (near plot, along edge of vehicle track and around nearby camp site)		*Swainsona formosa, Oldenlandia crouchiana, Senna notabilis, Goodenia muelleriana, Hybanthus auranticus, Bulbostylis barbata, Indigofera monophylla, Corchorus incanus, Ptilotus macrocephalus, Cleome viscosa, Goodenia stobbsiana, Gomphrena cunninghamii, Euphorbia australis, Polymeria ambigua, Ptilotus calostachyus, Mollugo molluginea, Fimbristylis simulans, Swainsona stenodonta, Trachymene oleracea*



Site 17 (SR17)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 38.6" Long: E 120°05' 47.9"	
Description	*Eucalyptus leucophloia* ssp. *leucophloia* low woodland over *Acacia inaequilatera* high open shrubland over *Corchorus parviflorus* low open shrubland over *Triodia brizoides/T. epactia* hummock grassland	
Plot Size	50m x 50m	
Topography	Upper slope	
Slope	Moderate (15 – 45°)	
Aspect	South	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Banded Ironstone, 95 – 100%	
% Litter cover	5 - 10%	
Total vegetation cover (%)	50%	
Condition	Pristine	
Disturbance Details	Burnt within last 3 years. *Triodia* hummocks small (average height 0.15m)	
Fire History	Old (more than 5 years ago)	
Weeds	-	
Trees < 10m	10 – 30%	*Eucalyptus leucophloia* ssp. *leucophloia* (dominant), *Corymbia ferriticola* ssp. *ferriticola*
Shrubs >2m	2 - 10%	*Acacia inaequilatera, Grevillea pyramidalis* ssp. *leucadendron*
Shrubs 1 – 2m	<2%	*Senna symonii*
Shrubs <1m	2 - 10%	*Corchorus parviflorus, Corchorus sidoides* ssp. *sidoides*
Hummock Grass	30 - 70%	*Triodia brizoides* dominant, *Triodia epactia* 2 – 10% cover
Tussock Grass	<2%	*Cymbopogon procerus*
Herbs	<2%	*Rhynchosia minima* var. *australis, Goodenia stobbsiana*
Other species near plot		Upper slope: *Triumfetta appendiculata, Corchorus* sp., *Atalaya hemiglauca, Boerhaevia paludosa, Eriachne mucronata, Tephrosia rosea* var. *clementii* Ridge top: *Cheilanthes austrotenuifolia, Dodonaea viscosa* ssp. *mucronata, Tephrosia* aff. *supina, Ficus brachypoda, Atalaya hemiglauca, Terminalia canescens*



Site SR17 **Vegetation of banded ironstone ridge**

Site 18 (SR18)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 30.2" Long: E 120°05' 19.5"	
Description	*Eucalyptus camaldulensis* var. *obtusa* open woodland over *Corymbia hamersleyana* low open woodland over *Tephrosia rosea* var. *clementii* shrubland over *Stemodia viscosa* open herbs over *Triodia epactia* open hummock grassland.	
Plot Size	50m x 50m	
Topography	Drainage line	
Slope	Gentle (5 – 15°)	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Mixture basalt etc, 60%	
% Litter cover	30%, includes dead trees	
Total vegetation cover (%)	Patchy in drainage line, thick on edges, 50%	
Condition	Excellent	
Disturbance Details	Vehicle track dissects drainage line	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Trees < 10m	10 – 30%	*Eucalyptus camaldulensis* var. *obtusa, Corymbia hamersleyana,*
Shrubs >2m	<2%	*Grevillea wickhamii* ssp. *hispidula*
Shrubs 1 – 2m	2 - 10%	*Tephrosia rosea* var. *clementii, Acacia tumida var. pilbarensis*
Shrubs <1m	30 - 70%	*Tephrosia rosea* var. *clementii (thick in patches), Isotropis atropurpurea, Corchorus sidoides* ssp. *sidoides, Corchorus parviflorus, Pluchea tetranthera*
Hummock Grass	10 - 30%	*Triodia epactia*
Tussock Grass	2 - 10%	*Cymbopogon procerus, Eriachne mucronata*
Sedges	<2%	*Cyperus vaginatus*
Herbs/creepers	10 - 30%	*Stemodia viscosa, Euphorbia coghlanii, Rhynchosia minima* var. *australis, Polymeria ambigua*
Other species near plot		*Grevillea pyramidalis* ssp. *leucadendron*

Site 19 (SR19)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 32.9" Long: E 120°05' 18.0"	
Description	*Acacia inaequilatera* shrubland over *Indigofera monophylla* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Small rises in valley	
Slope	Gentle (5 – 15°)	
Aspect	North west	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Mixture basalt, greenstone etc, 95 - 100%	
% Litter cover	30%, includes dead trees	
Total vegetation cover (%)	40%	
Condition	Pristine	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs >2m	2 - 10%	*Acacia inaequilatera*
Shrubs 1 – 2m	10 - 30%	*Acacia inaequilatera*
Shrubs <1m	2 - 10%	*Indigofera monophylla, Triumfetta appendiculata, Ptilotus calostachyus*
Hummock Grass	30 - 70%	*Triodia epactia*
Herbs/creepers	<2%	*Polymeria ambigua, Goodenia stobbsiana, Boerhaevia paludosa*

Site 20 (SR20)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 24.8" Long: E 120°04' 26.9"	
Description	*Corymbia hamersleyana* scattered low trees over *Acacia inaequilatera* high open shrubland over *Triodia epactia* hummock grassland with *Petalostylis labichioides* shrubland in drainage lines.	
Plot Size	50m x 50m	
Topography	Valley Floor/Drainage line	
Slope	Gentle (5 – 15°)	
Aspect	South	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Ironstone and basalt, 95 - 100%	
% Litter cover	2%	
Total vegetation cover (%)	40 - 50%	
Condition	Excellent	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Trees <10m	<2%	*Corymbia hamersleyana*
Shrubs >2m	2 - 10%	*Acacia inaequilatera, Petalostylis labichioides* (10 – 30% in drainage lines)
Shrubs <1m	2 - 10%	*Ptilotus calostachyus* (defoliated), *Goodenia stobbsiana*
Hummock Grass	30 - 70%	*Triodia epactia*

Site 21 (SR21)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 38.8" Long: E 120°04' 28.6"	
Description	*Eucalyptus leucophloia* ssp. *leucophloia* scattered low trees over *Acacia inaequilatera* open shrubland over *Triodia epactia/T. brizoides* hummock grassland.	
Plot Size	50m x 50m	
Topography	Upper slope and top of basalt hills	
Slope	Moderate (15 – 45°)	
Aspect	South	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, 99 - 100%	
% Litter cover	2%	
Total vegetation cover (%)	30 - 40%	
Condition	Pristine	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Trees <10m	<2%	*Eucalyptus leucophloia* ssp. *leucophloia*
Shrubs 1 - 2m	2 - 10%	*Acacia inaequilatera*
Shrubs <1m	<2%	*Dampiera candicans, Tribulus platypterus, Goodenia stobbsiana*
Hummock Grass	30 - 70%	*Triodia epactia* (dominant), *Triodia brizoides* (2 – 10%)
Sedges	<2%	*Bulbostylis barbata*

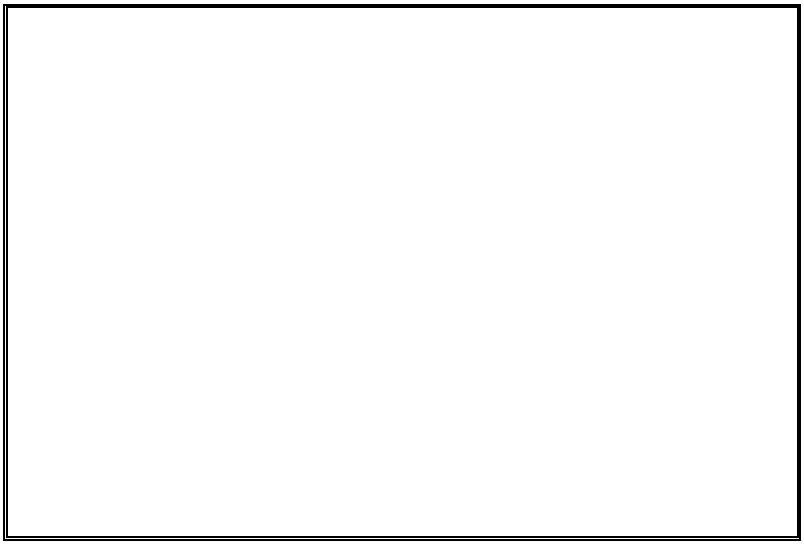
Site 22 (SR22)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 38.8" Long: E 120°04' 28.0"	
Description	*Acacia inaequilatera* high open shrubland over *Grevillea wickhamii* ssp. *hispidula/Acacia ptychophylla/Indigofera monophylla* low open shrubland over *Goodenia stobbsiana* very open herbs over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Top of basalt hills	
Slope	Flat (0 – 5^{o})	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, 99 - 100%	
% Litter cover	2%	
Total vegetation cover (%)	30 - 40%	
Condition	Pristine	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs >2m	<2%	*Acacia inaequilatera*
Shrubs 1 - 2m	<2%	*Acacia inaequilatera, Eucalyptus leucophloia* ssp. *leucophloia*
Shrubs <1m	2 - 10%	*Grevillea wickhamii* ssp. *hispidula, Acacia ptychophylla, Indigofera monophylla, Goodenia stobbsiana*
Hummock Grass	10 - 30%	*Triodia epactia* (dominant)
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Ptilotus clementii*

Site 23 (SR23)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 41.5" Long: E 120°04' 29.7"	
Description	*Acacia tumida var. pilbarensis*/*Acacia inaequilatera* open shrubland over *Ptilotus calostachyus*/*Goodenia stobbsiana* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	Plotless	
Topography	Drainage line	
Slope	Gentle (5 – 15°)	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt and greenstone, 95 - 100%	
% Litter cover	10%	
Total vegetation cover (%)	70 - 80%	
Condition	Pristine	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago). *Acacia* and *Grevillea* plants resprouting after fire.	
Weeds	-	
Shrubs 1 - 2m	<2%	*Grevillea wickhamii* ssp. *hispidula*
Shrubs <1m	10 - 30%	*Acacia tumida var. pilbarensis, Acacia ptychophylla, Ptilotus calostachyus, Dampiera candicans, Solanum lasiophyllum*
Hummock Grass	30 - 70%	*Triodia epactia*
Herbs/creepers	2 - 10%	*Goodenia stobbsiana*

Site 24 (SR24)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 29.6" Long: E 120°03' 48.3"	
Description	*Eucalyptus leucophloia ssp. leucophloia* low open woodland over *Acacia inaequilatera* high open shrubland over *Goodenia stobbsiana* very open herbs over *Triodia epactia/T. brizoides* hummock grassland.	
Plot Size	Plotless	
Topography	Upper slope of basalt hills	
Slope	Gentle (5 – 15°)	
Aspect	South	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Quartz, basalt, 95 - 100%	
% Litter cover	5%	
Total vegetation cover (%)	50%	
Condition	Pristine	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago). *Acacia* and *Grevillea* plants resprouting after fire.	
Weeds	-	
Trees <10m	2 – 10%	*Eucalyptus leucophloia* ssp. *leucophloia*
Shrubs 1 - 2m	2 - 10%	*Acacia inaequilatera, Grevillea pyramidalis* ssp. *leucadendron*
Shrubs <1m	2 – 10%	*Goodenia stobbsiana* (dominant), *Indigofera monophylla, Corchorus parviflorus, Corchorus sidoides* ssp. *sidoides, Isotropis atropurpurea., Ptilotus calostachyus,*
Hummock Grass	30 - 70%	*Triodia epactia* (dominant)*, Triodia brizoides* (2 – 10%) (toward top of ridge)
Herbs/creepers	2 - 10%	*Euphorbia drummondii* ssp. *drummondii*
Other species near plot		*Ptilotus clementii*

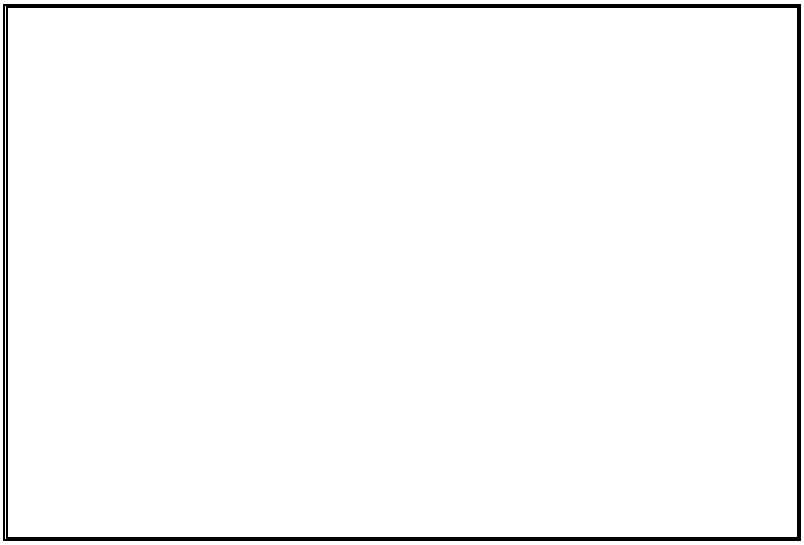
Site 25 (SR25)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 32.5" Long: E 120°03' 47.3"	
Description	*Corymbia hamersleyana* low woodland over *Acacia inaequilatera* open shrubland over *Corchorus parviflorus* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	Plotless	
Topography	Drainage flat and channel	
Slope	Flat (0 – 5°)	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Basalt, greenstone etc, 90% in drainage channel, 40% on drainage flat	
% Litter cover	5%	
Total vegetation cover (%)	in drainage channel <10%, 60% on drainage flat	
Condition	Excellent	
Fire History	Moderate (2 – 5 years ago). *Acacia* and *Grevillea* plants resprouting after fire.	
Weeds	-	
Trees <10m	10 - 30%	*Corymbia hamersleyana*
Shrubs 1 - 2m	2 – 10%	*Acacia inaequilatera* (dominant), *Acacia tumida* var. *pilbarensis, Atalaya hemiglauca*
Shrubs <1m	2 – 10%	*Corchorus parviflorus* (dominant), *Solanum lucani, Indigofera monophylla, Dampiera candicans, Goodenia stobbsiana*
Hummock Grass	30 - 70%	*Triodia epactia*
Tussock Grass	2 – 10%	*Eriachne mucronata*, *Cymbopogon procerus*
Herbs/creepers	<2%	*Polymeria ambigua, Euphorbia drummondii* ssp. *drummondii, Rhynchosia minima* var. *australis, Boerhaevia paludosa*
Other species near plot		*Grevillea wickhamii ssp. hispidula*
Site 26 (SR26)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 33.5" Long: E 120°03' 51.2"	
Description	*Acacia inaequilatera* open shrubland over *Indigofera monophylla* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Lower slope of ridge	
Slope	Moderate (15 – 45°)	
Aspect	East	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Basalt, greenstone etc, 95 – 100%	
% Litter cover	2%	
Total vegetation cover (%)	50%	
Condition	Pristine	
Fire History	Moderate (2 – 5 years ago).	
Shrubs >2m	2 - 10%	*Acacia inaequilatera*
Shrubs 1 - 2m	2 - 10%	*Acacia inaequilatera, Sida ?calyxhymenia*
Shrubs <1m	2 - 10%	*Indigofera monophylla* (dominant), *Corchorus parviflorus, Corchorus sidoides* ssp. *sidoides, Ptilotus calostachyus, Tribulus platypterus, Senna symonii, Goodenia stobbsiana*
Hummock Grass	30 - 70%	*Triodia epactia* dominant, *Triodia brizoides* <2%

Site 27 (SR27)		
Date	28/07/05	
Coordinates	Lat: S 20°53' 00.3" Long: E 120°04' 29.6"	
Description	*Grevillea pyramidalis* ssp. *leucadendron* scattered tall shrubs over *Acacia inaequilatera* scattered shrubs over *Indigofera monophylla* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Upper slope of ridge	
Slope	Moderate (15 – 45°)	
Aspect	North	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	BIF and greenstone 100%	
% Litter cover	2%	
Total vegetation cover (%)	60%	
Condition	Pristine	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs >2m	<2%	*Grevillea pyramidalis* ssp. *leucadendron*
Shrubs 1 - 2m	<2%	*Acacia inaequilatera*
Shrubs <1m	2 - 10%	*Indigofera monophylla*
Hummock Grass	30 - 70%	*Triodia epactia*
Other species near plot		Top of slope: *Terminalia canescens, Grevillea wickhamii* ssp. *hispidula, Corchorus parviflorus, Corchorus sidoides* ssp. *sidoides, Cymbopogon procerus, Eriachne mucronata*



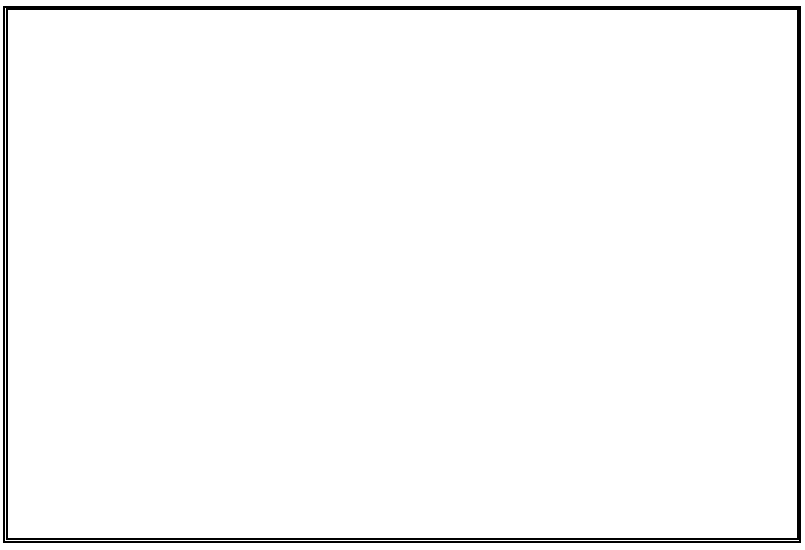
Site 28 (SR28) Kittys Gap		
Date	28/07/05	
Coordinates	Lat: S 20°53' 07.0" Long: E 120°04' 19.9"	
Description	*Terminalia canescens* and *Corymbia hamersleyana* low woodland over *Acacia tumida* var. *pilbarensis/A. inaequilatera/A. pyrifolia* high shrubland over *Cymbopogon procerus/Eriachne* mucronata open tussock grassland.	
Plot Size	20m x 125m	
Topography	Drainage line	
Slope	Flat (0 – 5°)	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Mixture, some large ironstone boulders, 70%	
% Litter cover	2%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Some cattle grazing evident.	
Fire History	Moderate (2 – 5 years ago).	
Weeds	**Cenchrus ciliaris*	
Trees <10m	10 – 30%	*Corymbia hamersleyana, Terminalia canescens, Atalaya hemiglauca, Ficus brachypoda, Carissa spinarum, Acacia tumida* var. *pilbarensis*
Shrubs >2m	10 - 30%	*Acacia pyrifolia, Grevillea wickhamii* ssp *hispidula, Acacia inaequilatera, Atalaya hemiglauca, Acacia bivenosa*
Shrubs 1 - 2m	<2%	*Petalostylis labichioides*
Shrubs <1m	<2%	*Corchorus parviflorus*
Tussock Grasses	10 – 30%	*Eriachne mucronata, Cymbopogon procerus* (dominates drainage line)
Sedges	<2%	*Cyperus vaginatus*
Herbs/creepers	<2%	*Typha domingensis, Euphorbia drummondii* ssp *drummondii, Euphorbia coghlanii*
Other species near plot		*Acacia tumida var. pilbarensis* dominates creekline further south, along with *Tephrosia rosea* var. *rosea.*
Additional species recorded April/May 2006		*Corchorus incanus, Goodenia stobbsiana, Eragrostis tenellula, *Cenchrus ciliaris, Sporobolus australasicus*

Site 29 (SR29)		
Date	29/07/05	
Coordinates	Lat: S 20°53' 28.1" Long: E 120°05' 48.6"	
Description	*Acacia inaequilatera* high open shrubland over *Triodia epactia/T. brizoides* hummock grassland.	
Plot Size	Plotless	
Topography	Upper slope of hill within valley, just west of deposit	
Slope	Moderate (15 – 45°)	
Aspect	West-south-west	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Mixture, greenstone, quartz and ironstone, 95 - 100%	
% Litter cover	5%	
Total vegetation cover (%)	40%	
Condition	Excellent	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago).	
Weeds	-	
Shrubs >2m	2 - 10%	*Acacia inaequilatera*
Shrubs 1 - 2m	<2%	*Acacia inaequilatera, Senna glutinosa* ssp. *glutinosa*
Shrubs <1m	<2%	*Triumfetta clementii, Solanum lucani, Corchorus parviflorus, Corchorus sidoides* ssp. *sidoides* , *Goodenia stobbsiana*
Hummock Grasses	30 - 70%	*Triodia epactia* (dominant), *Triodia brizoides* (<2%)
Tussock Grasses	<2%	*Cymbopogon procerus*
Herbs/creepers	<2%	*Bonamia media* var. *villosa*
Other species near plot		*Eucalyptus leucophloia* ssp. *leucophloia, Acacia pyrifolia*



Site 30 (SR30)		
Date	29/07/05	
Coordinates	Lat: S 20°53' 21.2" Long: E 120°05' 47.7"	
Description	*Eucalyptus leucophloia* ssp. *leucophloia* low open woodland over *Acacia inaequilatera/Grevillea wickhamii* ssp. *hispidula* scattered shrubs over *Acacia ptychophylla* low shrubland over *Triodia brizoides* hummock grassland.	
Plot Size	plotless	
Topography	Lower slope of BIF ridge	
Slope	Moderate (15 – 45°)	
Aspect	South	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Mixture basalt and ironstone, 95 - 100%	
% Litter cover	10%	
Total vegetation cover (%)	50%	
Condition	Pristine	
Disturbance Details	-	
Fire History	Old (more than 5 years ago) and Moderate (2 – 5 years ago) as there are fingers of fire scars across the slope.	
Weeds	-	
Trees <10m	2 – 10%	*Eucalyptus leucophloia* ssp. *leucophloia*
Shrubs >2m	<2%	*Acacia inaequilatera*
Shrubs 1 - 2m	<2%	*Grevillea wickhamii* ssp. *hispidula*
Shrubs <1m	10 – 30%	*Acacia ptychophylla, Ptilotus calostachyus, Goodenia stobbsiana*
Hummock Grasses	30 - 70%	*Triodia brizoides*

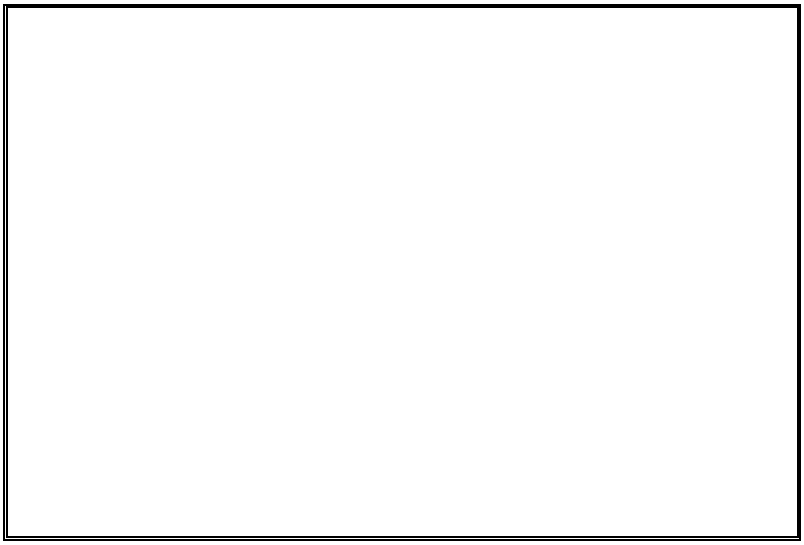
Site 31 (SR31)		
Date	29/07/05	
Coordinates	Lat: S 20°53' 09.7" Long: E 120°06' 52.1"	
Description	*Eucalyptus camaldulensis* var. *obtusa* open forest over *Melaleuca glomerate*/*Atalaya hemiglauca* low open forest over *Acacia pyrifolia/ A. trachycarpa/A. ampliceps* high open shrubland over *Stemodia viscosa* very open herbs over *Cyperus vaginatus* open sedges	
Plot Size	Plotless	
Topography	Drainage line	
Slope	Flat (0 – 5°)	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Mixture basalt, greenstone and ironstone, 30%	
% Litter cover	20 - 30%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Small amount of rubbish. Adjacent area burnt recently (Feb 05)	
Fire History	No recent fire history evident within drainage line. Adjacent area burnt in Feb 05.	
Weeds	*Cenchrus ciliaris* - grazed	
Trees >10m	30 – 70%	*Eucalyptus camaldulensis* var. *obtusa*
Trees <10m	30 – 70%	*Melaleuca glomerata, Atalaya hemiglauca*
Shrubs >2m	2 - 10%	*Acacia trachycarpa, Acacia pyrifolia, Acacia ampliceps*
Shrubs <1m	<2%	*Goodenia stobbsiana*
Hummock Grasses	2 - 10%	*Triodia epactia*
Tussock Grasses	<2%	*Eriachne mucronata*, *Cymbopogon procerus*
Sedges	10 – 30%	*Cyperus vaginatus, Typha domingensis*
Herbs/creepers	2 - 10%	*Cassytha filiformis, Stemodia viscosa, Euphorbia schultzii, Pterocaulon sphaeranthoides*
Other species		*Adriana urticoides* var. *urticoides*



Site 32 (SR32)		
Date	29/07/05	
Coordinates	Lat: S 20°53' 07.7" Long: E 120°06' 54.1"	
Description	*Eucalyptus leucophloia* ssp. *leucophloia*/*Corymbia hamersleyana* low woodland over *Grevillea wickhamii* ssp. *hispidula*/*Grevillea pyramidalis* ssp. *leucadendron* and *Acacia inaequilatera* open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Lower/mid slope of ridgeline	
Slope	Moderate (15 – 45°)	
Aspect	South	
Soil	Moderate reddish brown clayey sand	
Exposed rock type (%)	Ironstone with small amount of quartz, 95%	
% Litter cover	20%	
Total vegetation cover (%)	60%	
Condition	Pristine	
Disturbance Details	-	
Fire History	Old (more than 5 years ago)	
Weeds	-	
Trees <10m	10 - 30%	*Corymbia hamersleyana, Eucalyptus leucophloia* ssp. *leucophloia, Terminalia canescens* (At top of slope)
Shrubs 1 - 2m	2 - 10%	*Grevillea pyramidalis* ssp. *leucadendron*, *Grevillea wickhamii* ssp. *hispidula, Acacia inaequilatera*
Shrubs <1m	<2%	*Indigofera monophylla*
Hummock Grasses	30 - 70%	*Triodia epactia*

Site 33 (SR33)		
Date	29/07/05	
Coordinates	Lat: S 20°53' 01.9" Long: E 120°07' 00.6"	
Description	*Eucalyptus camaldulensis* var. *obtusa* open woodland over *Melaleuca argentea/Atalaya hemiglauca/Terminalia canescens/Ficus brachypoda* low woodland over *Melaleuca glomerata* high open shrubland with scattered *Acacia ampliceps/A. coriacea* ssp. *pendens*/*Ficus opposita* var. *indecora* over *Cyperus vaginatus* open sedges.	
Plot Size	Plotless	
Topography	Coppin Gap – creekline through BIF ridge	
Slope	Varies from flat (drainage line) to steep (gorge walls)	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Ironstone	
% Litter cover	20 - 30%	
Total vegetation cover (%)	50%	
Condition	Good	
Disturbance Details	Small amount of litter from human visitation. Grazing by cattle evident. Cattle and human tracks along edge of water course.	
Fire History	None evident	
Weeds	**Cenchrus ciliaris* (30 – 70% cover in patches)	
Trees <10m	10 – 30%	*Eucalyptus camaldulensis* var. *obtusa, Melaleuca argentea, Atalaya hemiglauca, Ficus brachypoda, Terminalia canescens, Sesbania formosa* (one plant only)*, Melaleuca glomerata, Acacia coriacea* ssp. *pendens, Ficus opposita* var. *indecora*
Shrubs >2m	2 - 10%	*Acacia ampliceps*
Shrubs 1 - 2m	<2%	*Acacia farnesiana*
Shrubs <1m	<2%	*Corchorus parviflorus, Dodonaea viscosa* ssp. *mucronata, Sida rohlenae* ssp. *rohlenae, Corchorus incanus, Acacia farnesiana*
Tussock Grasses	30 – 70%	**Cenchrus ciliaris* (seedlings, 30 – 70% in patches), *Cymbopogon procerus, Eriachne mucronata*
Sedges	2 - 10%	*Cyperus vaginatus*
Herbs/creepers	<2%	*Tinospora smilacina*
Other species		*Eucalyptus camaldulensis* var. *obtusa* over *Cyperus vaginatus* at northern end of Coppin gap. *Capparis spinosa* var. *nummularia.*

Site 34 (SR34)		
Date	28/04/06	
Coordinates	Lat: S20°51' 35.8" Long: E120°04' 09.7"	
Description	*Grevillea wickhamii* ssp. *hispidula*/*G. pyramidalis* ssp. *leucadendron* scattered tall shrubs over *Triodia wiseana*/*T. epactia* hummock grassland over mixed very open herbs.	
Plot Size	50m x 50m	
Topography	Valley flats, Small rises in valley	
Slope	gentle (5 - 15^{o})	
Soil	red/brown loamy sand	
Exposed rock type (%)	Ironstone pebbles, some quartz, 60 - 98%	
% Litter cover	Patchy, greater around *T. epactia*. 2 – 10%	
Total vegetation cover (%)	60 – 70%	
Condition	-	
Disturbance Details	Cattle tracks	
Fire History	Moderate (2 – 5 yrs ago)	
Weeds	-	
Shrubs >2m	<2%	*Grevillea wickhamii* ssp. *hispidula, Grevillea pyramidalis* ssp. *leucadendron*
Shrubs < 1m	<2%	*Corchorus parviflorus*
Hummock Grass	30 – 70%	*Triodia epactia* (10 – 30%), *T. wiseana* (30 – 70%)
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	2 - 10%	*Mollugo molluginea, Trianthema triquetra, Stemodia viscosa, Sporobolus australasicus, Eriachne pulchella* ssp. *dominii*
Species near plot		*Trichodesma zeylanicum* var. *zeylanicum, Rhynchosia minima* var. *australis, Pluchea tetranthera, Alysicarpus muelleri, Oldenlandia crouchiana, Rhynchosia minima* var. *australis, Senna notabilis.*

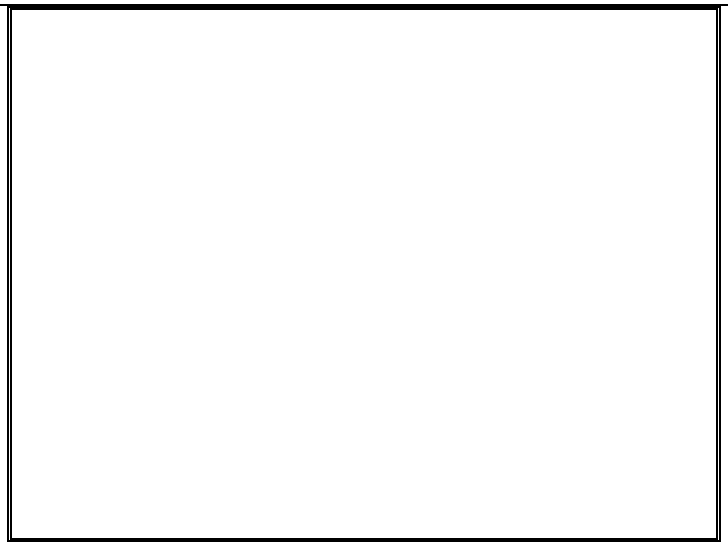


Site 35 (SR35)		
Date	28/04/06	
Coordinates	Lat: S20°51' 39.9" Long: E120°03' 04.9"	
Description	*Acacia tumida* var. *pilbarensis* and *Crotalaria cunninghamii* high open shrubland over *Pluchea ferdinandi-muelleri* and *Pluchea tetranthera* low shrubland over scattered herbs and grasses.	
Plot Size	50m x 50m	
Topography	Drainage line/flat	
Slope	flat (0 – 5°)	
Soil	Red/brown loamy sand	
Exposed rock type (%)	-	
% Litter cover	10 – 20%	
Total vegetation cover (%)	70%	
Condition	Very good	
Disturbance Details	Cattle grazing evident – cattle tracks along drainage line. Buffel grass grazed.	
Fire History	None evident – No recent fire history. Thick litter built up on *T. epactia*	
Weeds	**Cenchrus ciliaris,*Aerva javanica*	
Shrubs >2m	2 - 10%	*Acacia tumida* var. *pilbarensis, Crotalaria cunninghamii*
Shrubs 1 – 2m	10 – 30%	*Pluchea ferdinandi-muelleri*
Shrubs < 1m	10 – 30%	*Pluchea tetranthera, Senna notabilis, Corchorus sidoides* ssp. *sidoides, Triumfetta* aff. *chaetocarpa, Indigofera colutea.*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	<2%	*Eriachne aristidea, Dactyloctenium radulans, Sporobolus australasicus, *Cenchrus ciliaris*
Bunch Grass	2 – 10%	*Aristida ?holathera,*
Sedges	<2%	*Cyperus vaginatus, Bulbostylis barbata*
Herbs/creepers	10 – 30%	*Stemodia grossa, Rhynchosia minima var. australis, Euphorbia drummondii, Pterocaulon sphaeranthoides, Indigofera linifolia, Cleome viscosa, *Aerva javanica* (*R. minima* var. *australis* and *E. drummondii* dominant)
Other species		*Eriachne obtusa, Boerhaevia sp., Sida rohlenae* ssp. *rohlenae, Polymeria ambigua, Solanum ?phlomoides, Indigofera monophylla, Grevillea pyramidalis* ssp. *leucadendron, Mukia maderaspatana, Cymbopogon procerus* .

Site 36 (SR36)		
Date	28/04/06	
Coordinates	Lat: S20°50' 36.2" Long: E120°04' 27.2"	
Description	Scattered tall shrubs of *Acacia inaequilatera, Grevillea pyramidalis* ssp. *leucadendron/G.wickhamii* ssp. *hispidula* over *Triodia epactia* hummock grassland on sandplain.	
Plot Size	50m x 50m	
Topography	Plains	
Slope	flat (0 – 5^{o})	
Soil	Red-brown loamy sand	
Exposed rock type (%)	Small amount quartz pebble 2%	
% Litter cover	2%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Cattle tracks	
Fire History	None evident	
Weeds	None	
Shrubs >2m	<2%	*Acacia inaequilatera, Grevillea pyramidalis* ssp. *leucadendron, G. wickhamii* ssp. *hispidula*
Shrubs < 1m	<2%	*Pluchea tetranthera*
Hummock Grass	30 – 70%	*Triodia epactia*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Mollugo molluginea*
Other species		*Acacia bivenosa* (not common), *Acacia ancistrocarpa, Alysicarpus muelleri, Indigofera colutea, Rhynchosia minima* var. *australis.*

Site 37 (SR37)		
Date	28/04/06	
Coordinates	Lat: S S20°50' 13.2" Long: E120°05' 13.5"	
Description	*Corymbia flavescens/Bauhinia cunninghamii* low open woodland over mixed *Acacia* open scrub over *Cyperus vaginatus* sedges over *Cenchrus ciliaris* open tussock grassland over mixed very open herbs.	
Plot Size	50m x 50m	
Topography	Drainage line	
Slope	gentle (5 - 15^{o})	
Soil	Red-brown clayey sand	
Exposed rock type (%)	-	
% Litter cover	30%	
Total vegetation cover (%)	70%	
Condition	Very good	
Disturbance Details	Cattle tracks along drainage line. Buffel grass common.	
Fire History	None evident	
Weeds	**Cenchrus ciliaris, *Citrullus colyocynthis,*Echinochloa colona*	
Trees <10m	2-10%	*Corymbia flavescens, Bauhinia cunninghamii*
Shrubs >2m	30 – 70%	*Acacia tumida var. pilbarensis* (dominant), *A. trachycarpa, A. coriacea* ssp. *pendens, A. farnesiana, Ficus opposititifolia* var. *indecora*
Shrubs < 1m	<2%	*Pluchea ferdinandi-muelleri , Senna notabilis*
Tussock Grass	10 – 30%	**Cenchrus ciliaris* (dominant), *Dactyloctenium radulans, Sporobolus australasicus, Chloris pectinata, Eriachne obtusa, *Echinochloa colona, Eragrostis tenellula*
Sedges	30 – 70%	*Cyperus vaginatus*
Herbs/creepers	2 – 10%	*Boerhaevia sp., Ipomoea muelleri, Rhynchosia minima* var. *australis, Amaranthus* aff. *pallidiflorus, Alysicarpus muelleri, Euphorbia australis,*Citrullus colyocynthis*

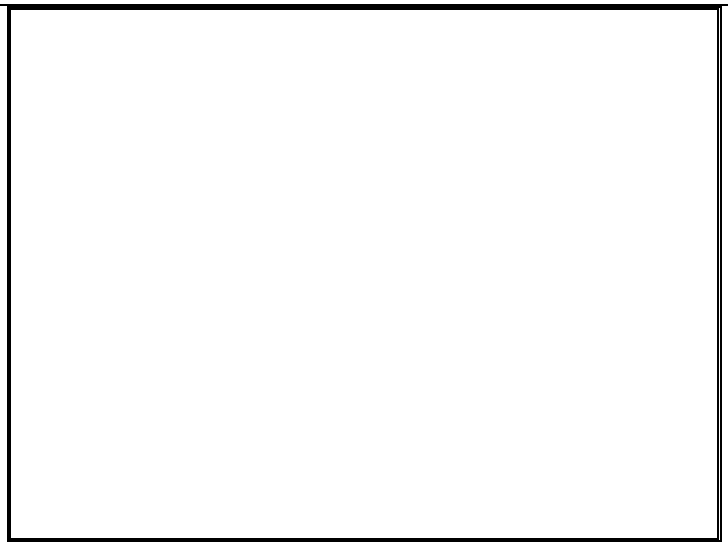
Site 38 (SR38)		
Date	28/04/06	
Coordinates	Lat: S20°51' 59.4" Long: E120°04' 17.5"	
Description	*Corymbia hamersleyana* scattered low trees over *Acacia tumida* var. *pilbarensis* open scrub over *Triodia epactia* open hummock grassland on drainage line banks. Sandy creek floor (no other understorey).	
Plot Size	plotless	
Topography	Drainage Line	
Slope	Moderate (15 - 45°)	
Soil	Red-brown clayey sand	
Exposed rock type (%)	-	
% Litter cover	2 – 10%	
Total vegetation cover (%)	-	
Condition	Good. Burning of site has resulted in dense stands of *Acacia tumida var. pilbarensis* along some drainage lines.	
Disturbance Details	Vehicle track dissects creekline	
Fire History	Moderate (2 – 5 years ago)	
Weeds	none	
Trees <10m	<2%	*Corymbia hamersleyana*
Shrubs >2m	30 – 70%	*Acacia tumida* var. *pilbarensis*
Hummock Grass	10 – 30%	*Triodia epactia* (on banks)



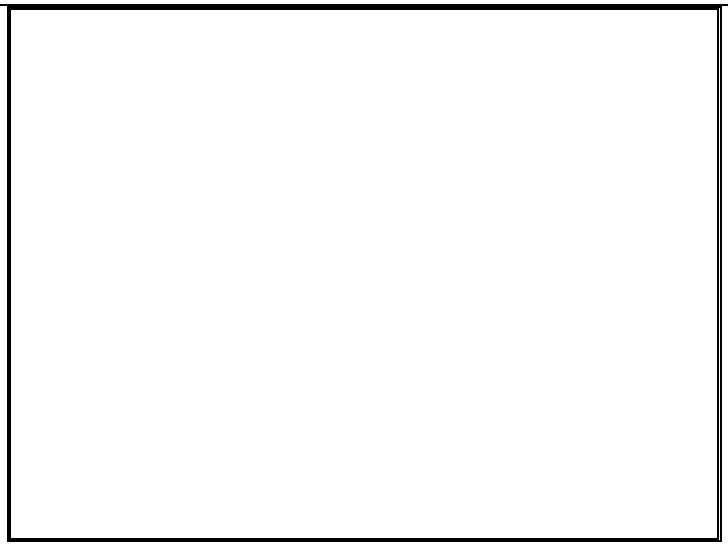
Site 39 (SR39)		
Date	28/04/06	
Coordinates	Lat: S20°48' 58.8" Long: E120°07' 01.8"	
Description	*Acacia tumida* var. *pilbarensis, Cullen pustulatum* and *Grevillea pyramidalis* ssp. *leucadendron* high open shrubland over *Corchorus sidoides* ssp. *sidoides* and *Indigofera monophylla* low shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plain	
Slope	flat (0 – 5^{o}) Small drainage line dissects	
Soil	Red-brown clayey sand	
Exposed rock type (%)	None	
% Litter cover	5%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Some cattle tracks, mostly undisturbed	
Fire History	Old (more than 5 yrs ago)	
Weeds	**Cenchrus ciliaris* <2%, small amount around dead tree	
Shrubs >2m	10 – 30%	*Acacia tumida* var. *pilbarensis, Cullen pustulatum, Grevillea pyramidalis* ssp. *leucadendron.*
Shrubs 1 – 2m	10 – 30%	*Acacia tumida* var. *pilbarensis, Grevillea pyramidalis* ssp. *leucadendon, Acacia trachycarpa, Acacia victoriae,*
Shrubs < 1m	10 – 30%	*Corchorus sidoides* ssp. *sidoides, Indigofera monophylla, Tephrosia rosea* var. *clementii*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	2 – 10%	*Eragrostis tenellula, Eragrostis cumingii, Sporobolus australasicus, Iseleima membranaceum, Dactyloctenium radulans, Chloris pectinata*
Herbs/creepers	<2%	*Polymeria calycina, Portulaca oleracea, Indigofera trita, Indigofera colutea, Alysicarpus muelleri*
Other species		*Acacia farnesiana*

Site 40 (SR40)		
Date	28/04/06	
Coordinates	Lat: S20°51' 09.5" Long: E120°05' 54.9"	
Description	*Corymbia flavescens* low open woodland over *Acacia tumida var. pilbarensis* open scrub over *Sida rohlenae* ssp. *rohlenae* low open heath over *Triodia epactia* open hummock grassland.	
Plot Size	50m x 50m	
Topography	Drainage channel/flat	
Slope	flat (0 – 5^{o})	
Soil	Red-brown sandy clay loam	
Exposed rock type (%)	-	
% Litter cover	60%	
Total vegetation cover (%)	90%	
Condition	Excellent	
Disturbance Details	Buffel grass grazed	
Fire History	Old (more than 5 years ago)	
Weeds	**Cenchrus ciliaris*	
Trees <10m	2 - 10%	*Corymbia flavescens*
Shrubs >2m	30 - 70%	*Acacia tumida var. pilbarensis, Crotalaria cunninghamii* (<2%)
Shrubs < 1m	30 – 70%	*Sida rohlenae* ssp. *rohlenae* (dominant), *Triumfetta appendiculata, Corchorus sidoides* ssp. *sidoides, Tephrosia rosea* var. *clementii, Ficus oppositifolia* var. *indecora, Senna notabilis,*
Hummock Grass	10 – 30%	*Triodia epactia*
Tussock Grass	2 – 10%	**Cenchrus ciliaris* (dominant), *Eragrostis cumingii, Perotis rara, Sporobolus australasicus*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	2 - 10%	*Euphorbia australis, Mollugo molluginea, Rhynchosia minima* var. *australis, Polymeria calycina, Amaranthus* aff. *pallidiflorus, Boerhaevia sp., Indigofera colutea*

Site 41 (SR41)		
Date	28/04/06	
Coordinates	Lat: S20°52' 22.4" Long: E120°05' 10.2"	
Description	Scattered shrubs of *Acacia inequilatera* over *Triodia epactia* hummock grassland and *Eriachne pulchella* ssp. *dominii* open tussock grassland over *Bulbostylis barbata* very open sedges.	
Plot Size	50m x 50m	
Topography	Small rises	
Slope	gentle (5 - 15^{o})	
Soil	Red loamy sand	
Exposed rock type (%)	Quartz and ironstone pebbles	
% Litter cover	2%	
Total vegetation cover (%)	40%	
Condition	Excellent	
Disturbance Details	Burnt within last two years	
Fire History	Recent (within last 2 yrs)	
Weeds	None	
Shrubs 1 – 2m	<2%	*Acacia inaequilatera*
Hummock Grass	30-70%	*Triodia epactia*
Tussock Grass	10 – 30%	*Eriachne pulchella* ssp. *dominii* (dominant), *Eriachne aristidea*
Sedges	2 – 10%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Boerhavia sp., Mollugo molluginea, Cleome viscosa*
Other species		*Fimbristylis simulans, Acacia victoriae, Ptilotus calostachyus, Portulaca oleracea*



Site 42 (SR42)		
Date	28/04/06	
Coordinates	Lat: S20°52' 32.5" Long: E120°06' 05.5"	
Description	*Acacia inaequilatera* scattered tall shrubs over *Triodia epactia* hummock grassland over *Bulbostylis barbata* and *Fimbristylis simulans* open annual sedges.	
Plot Size	50m x 50m	
Topography	Small rises	
Slope	gentle (5 - 15^{o})	
Soil	Red clayey sand	
Exposed rock type (%)	Ironstone pebbles 95%	
% Litter cover	2%	
Total vegetation cover (%)	40-50%	
Condition	Very good	
Disturbance Details	Burnt within last 2years. Spinifex re-establishment patchy	
Fire History	Recent (within last 2 yrs)	
Weeds	None	
Shrubs >2m	<2%	*Acacia inaequilatera*
Hummock Grass	30 - 70%	*Triodia epactia*
Sedges	10 - 30%	*Fimbristylis simulans, Bulbostylis barbata*
Herbs/creepers	<2%	*Polycarpaea holtzei, Gomphrena cunninghamii, Mollugo molluginea*
Other species		*Euphorbia australis, Dampiera candicans*



Site 43 (SR43)		
Date	29/04/06	
Coordinates	Lat: S20°52' 02.6" Long: E120°04' 44.2"	
Description	*Acacia inaequilatera* scattered shrubs over *Pluchea tetranthera* low shrubland over *Triodia epactia* hummock grassland on sandy plain.	
Plot Size	50m x 50m	
Topography	Plains, Sandy	
Slope	flat (0 – 5°)	
Soil	Red-brown clayey sand	
Exposed rock type (%)	<1%	
% Litter cover	10 – 20%	
Total vegetation cover (%)	70%	
Condition	Pristine/Excellent	
Disturbance Details	Some cattle tracks, generally excellent/ pristine	
Fire History	Old (more than 5 yrs ago)	
Weeds	None	
Shrubs 1 – 2m	<2%	*Acacia inaequilatera*
Shrubs < 1m	10 – 30%	*Pluchea tetranthera* (dominant), *Corchorus incanus, Pluchea ferdinandi-muelleri*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	2 - 10%	*Eriachne aristidea* (dominant), *Cymbopogon procerus*
Bunch Grass	<2%	*Aristida ?holathera*
Sedges	2 – 10%	*Bulbostylis barbata, Bulbostylis turbinata*
Herbs/creepers	10 – 30%	*Rhynchosia minima* var. *australis* (dominant), *Indigofera linifolia, Polycarpaea holtzei, Indigofera colutea, Alysicarpus muelleri, Cassytha filiformis*

Site 44 (SR44)		
Date	29/04/06	
Coordinates	Lat: S20°52' 32.3" Long: E120°07' 01.9"	
Description	*Pluchea tetranthera* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plains	
Slope	flat (0 – 5°)	
Soil	Red clayey sand	
Exposed rock type (%)	Ironstone pebbles, small amount of quartz. 25 - 70%	
% Litter cover	10%	
Total vegetation cover (%)	50 - 60%	
Condition	Pristine/Excellent	
Disturbance Details	-	
Fire History	Old (more than 5 yrs ago)	
Weeds	None	
Shrubs < 1m	2-10%	*Pluchea tetranthera* (dominant), *Corchorus incanus*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	<2%	*Cymbopogon procerus, Sporobolus australasicus, Eriachne obtusa*
Bunch Grass	<2%	*Aristida contorta*
Sedges	2 – 10%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Rhynchosia minima* var. *australis, Alysicarpus muelleri, Euphorbia australis, Pterocaulon sphaeranthoides*
Other species		*Grevillia pyramidalis* ssp. *leucadendron, Grevillea wickhamii* ssp. *hispidula, Eragrostis* aff. *eriopoda*

Site 45 (SR45)		
Date	30/04/06	
Coordinates	Lat: S20°51' 04.9" Long: E120°04' 54.6"	
Description	*Grevillia pyramidalis* ssp. *leucadendron* and *Acacia tumida* var. *pilbarensis* scattered tall shrubs over *Corchorus sidoides* ssp. *sidoides* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plain	
Slope	flat (0 – 5°)	
Soil	Red-brown loamy sand	
Exposed rock type (%)	Small ironstone pebbles – very sparse. 2%	
% Litter cover	2%	
Total vegetation cover (%)	50%	
Condition	Excellent	
Disturbance Details	Cattle tracks present	
Fire History	Old (more than 5 years ago)	
Weeds	None	
Shrubs >2m	<2%	*Grevillea pyramidalis* ssp. *leucadendron, Acacia tumida* var. *pilbarensis*
Shrubs < 1m	2 – 10%	*Corchorus sidoides* ssp. *sidoides* (dominant), *Pluchea ferdinandi-muelleri, Bonamia rosea*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	<2%	*Eriachne aristidea, Eragrostis cumingii, Eragrostis* aff. *eriopoda*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Mollugo molluginea, Rhynchosia minima* var. *australis, Indigofera linnaei, Synaptantha tillaeacea* var. *tillaeacea, Indigofera colutea, Bonamia linearis*
Other species		*Heliotropium skeleton*

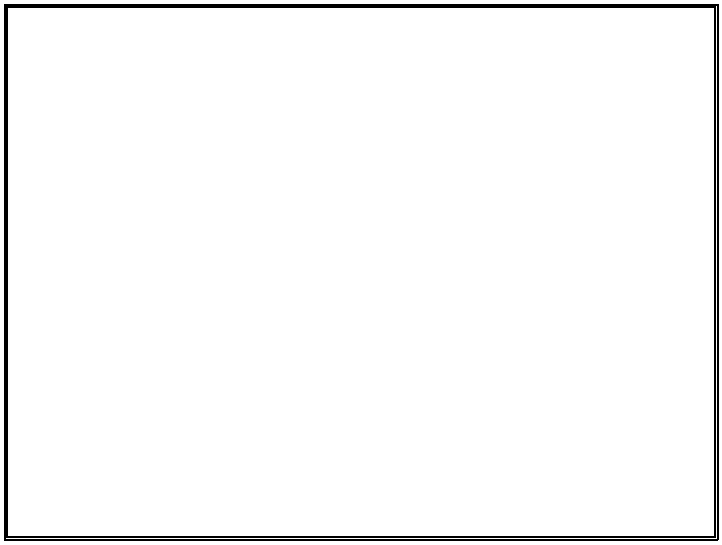
Site 46 (SR46)		
Date	30/04/06	
Coordinates	Lat: S20°51' 57.4" Long: E120°07' 18.1"	
Description	*Grevillea wickhamii* ssp. *hispidula* scattered tall shrubs over *Corchorus incanus/Bonamia rosea* low scattered shrubs over *Triodia wiseana* hummock grassland with some *T. epactia.* Located on areas covered with quartz pebbles.	
Plot Size	50m x 50m	
Topography	Plains	
Slope	flat (0 – 5^{o})	
Soil	Red clayey sand	
Exposed rock type (%)	Quartz and basalt pebble 20 – 70%. Small amount of ironstone.	
% Litter cover	2 – 5%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Appears pale on aerial due to quartz and pale sands. Little evidence of disturbance by cattle.	
Fire History	Old (more than 5 yrs ago)	
Weeds	None	
Shrubs >2m	<2%	*Grevillia wickhamii* ssp *hispidula*
Shrubs < 1m	<2%	*Corchorus incanus, Bonamia rosea*
Hummock Grass	30 – 70%	*Triodia wiseana* (30 – 70%), *Triodia epactia* (2 – 10%)

Site 47 (SR47)		
Date	30/04/06	
Coordinates	Lat: S20°49' 47.7" Long: E120°05' 58.7"	
Description	*Grevillia pyramidalis* ssp. *leucadendron/Acacia tumida* var. *pilbarensis/Acacia trachycarpa* scattered tall shrubs over *Triodia epactia* hummock grassland on sandy plain.	
Plot Size	50m x 50m	
Topography	Plain	
Slope	flat (0 – 5°)	
Soil	Red-brown sandy loam	
Exposed rock type (%)	None	
% Litter cover	-	
Total vegetation cover (%)	60 - 70%	
Condition	Excellent/Pristine	
Disturbance Details	Limited disturbance	
Fire History	None evident	
Weeds	None	
Shrubs >2m	<2%	*Grevillia pyramidalis* ssp. *leucadendron, Acacia tumida* var. *pilbarensis, Acacia trachycarpa*
Shrubs < 1m	<2%	*Pluchea tetranthera, Acacia inaequilatera, Corchorus sidoides* ssp. *sidoides, Tephrosia rosea* var. *clementii*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	<2%	*Sporobolus australasicus, Eriachne aristidea, Perotis rara*
Bunch Grass	<2%	*Aristida contorta*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Mollugo molluginea, Portulaca oleracea, Rhynchosia minima var. australis, Boerhaevia sp., Cleome uncifera* ssp. *uncifera, Polycarpaea corymbosa* var. *corymbosa, Indigofera colutea, Indigofera trita, Polymeria ambigua, Zornia muelleriana* ssp *congesta*

Site 48 (SR48)		
Date	30/04/06	
Coordinates	Lat: S20° 49' 27.2' Long: E120° 06' 14.5"	
Description	*Pluchea tetranthera* low open shrubland over *Triodia epactia* open hummock grassland over *Sporobolus actinocladus* tussock grassland.	
Plot Size	50m x 50m	
Topography	Plains	
Slope	flat (0 – 5°)	
Soil	Red-brown sandy loam	
Exposed rock type (%)	-	
% Litter cover	10%	
Total vegetation cover (%)	65%	
Condition	Excellent.	
Disturbance Details	Some cattle tracks	
Fire History	Old (more than 5 yrs ago)	
Weeds	None	
Shrubs < 1m	2-10%	*Pluchea tetranthera*
Hummock Grass	10-30%	*Triodia epactia*
Tussock Grass	30 – 70%	*Sporobolus actinocladus* (dominant), *Eragrostis cumingii, Dactyloctenium radulans, Chloris pectinata*
Herbs/creepers	<2%	*Cleome viscosa, Calandrinia* sp.

Site 49 (SR49)		
Date	30/04/06	
Coordinates	Lat: S20°48' 44.3" Long: E120°06' 58.0"	
Description	*Acacia tumida var. pilbarensis* and *Grevillia pyramidalis ssp. leucadendron* open shrubland over *Corchorus sidoides ssp. sidoides* low open heath over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plains	
Slope	flat (0 – 5°)	
Soil	Red-brown sandy loam	
Exposed rock type (%)	Small amount of quartz. 2%	
% Litter cover	5 - 10%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	Burnt in the last 5 years. Cattle tracks	
Fire History	Moderate (2 – 5 yrs ago)	
Weeds	None	
Shrubs 1 – 2m	2 – 10%	*Acacia tumida* var. *pilbarensis* (dominant), *Grevillia pyramidalis* ssp. *leucadendron*
Shrubs < 1m	30 – 70%	*Corchorus sidoides* ssp. *sidoides* (dominant), *Sida pilbarensis*
Hummock Grass	30-70%	*Triodia epactia*
Tussock Grass	2-10%	*Sporobolus australasicus* (dominant), *Chloris pectinata, Cymbopogon procerus*
Bunch Grass	<2%	*Aristida contorta*
Herbs/creepers	<2%	*Mollugo molluginea, Portulaca oleracea, Boerhaevia sp., Polycarpaea holtzei*
Other species		*Dactyloctenium radulans*

Site 50 (SR50)		
Date	30/04/06	
Coordinates	Lat: S20° 49' 59.6" Long: E120° 07' 18.9"	
Description	*Acacia victoriae* open shrubland over *Pluchea tetranthera* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plains	
Slope	flat (0 – 5°)	
Soil	Red-brown clayey sand	
Exposed rock type (%)	None	
% Litter cover	2 – 5%	
Total vegetation cover (%)	60%	
Condition	Good	
Disturbance Details	Has been inundated, resulting in germination of grasses which were dying off at the time of assessment. Cattle tracks and dung. Vehicle track adjacent.	
Fire History	Moderate (2 – 5 yrs ago)	
Weeds	None	
Shrubs 1 – 2m	2 - 10%	*Acacia victoriae*
Shrubs < 1m	2 – 10%	*Pluchea tetranthera, Pluchea ferdinandi-muelleri.*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	<2%	*Sporobolus australasicus, Dactyloctenium radulans, Dichanthium sericeum, Chloris pectinata, Eragrostis tenellula, Iseilema membranaceum*
Herbs/creepers	<2%	*Portulaca oleracea, Neptunia dimorphantha, Ipomoea coptica*



Site 51 (SR51)		
Date	30/04/06	
Coordinates	Lat: S20°50' 51.8" Long: E120°07' 36.2"	
Description	*Eucalyptus camaldulensis* var. *obtusa* open woodland over *Melaleuca glomerata* low woodland over Mixed *Acacia* high open shrubland over *Cyperus vaginatus* open sedges over mixed open herbs.	
Plot Size	50m x 50m	
Topography	Drainage line (Coppin Creek)	
Slope	gentle (5 - 15^{o})	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Mixture - ironstone, basalt and quartz pebbles. 40%	
% Litter cover	Patchy. 5 – 10 %	
Total vegetation cover (%)	40 – 50%	
Condition	Excellent	
Disturbance Details	Water flow disturbance only.	
Fire History	None evident	
Weeds	**Cenchrus ciliaris, *Citrullus colyocynthis*	
Trees 10 - 30m	2 – 10%	*Eucalyptus camaldulensis* var. *obtusa*
Trees <10m	10 - 30%	*Melaleuca glomerata*
Shrubs >2m	2 – 10%	*Acacia ancistrocarpa, A. trachycarpa, A. ampliceps,*
Shrubs 1 – 2m	<2%	*Cullen pustulatum*
Tussock Grass	<2%	**Cenchrus ciliaris*
Sedges	10 – 30%	*Cyperus vaginatus*
Herbs/creepers	2 – 10%	*Cleome viscosa* (dominant), *Amaranthus* aff. *pallidiflorus, Euphorbia australis, * Citrullus colyocynthis*

Site 52 (SR52)		
Date	30/04/06	
Coordinates	Lat: S20°52' 21.4" Long: E120°04' 55.2"	
Description	*Acacia tumida* var. *pilbarensis* high shrubland along creekline over mixed low open shrubland over *Triodia epactia* open hummock grassland.	
Plot Size	Plotless	
Topography	Drainage line (creekline)	
Slope	Gentle (5 – 15°)	
Soil	Light brown sand – loamy sand	
Exposed rock type (%)	Mixture of basalt, ironstone and quartz pebbles 40 – 60%	
% Litter cover	2%	
Total vegetation cover (%)	Thick along creek edge (70%), sparse on creek bed (10%)	
Condition	Excellent	
Disturbance Details	Vehicle track dissects creekline	
Fire History	Old (more than 5 years)	
Weeds	**Cenchrus ciliaris* on creek edges	
Shrubs >2m	10 – 30%	*Acacia tumida* var. *pilbarensis* along creek edge
Shrubs < 1m	2 – 10%	*Triumfetta* aff. *chaetocarpa, Corchorus incanus, Cynanchum floribundum, Senna notabilis*
Hummock Grass	2 – 10%	*Triodia epactia*
Tussock Grass	<2%	*Cymbopogon procerus, Sporobolus australasicus, Eriachne aristidea*
Bunch Grass	<2%	*Aristida ?holathera*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	<2%	*Rhynchosia minima* var. *australis, Boerhaevia* sp., *Indigofera linifolia, Indigofera colutea, Euphorbia coghlanii,*

Site 53 (SR53)		
Date	30/04/06	
Coordinates	Lat: S20°52' 26.1" Long: E120°05' 20.6"	
Description	*Acacia inaequilatera* high open shrubland over *Triodia wiseana* hummock grassland with some *Triodia epactia.*	
Plot Size	Plotless	
Topography	Small rise	
Slope	Gentle (5 – 15°)	
Soil	Red clayey sand	
Exposed rock type (%)	Calcrete and basalt	
% Litter cover	2%	
Total vegetation cover (%)	60%	
Condition	Excellent	
Disturbance Details	-	
Fire History	Old (more than 5 years ago). Edge of fire scar – (Everything south was burnt 2003)	
Weeds	none	
Shrubs >2m	2 - 10%	*Acacia inaequilatera*
Hummock Grass	30 – 70%	*Triodia wiseana* (30 – 70%), *T. epactia* (10 – 30%)
Sedges	<2%	*Bulbostylis barbata*

Site 54 (SR54)		
Date	30/04/06	
Coordinates	Lat: S20°49' 34.3" Long: E120°07' 15.6"	
Description	*Acacia victoriae* open scrub over *Pluchea tetranthera* low open shrubland over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plain	
Slope	Flat (0 -5°)	
Soil	Red clayey sand	
Exposed rock type (%)	Ironstone pebble <5%	
% Litter cover	2%	
Total vegetation cover (%)	70%	
Condition	Excellent	
Disturbance Details	Track adjacent.	
Fire History	No recent fire	
Weeds	None	
Shrubs >2m	30 – 70%	*Acacia victoriae*
Shrubs 1 – 2m	<2%	*Acacia tumida var. pilbarensis*
Shrubs < 1m	2 – 10%	*Pluchea tetranthera*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	<2%	*Sporobolus australasicus, Chloris pectinata, Dactyloctenium radulans*
Herbs/creepers	<2%	*Trianthema triquetra, Portulaca oleracea*

Site 55 (SR55)		
Date	30/04/06	
Coordinates	Lat: S20°50' 21.9" Long: E120°0'7 26.7"	
Description	*Acacia inaequilatera* scattered shrubs over *Triodia wiseana* hummock grassland over *Enneapogon lindleyanus* and *Cenchrus ciliaris* open tussock grassland with mixed open herbs.	
Plot Size	30m x 30m	
Topography	Small outcrop on plain (north of tank)	
Slope	Moderate (15 – 45°)	
Soil	Red clayey sand	
Exposed rock type (%)	Basalt outcrop, some quartz pebbles.	
% Litter cover	10%	
Total vegetation cover (%)	60%	
Condition	Good	
Disturbance Details	Outcrop dominated by weeds	
Fire History	Old (more than 5 years ago)	
Weeds	**Aerva javanica* (10 – 30%), **Cenchrus ciliaris* (10 – 30%)	
Shrubs 1m - 2m	<2%	*Acacia inaequilatera*
Hummock Grass	30 – 70%	*Triodia wiseana* (30 – 70%), *T. epactia* (2 – 10%)
Tussock Grass	10 – 30%	*Enneapogon caerulescens, *Cenchrus ciliaris, Sporobolus australasicus*
Herbs/creepers	10 – 30%	**Aerva javanica* (dominant), *Euphorbia australis, Rhynchosia minima* var. *australis, Indigofera colutea, Indigofera trita, Boerhavia* sp.

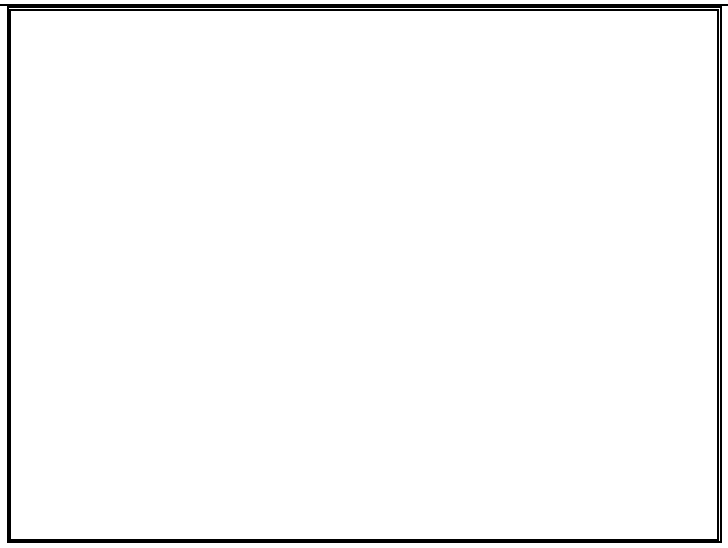
Site 56 (SR56)		
Date	30/04/06	
Coordinates	Lat: S20°50' 52.0" Long: E120°07' 33.4"	
Description	*Acacia stellaticeps* low open heath over *Triodia epactia* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plain	
Slope	Flat (0 – 5°)	
Soil	Red clayey sand	
Exposed rock type (%)	-	
% Litter cover	10%	
Total vegetation cover (%)	90%	
Condition	Excellent	
Disturbance Details	-	
Fire History	Old (more than 5 years ago)	
Weeds	none	
Shrubs < 1m	30 – 70%	*Acacia stellaticeps*
Hummock Grass	30 – 70%	*Triodia epactia*
Tussock Grass	2 – 10%	*Sporobolus australasicus, Dactyloctenium radulans*
Sedges	<2%	*Bulbostylis barbata*

Site 57 (SR57)		
Date	30/04/06	
Coordinates	Lat: S20°50' 51.5" Long: E120°07' 35.3"	
Description	*Triodia longiceps* hummock grassland.	
Plot Size	30m x 150m (approximate)	
Topography	Plain, near edge of Coppin Creek	
Slope	Flat (0 – 5°)	
Soil	Red clayey sand	
Exposed rock type (%)	-	
% Litter cover	20%	
Total vegetation cover (%)	80%	
Condition	Pristine/Excellent	
Disturbance Details	-	
Fire History	Old (more than 5 years ago)	
Weeds	none	
Hummock Grass	30 – 70%	*Triodia longiceps*
Sedges	<2%	*Bulbostylis barbata*
Herbs/creepers	2 – 10%	*Cassytha filiformis* (dominant), *Rhynchosia minima* var. *australis, Indigofera trita*

Site 58 (SR58)		
Date	30/04/06	
Coordinates	Lat: S20°51' 05.2" Long: E120°04' 46.6"	
Description	*Acacia inaequilatera* and *Grevillea pyramidalis* ssp. *leucadendron* scattered tall shrubs over *Triodia wiseana* hummock grassland.	
Plot Size	50m x 50m	
Topography	Plain	
Slope	-	
Soil	Red-brown sandy loam	
Exposed rock type (%)	Quartz and ironstone pebbles 60 – 70%	
% Litter cover	2 – 5%	
Total vegetation cover (%)	60%	
Condition	Pristine/Excellent	
Disturbance Details	None	
Fire History	Old (more than 5 years ago)	
Weeds	None	
Shrubs >2m	<2%	*Acacia inaequilatera, Grevillea pyramidalis* ssp. *leucadendron*
Shrubs 1 – 2m	<2%	*Corchorus sidoides* ssp. *sidoides*
Hummock Grass	30-70%	*Triodia wiseana*

Site 59 (SR59)		
Date	30/04/06	
Coordinates	Lat: S20°50' 13.2" Long: E120°07' 01.2"	
Description	*Acacia inaequilatera* low scattered shrubs over *Triodia wiseana* hummock grassland.	
Plot Size	Plotless	
Topography	Low rise running approximately north - south	
Slope	Gentle (5 – 15°)	
Soil	Red-brown sandy loam	
Exposed rock type (%)	Quartz and ironstone pebbles – 90% cover	
% Litter cover	2%	
Total vegetation cover (%)	40%	
Condition	Excellent	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago)	
Weeds	none	
Shrubs < 1m	<2%	*Acacia inaequilatera*
Hummock Grass	30 – 70%	*Triodia wiseana*

Site 60 (SR60)		
Date	30/04/06	
Coordinates	Lat: S20 50 18.9 Long: E120 06 58.3	
Description	Mixed annual tussock grasses in scald area.	
Plot Size	50m x 50m	
Topography	Plain. 'Scald' area.	
Slope	Flat (0 – 5°)	
Soil	Red clayey sand	
Exposed rock type (%)	-	
% Litter cover	20% (annual grasses dying off)	
Total vegetation cover (%)	60%	
Condition	Very Good	
Disturbance Details	Cattle tracks, grazing	
Fire History	Unknown	
Weeds	None	
Shrubs 1 – 2m	<2%	*Acacia victoriae*
Shrubs < 1m	<2%	*Sida* sp. (90)
Tussock Grass	30 – 70%	*Chloris pectinata, Dactyloctenium radulans, Iseilema membranaceum, Sporobolus australasicus*
Herbs/creepers	<2%	*Gomphrena cunninghamii, Trianthema triquetra*



Site 61 (SR61)		
Date	03/05/06	
Coordinates	Lat: S20°50' 36.9" Long: E120°06' 32.5"	
Description	*Triodia wiseana* hummock grassland.	
Plot Size	Plotless	
Topography	Plain	
Slope	Flat (0 – 5°)	
Soil	Red-brown sandy loam	
Exposed rock type (%)	Quartz pebbles, some ironstone, 70%	
% Litter cover	2%	
Total vegetation cover (%)	50%	
Condition	Excellent	
Disturbance Details	-	
Fire History	Moderate (2 – 5 years ago)	
Weeds	None	
Hummock Grass	30 – 70%	*Triodia wiseana*
Other species		*Heliotropium ammophilum* nearby on *Triodia epactia* dominated sandy plain.

Site 62 (SR62)		
Date	03/04/06	
Coordinates	Lat: S20°51' 13.3" Long: E12°06' 16.3"	
Description	*Grevillea pyramidalis* ssp. *leucadendron* open shrubland over *Corchorus sidoides* ssp. *sidoides* low open heath over *Triodia epactia* hummock grassland.	
Plot Size	Plotless	
Topography	Plain	
Slope	Flat (0 – 5°)	
Soil	Red-brown sandy loam	
Exposed rock type (%)	-	
% Litter cover	2 – 5%	
Total vegetation cover (%)	55%	
Condition	Excellent/Pristine	
Disturbance Details	-	
Fire History	Old (more than 5 years ago)	
Weeds	none	
Shrubs 1 - 2m	2 - 10%	*Grevillea pyramidalis* ssp. *leucadendron*
Shrubs < 1m	30 – 70%	*Corchorus sidoides* ssp. *sidoides*
Hummock Grass	30 – 70%	*Triodia epactia*

Appendix C

Classification of Vegetation Structural Formation and Height Classes

Vegetation Classifications for the Pilbara based on Specht (1970) with modification by Aplin (1979) &Trudgen

Life Form	Canopy Cover				
Height Class	**100 - 70%**	**70 - 30%**	**30 - 10%**	**10 - 2%**	**< 2%**
Trees > 30 m	High Closed Forest	High Open Forest	High Woodland	High Open Woodland	Scattered Tall Trees
Trees 10-30 m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees < 10 m	Low Closed Woodland	Low Open Forest	Low Woodland	Low Open Woodland	Scattered Low Trees
Shrubs > 2 m	Closed Scrub	Open Scrub	High Shrubland	High Open Shrubland	Scattered Tall Shrubs
Shrubs 1-2 m	Closed Heath	Open Heath	Shrubland	Open Shrubland	Scattered Shrubs
Shrubs < 1 m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Low Scattered Shrubs
Hummock Grass **Tussock Grass** **Bunch Grass**	Closed Hummock Grassland Closed Tussock Grassland Closed Bunch Grassland	Hummock Grassland Tussock Grassland Bunch Grassland	Open Hummock Grassland Open Tussock Grassland Open Bunch Grassland	Very Open Hummock Grassland Very Open Tussock Grassland Very Open Bunch Grassland	Scattered Hummock Grass Scattered Tussock Grass Scattered Bunch Grass
Sedges	Closed Sedges	Sedges	Open Sedges	Very Open Sedges	Scattered Sedges
Herbs	Closed Herbs	Herbs	Open Herbs	Very Open Herbs	Scattered Herbs

Appendix D
Vegetation Condition Scale

Vegetation Condition Scale (Keighery, 1994).

Code	Description
Pristine	Pristine or nearly so. No obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as ‘parkland cleared’ with the flora comprising weed or crop species with isolated native trees or shrubs.