Biota Environmental Sciences

Yandi Billiards Vegetation and Flora Survey – Phase 1 Interim Report

Prepared for Rio Tinto Pty Ltd

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1.0 Summary

Rio Tinto Pty Ltd's Yandicoogina (Yandi) iron ore project is located approximately 75 km northwest of Newman, in the Pilbara region of Western Australia. Rio Tinto is currently undertaking a 'Pre-feasibility Study' for development of two channel-iron deposits at Yandi Billiards, Pocket and Billiards South. In addition, Rio Tinto is also developing an updated 'Life of Mine' closure plan. Numerous biological surveys have been completed in the Yandi locality, and although some of these overlap Yandi Billiards, they do not provide full coverage of this area.

Biota Environmental Sciences (Biota) was commissioned in 2014 to undertake a vegetation and flora survey at Yandi Billiards (referred to hereafter as the study area) in order to address gaps in knowledge and expand the existing dataset for flora and vegetation. This survey will be conducted over two seasons and comply with the requirements of a Level 2 vegetation and flora assessment. This interim report documents the first field survey (Phase 1), which was completed in March 2014.

A desktop review and gap analysis of biological information relevant to the study area was undertaken prior to the survey. A total of 118 quadrats and 28 relevés have been sampled in the study area. Of these, 46 quadrats and eight relevés were established during the March 2014 field survey to sample previously unsurveyed areas and to provide replicated sampling for particular vegetation types. In addition, 32 existing quadrats that were established within the study area as part of other surveys in the locality were resampled. Mapping of dominant vegetation types was also undertaken in previously unsurveyed areas and in areas of broad-scale historical mapping. The field survey also included targeted searches for the Threatened species, *Lepidium catapycnon*, and for Priority listed flora.

A total of 23 vegetation units have been described for the study area. These vegetation types were associated with four broad landscape categories: major creeklines and tributaries; minor creeklines, floodplains and valleys; hills, ridges and breakaways; and plains. Most of the vegetation was in Good to Very Good condition, however the creekline and floodplain vegetation ranged from Good to Very Poor condition due to weed invasion and disturbance from cattle. None of the vegetation types observed in the study area represent Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs). Vegetation similar to that recorded for the study area is well represented in the locality. Three vegetation units, C1, C2 and C3, which occur in the major creeklines intersected by the study area (Marillana Creek and Weeli Wolli Creek), would represent an ecosystem at risk according to Kendrick (2003a).

A total of 451 native vascular flora taxa from 147 genera and 47 families have been recorded from the study area to date. This species richness is within the range expected for an area of this size in this locality.

One Threatened flora species, *Lepidium catapycnon*, was recorded from two locations in the study area during field surveys prior to 2009. These two locations were searched during the March 2014 field survey, however no plants were recorded. Targeted searches did not locate any additional populations of *Lepidium catapycnon*, however it is possible this species does occur elsewhere in the study area, as suitable habitat is present.

One Priority 4 flora species, *Goodenia nuda,* was recorded in the study area during the current survey. A total of 76 plants of this species were recorded from nine locations in Mulga woodlands and plains habitats. Based on the results of the field survey and the known distribution and habitats present in the study area, two Priority flora species may potentially occur in the study area: *Stylidium weeliwolli* (Priority 2) and *Rostellularia adscendens* var. *latifolia* (Priority 3). *Stylidium weeliwolli* is a small annual herb that may potentially occur in Weeli Wolli and Marillana Creek. *Rostellularia adscendens* var. *latifolia* is similarly a herb and has a wide range of habitat preferences, though it is most commonly recorded in drainage areas.

Eighteen introduced flora species (weeds) were recorded from the study area. *Argemone ochroleuca* (Mexican Poppy) is the only one of these listed as a Declared Pest for WA. **Cenchrus ciliaris* (Buffel Grass) was the most prolific introduced flora species observed in the study area. This species formed dense populations along sections of creek banks and floodplains, frequently in association with **Cenchrus setiger* (Birdwood Grass).

2.0 Introduction

2.1 Project Background

Rio Tinto currently operates the Yandi iron ore mine as part of its Pilbara Iron operations. It is located approximately 75 km northwest of Newman in the Pilbara region of Western Australia (Figure 2.1). The original Yandi mine, Junction Central, started construction in 1997 with the first shipment of ore occurring in 1999. The Yandi operations are approved under Ministerial Statement 914.

Rio Tinto is currently undertaking a 'Pre-feasibility Study' for development of two channel-iron deposits at Yandi Billiards, Pocket and Billiards South (PBS), located approximately 7 km east of the existing Yandi mine. In addition, Rio Tinto is also developing an updated 'Life of Mine' closure plan for the Yandi operations, including the Billiards deposits.

It is anticipated that the future development of Yandi Billiards may be formally assessed under both the State *Environmental Protection (EP) Act 1986* and the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. Numerous biological surveys have been completed in the Yandi locality, and although some of these overlap Yandi Billiards, they do not provide full coverage of this area (as defined in Ministerial Statement 914).

A desktop review and gap analysis of the surveys completed in the Yandi Billiards area was recently conducted (Biota 2013a) to determine any further work required to bring the level of information for the area to a level suitable for environmental impact assessment (EIA) under Part IV of the State *EP Act 1986*. Biota was subsequently commissioned to undertake a vegetation and flora survey in the Yandi Billiards area to address the recommendations of the desktop review and gap analysis report. The Yandi Billiards survey area is approximately 8,640 ha in size and is hereafter referred to as the 'study area'.

2.2 Scope and Objectives of this Study

The objective of this study was to conduct a vegetation and flora survey in the study area, based on the recommendations of the desktop review and gap analysis (Biota 2013a) in order to expand the existing flora and vegetation dataset for the area. The survey is required to comply with the requirements of a Level 2 vegetation and flora assessment in accordance with the Environmental Protection Authority (EPA) Guidance Statement No. 51 (EPA 2004).

This report documents the methods, results and key findings of the first phase 'wet season' vegetation and flora survey of the study area. A second phase of sampling will be completed in mid-2014 in the 'dry season' to meet the requirements of EPA (2004).

As part of this study the following tasks were required to be completed:

- review and discuss the existing information for the study area, including a summary of the relevant findings of the desktop review and gap analysis (Biota 2013a);
- describe, photograph and map the dominant vegetation types in previously unsurveyed areas of the study area, and revise and refine the existing broad-scale historical vegetation mapping as necessary;
- establish floristic survey quadrats in previously unsurveyed areas and areas of existing broad-scale historical mapping;
- establish additional floristic survey quadrats in previously mapped areas for vegetation types that require additional sampling replication to meet Level 2 requirements;
- resample approximately 60% of the existing historical quadrats in the study area;
- identify any vegetation units of conservation significance, including TECs and PECs (see Appendix 1);

- conduct targeted searches for the Threatened flora species, *Lepidium catapycnon,* and Priority flora species that may occur in the study area;
- record any species of particular conservation significance, including Threatened flora, Priority flora and other species that may be of conservation interest (see Appendix 1);
- record any introduced (weed) species and conduct vegetation condition mapping for the study area; and
- combine current survey results with existing data to compile a vascular flora species inventory for the study area.

This vegetation and flora assessment was undertaken in accordance with:

- 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).

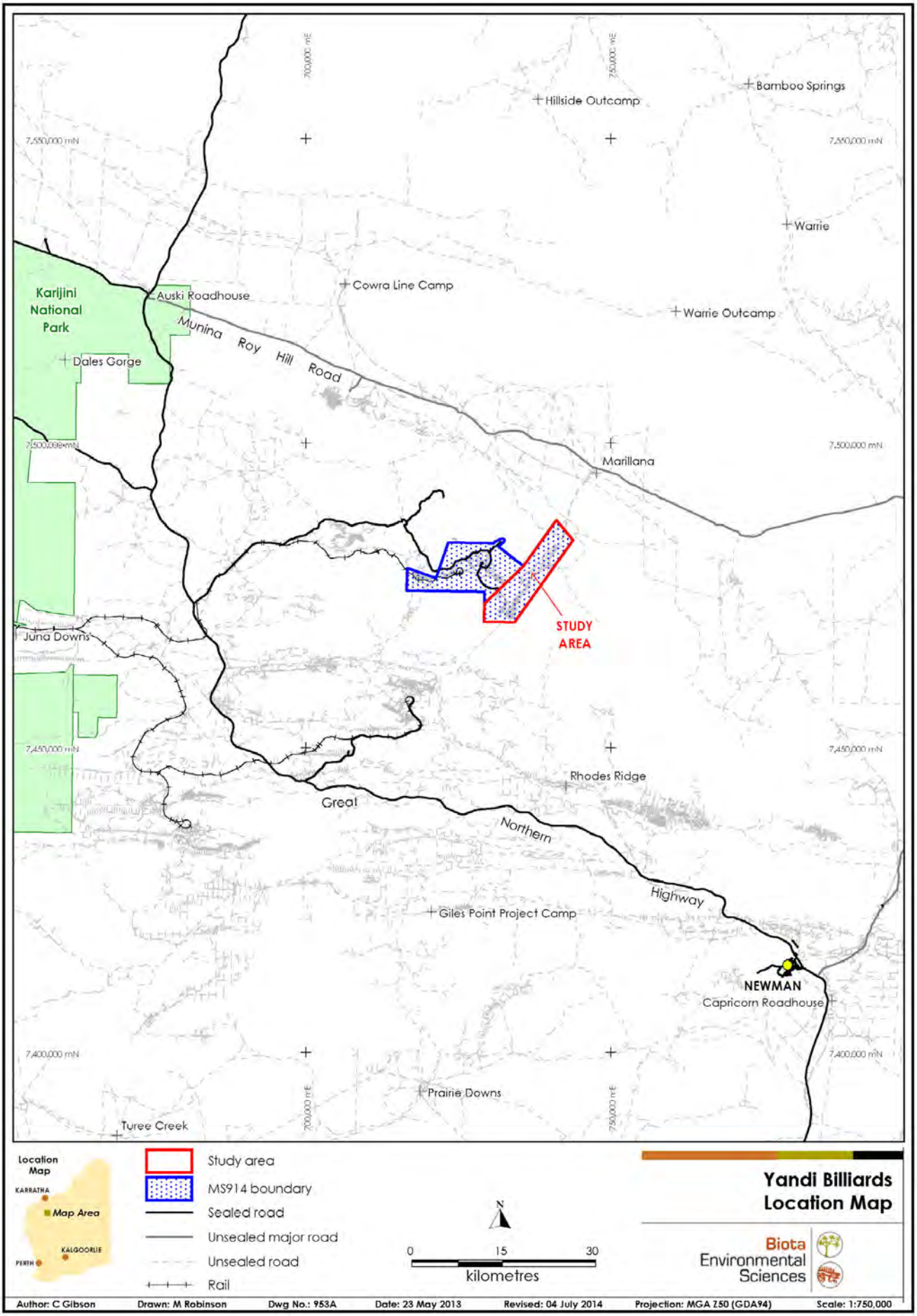

Figure 2.1: Location of the study area and the Ministerial Statement 914 (MS914) boundary.

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3.0 Desktop Review

Prior to the field survey, Biota was commissioned to undertake a desktop review of the study area with the specific aim of assessing the survey effort completed to date, identifying data gaps, and providing recommendations on additional biological surveys required to support a formal EIA of the study area.

The following section summarises the flora and vegetation findings of the desktop review and gap analysis of the study area, which are discussed in more detail in the 'Yandi Billiards Terrestrial Fauna, Flora and Vegetation Desktop Assessment' report (Biota 2013a).

3.1 Literature Review

Numerous botanical surveys have been undertaken in the Yandi locality; eight flora and vegetation surveys overlap the study area (Figure 3.1). These surveys were reviewed to provide a regional biological context for the study area. In particular, the review aimed to identify species and communities of conservation significance that may occur in the study area. The key findings of these surveys are summarised in Table 3.1.

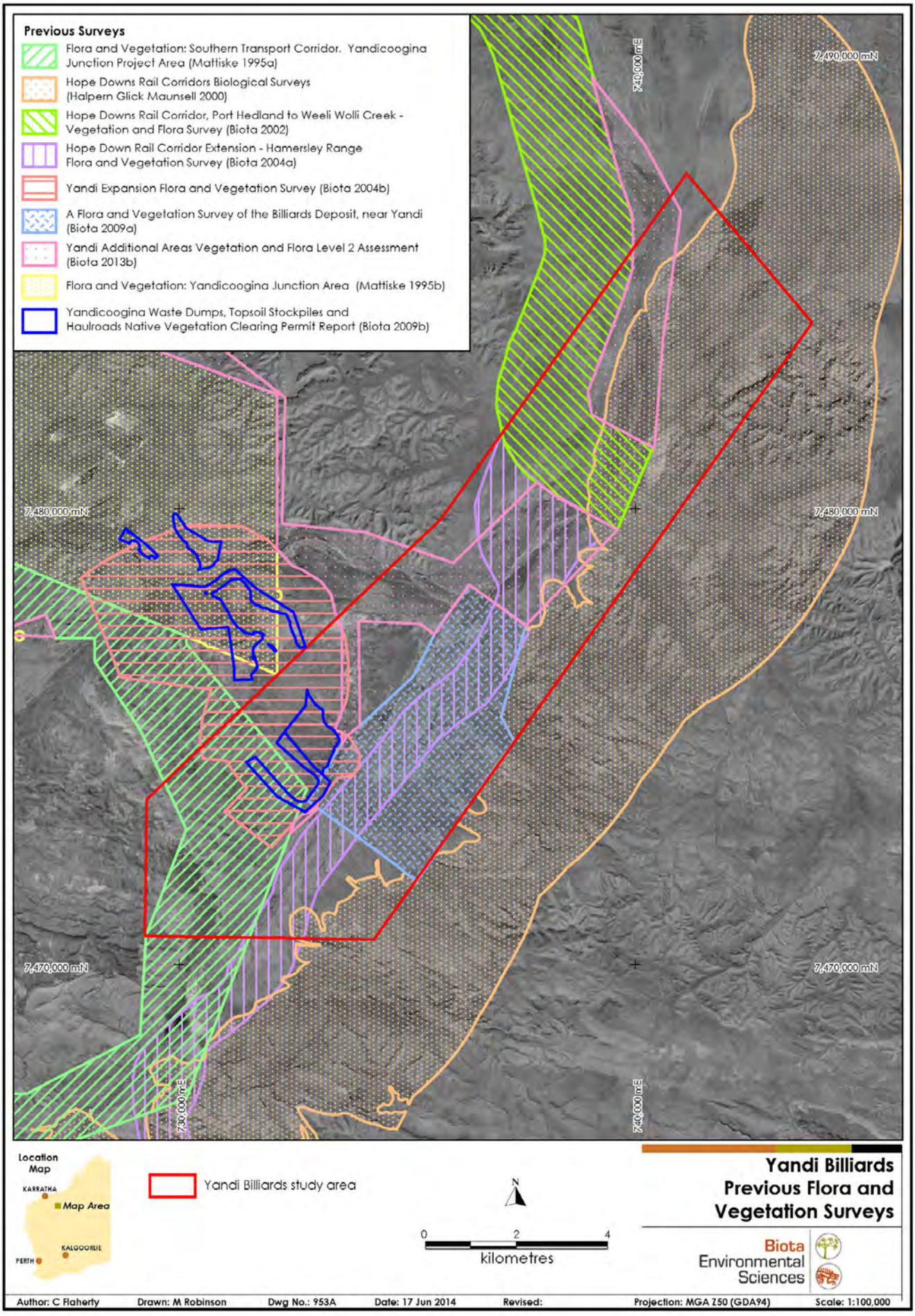

Figure 3.1: Previous flora and vegetation surveys conducted in the vicinity of the study area.

Table 3.1: Summary of previous vegetation and flora surveys that overlap the study area.

Survey (Reference)	Survey Dates	Location in Relation to Study Area	No. of Sites Recorded	No. of Flora Species Recorded		Communities and Species of Conservation Significance Identified for the Overall Survey Area	Survey / Report Limitations
				Native Vascular Flora	Introduced Flora		
Flora and vegetation survey of the Southern Transport Corridor associated with the Yandicoogina Junction Project Area (Mattiske 1995a)	January and March 1994 February 1995	Covers 1,061.4 ha of the study area.	116	392	7	• No TECs or PECs. • Three communities of local significance and four communities of regional significance. • No Threatened flora. • Five Priority flora species recorded (no longer listed). Two species of significance noted, which are currently listed as Priority flora species: *Stylidium weeliwolli* (Priority 2) and *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3).	• Vegetation mapping was completed at a very broad scale. • No quadrat data was provided to support the mapping. • Climatic data for Marillana Station (the closest recording station to the study area) is not available for the survey dates. Thus, the suitability of the conditions for plant growth prior to the surveys is unknown. • Plant identifications were completed 17 years ago, over which time there have been many taxonomic changes for Pilbara flora.
Hope Downs Rail Corridors biological surveys (Halpern Glick Maunsell 2000)	16-23 October 1998 25 November - 3 December 1999	Covers 1,903.8 ha of the study area.	75	354	8	• No TECs or PECs. • Three communities of conservation significance. • No Threatened flora. • Six Priority flora species recorded (five are no longer listed; the remaining species was not recorded near Yandi).	• Vegetation mapping was completed at a broad scale. • Quadrats were widely spaced along the corridor. • Plant identifications were completed 13 years ago, over which time there have been many taxonomic changes for Pilbara flora.

Survey (Reference)	Survey Dates	Location in Relation to Study Area	No. of Sites Recorded	No. of Flora Species Recorded		Communities and Species of Conservation Significance Identified for the Overall Survey Area	Survey / Report Limitations
				Native Vascular Flora	Introduced Flora		
Vegetation and flora survey of the Hope Downs Rail Corridor from Port Hedland to Weeli Wolli Creek (Biota 2002)	25 April – 14 May 2001 29 May – 10 June 2001 July 2001	Covers 448.5 ha of the study area.	286	752	8	• No TECs or PECs. • Eight vegetation units of high conservation significance. • No Threatened flora. • 14 Priority flora recorded (seven are no longer listed; three were not recorded near Yandi). The remaining species are *Indigofera ixocarpa* (Priority 2), *Gymnanthera cunninghamii* (Priority 3), *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (Priority 3) and *Goodenia nuda* (Priority 4).	• Vegetation mapping was completed at a broad scale • Quadrats were widely spaced along the corridor.
Flora and vegetation survey of the Hope Downs Rail Corridor Extension through the Hamersley Range (Biota 2004a)	April 2003	Covers 1,183.1 ha of the study area.	25	361	10	• No TECs or PECs. • Four vegetation units of high conservation significance. • No Threatened flora. • Seven Priority flora (six no longer listed): the remaining species is *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (Priority 3).	• Vegetation mapping was completed at a broad scale. • Quadrats were widely spaced along the corridor.
Flora and vegetation survey of the Yandi Expansion area (Biota 2004b)	30 August – 5 September 2004	Covers 884.1 ha of the study area.	39	319	13	• No TECs or PECs. • No Threatened flora. • Five Priority flora species recorded (three are no longer listed). The remaining species are *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (Priority 3).	• Unfavourable climatic conditions during the survey for the identification of annual and cryptic flora species. • Quadrats were sampled once only.

Survey (Reference)	Survey Dates	Location in Relation to Study Area	No. of Sites Recorded	No. of Flora Species Recorded		Communities and Species of Conservation Significance Identified for the Overall Survey Area	Survey / Report Limitations
				Native Vascular Flora	Introduced Flora		
Flora and vegetation survey of the Billiards Deposit, near Yandi (Biota 2009a and unpublished data)	11 – 20 June 2007 27 July – 6 August 2008 3 – 9 June 2009	Covers 1,510.0 ha of the study area.	50	247	7	• No TECs or PECs. • One vegetation unit of high conservation significance. • No Threatened flora. • No Priority flora.	• Unfavourable climatic conditions during the 2007 and 2008 surveys for the identification of annual and cryptic flora species. • Only some quadrats were resampled.
Yandicoogina Waste Dumps, Topsoil Stockpiles and Haulroads Native Vegetation Clearing Permit Report (Biota 2009b)	4 – 7 September 2008	Covers 175.7 ha of the study area	NA	211	11	• No TECs or PECs. • One Threatened flora species: *Lepidium catapycnon*. • No Priority flora.	• Unfavourable climatic conditions during the survey for the identification of annual and cryptic flora species
Yandi Additional Areas Level 2 vegetation and flora assessment (Biota 2013b)	12 – 18 June 2012	Covers 1,518.7 ha of the study area.	34	313	14	• No TECs or PECs. • Ecosystems at risk were identified (Weeli Wolli Creek and Marillana Creek). • No Threatened flora. • One Priority 4 flora species: *Goodenia nuda.* • One species of interest: *Eulalia* sp. (Three Rivers Station, B. Forsyth AQ6789133).	• Quadrats sampled once only.

3.2 Database Searches

Three databases were searched for records of fauna, flora and vegetation of conservation significance[1] previously recorded or potentially occurring within or in the vicinity of the study area:

- NatureMap[2] database: NatureMap is a joint project of the Western Australian Museum (WAM) and the Department of Parks and Wildlife (DPaW), which was formerly known as the Department of Environment and Conservation (DEC). This database represents the most comprehensive source of information on the distribution of Western Australia's flora and fauna, comprising records from the Fauna Survey Returns database and WA Threatened Fauna Database (both held by DPaW), the WAM Specimen database, BirdLife Australia's Atlas of Australian Birds, and the Western Australian Herbarium and DPaW Threatened Flora database.
- The Federal *EPBC Act 1999* Protected Matters database.
- The Atlas of Living Australia[3], which is a joint project between academic collecting institutions, private individual collectors and community groups. The atlas contains occurrence records, environmental data, images and the conservation status of species throughout Australia.

The NatureMap and *EPBC Act 1999* Protected Matters database searches were based on an approximate central point of the study area (22° 47' 31"S, 119° 18' 26"E) surrounded by a 25 km buffer. The Atlas of Living Australia search was centred on the same coordinate (22° 47' 31"S, 119° 18' 26"E), using a 10 km buffer. All database searches were conducted on 22nd May 2013. Records from Biota's internal databases were also examined.

All results from the literature review and database searches were then used to compile a list of conservation significant flora species that had previously been recorded from the broader locality. The likelihood that each species would occur in the study area was then assessed using the rankings and criteria provided in Table 3.2. Two rankings have been provided:

1. An initial assessment was made during the desktop review (see Section 5.8 and Appendix 2). This was based on consideration of the overall distribution of the species, the proximity of the study area to known populations and, if the species was known to be linked to particular habitats, whether suitable habitat was present in the study area based on inspection of aerial photography and/or existing information. In the case of the current study area, major and minor creeklines, stony hills and plains were apparent on aerial imagery.
2. The likelihood rankings were subsequently revised as necessary based on the findings of the field survey (see Section 7.4 and Appendix 2). Where the initial and final likelihood rankings were different, the reason was provided.

[1] The framework for conservation significance ranking of communities and species in Western Australia is presented in Appendix 1.

[2] http://NatureMap.dec.wa.gov.au

[3] http://www.ala.org.au/

Table 3.2: Ranking system used to assign the likelihood that a species would occur in the study area.

Rank	Example Criteria
Recorded	1. The species has been previously recorded in the study area.
Likely	1. There are existing records of the species in close proximity to the study area, or from the locality; and • the species is strongly linked to a specific habitat, which is present in the study area; or • the species has more general habitat preferences, and suitable habitat is present.
May potentially occur	1. There are existing records of the species from the locality, however • the species is strongly linked to a specific habitat, of which only a small amount is present in the study area; or • the species has more general habitat preferences, but only some suitable habitat is present. 2. There is suitable habitat in the study area, but the species is recorded infrequently in the region.
Unlikely	1. The species is linked to a specific habitat, which is absent from the study area; or 2. Suitable habitat is present, however there are no existing records of the species from the locality despite reasonable previous search effort in suitable habitat; or 3. There is some suitable habitat in the study area, however the species is very infrequently recorded in the region.
Would not occur	1. The species is strongly linked to a specific habitat, which is absent from the study area; and/or 2. The species' range is very restricted and would not include the study area.

3.3 Findings of the Gap Analysis

A comprehensive dataset is available for the Yandi Billiards study area, and there are considerable data from the locality to provide context. However, some additional biological survey work is required to raise the level of information for the study area to a level suitable for EIA under Part IV of the *Environment Protection Act 1986*.

Key flora and vegetation knowledge gaps for the Yandi Billiards study area comprise:

1. Approximately 9% (or 784 ha) of the study area has not been subject to vegetation mapping or flora quadrat sampling (Figure 3.2). A further 30% (or 2,611 ha) has only been subject to broad historical vegetation mapping, which requires refinement and additional flora quadrat sampling (Figure 3.2). Approximately 39% of the area thus requires vegetation mapping to current standards.
2. Six vegetation units from recent vegetation mapping (376 ha) require additional flora quadrat sampling to meet current regulator expectations (Figure 3.2).
3. A total of 49 of the 72 flora quadrats previously established were sampled during unfavourable climatic conditions for plant growth. These require resampling to meet Level 2 survey standards.
4. Targeted systematic searches for the Threatened flora species, *Lepidium catapycnon,* have not been conducted in all suitable habitat.
5. A total of 32 flora taxa recorded previously within the study area should be reviewed to address advances in taxonomy since their original identification.

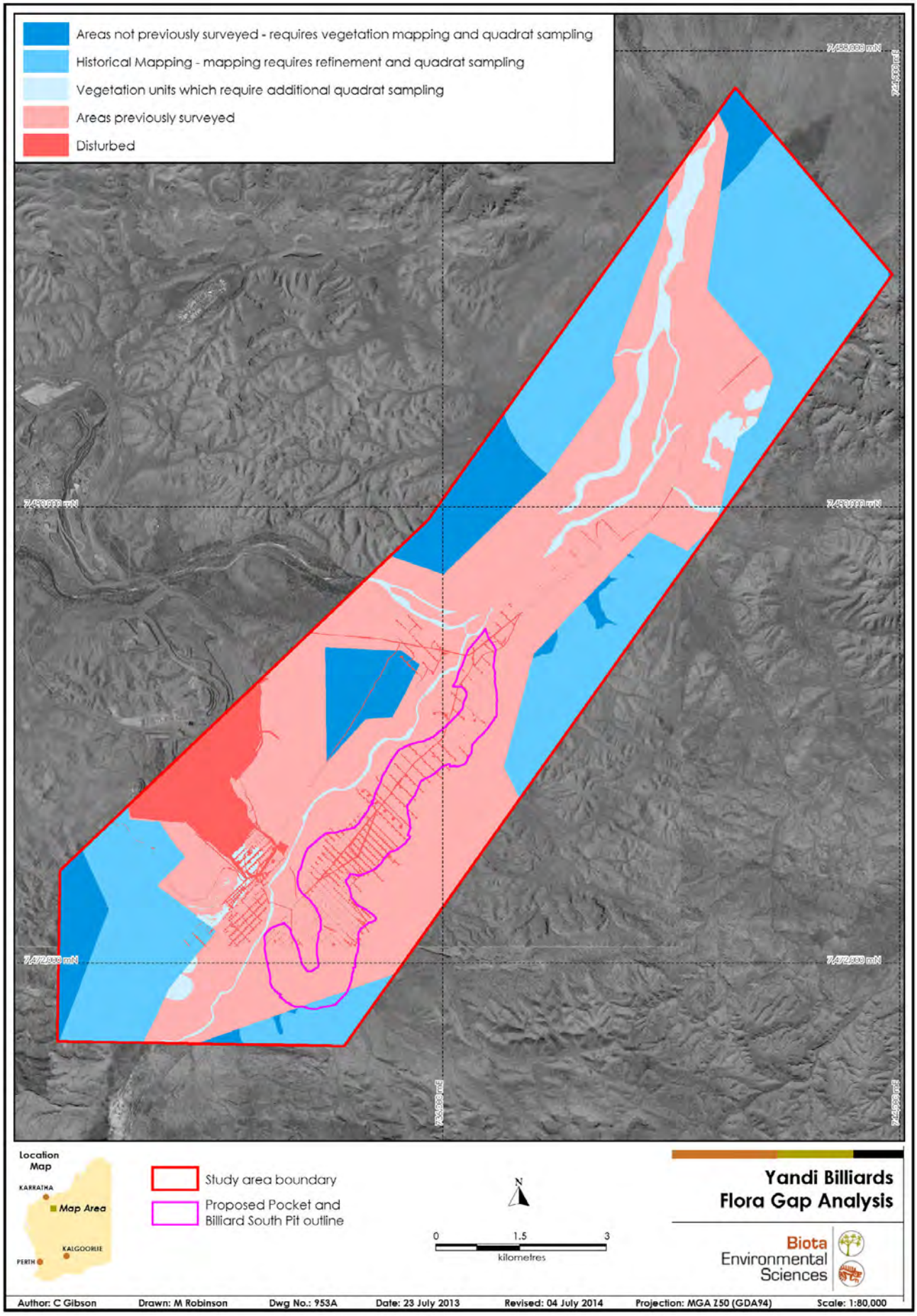

Figure 3.2: Vegetation mapping and quadrat sampling gap analysis for the study area.

4.0 Methodology

4.1 Field Survey

4.1.1 Survey Team

The field survey was undertaken between the 8th and 20th of March 2014, by five botanists from Biota (Rachel Butler, Chloe Flaherty, Pierre-Louis de Kock, Dr Shadila Venkatasamy and Scott Werner). Chloe Flaherty completed the mapping traverses and the remaining personnel completed the quadrat sampling. All personnel have experience in flora and vegetation surveys in the Pilbara, including large-scale Level 2 surveys. Excluding travel days, a total of 57.5 person days were spent on the field survey (no sampling occurred on the 8th of March and a half day of sampling was completed on the 20th of March).

4.1.2 Survey Timing and Conditions

The weather conditions (particularly rainfall) leading up to a field survey are important factors influencing the number and type of flora species that are recorded from an area. To indicate rainfall leading up to this survey, monthly rainfall data from a nearby Bureau of Meteorology (BoM) recording station for the 14 months preceding the field survey are shown in Figure 4.1, compared to the long-term monthly averages for the area (BoM 2014). All data was sourced from Marillana Station (number 5009), which is the closest recording station to the study area (approximately 20 km away).

The data showed that rainfall received during the wet season preceding the field survey (December 2013 to February 2014) was more than twice the median rainfall for this period (352.1 mm compared to 118.3 mm). Most of this rainfall was received on the 21st of January 2014, 46 days before the start of the field survey. Given this, the survey timing would be considered favourable for the collection of annual and cryptic perennial flora species.

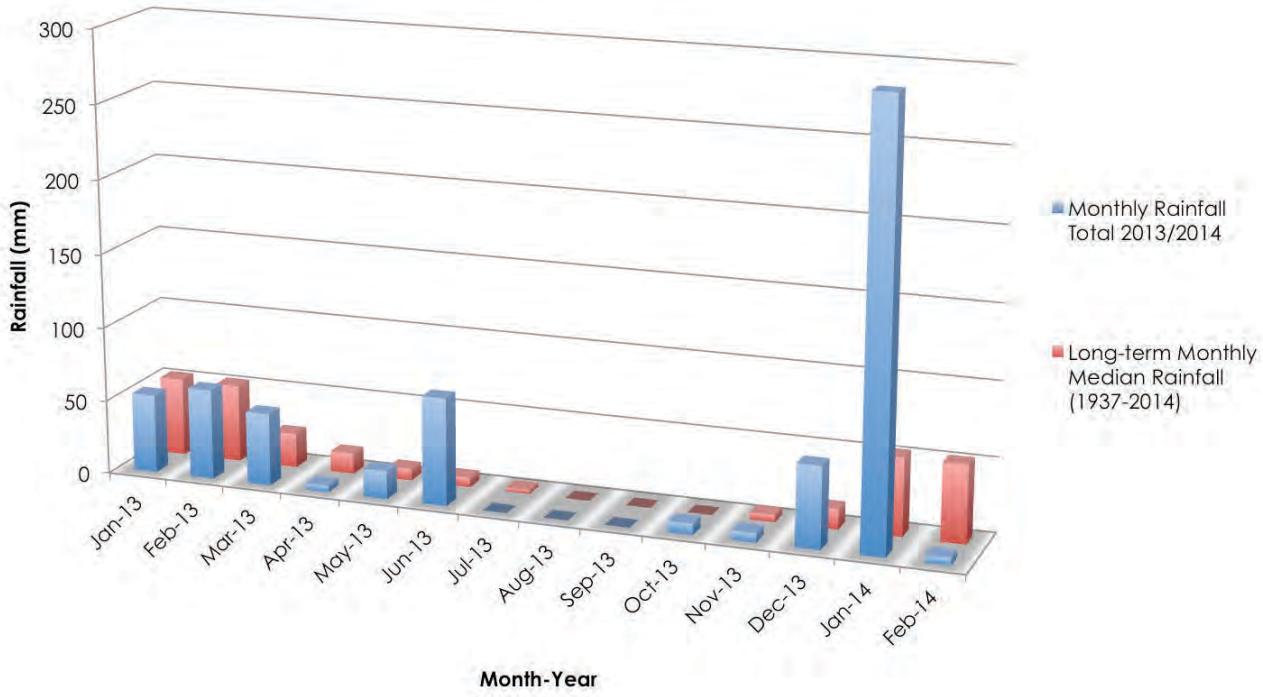

Figure 4.1: Monthly rainfall for January 2013 – February 2014, compared to the long-term median monthly rainfall for Marillana recording station (located approximately 20 km from the centre point of the study area).

4.1.3 Establishment and Assessment of Flora Quadrats and Relevés

Indicative quadrat locations were selected prior to the field survey. The study area boundaries, aerial photography and the previous vegetation mapping were viewed using Geographical Information System (GIS) software (QGIS). Quadrat sites were then selected such that there was replication of sampling (a minimum of two quadrats) within each mapped vegetation type, taking into account the broad habitats and vegetation types apparent from the aerial imagery. Some additional quadrats were established in previously mapped areas to improve sampling replication. Once in the field, the actual locations of the quadrats were adjusted as necessary (e.g. to be placed in an area more representative of the broader vegetation type).

Permanently marked quadrats (flora sampling sites of a fixed area) were used wherever possible. Most quadrats established were 50 m x 50 m in size. This quadrat area of 2,500 m^2 is recognised as providing an adequate sample of species presence for Pilbara vegetation and is the standard quadrat size for botanical survey work in the region (Clarke 2009). Where a square quadrat was unsuitable for capturing the vegetation unit (e.g. along narrow creeklines), a rectangular quadrat of equivalent area (e.g. 25 m x 100 m) was established instead. The quadrats were permanently marked using steel fence droppers on at least three corners. An optical square and measuring tapes were used to accurately position the quadrat boundaries.

In cases where quadrats could not be established (e.g. due to the small size or irregular shape of the habitat), these locations were instead surveyed as relevés or mapping notes were taken. A relevé is an unbounded flora sampling site with a similar area to a standard quadrat; essentially the same information is recorded as for a quadrat, however the sampling of flora is typically not as thorough. Relevé sampling is usually undertaken if the vegetation unit has a narrow linear or irregular shape (e.g. minor flowlines, narrow ridgelines, areas of cracking clay, etc.) or comprises only a small area (e.g. on rockpiles), making establishment of a standard quadrat in a single vegetation unit difficult.

Mapping notes are also sampling sites, but are conducted over an area of smaller scale; these notes are typically brief, with only dominant and commonly associated species being recorded. Mapping notes are taken primarily during foot traverses of an area, with the objective of detecting boundaries and changes in vegetation units. Typical information recorded at a mapping note location includes notes on the habitat, landscape and vegetation association, usually with a representative photograph and often with opportunistic specimen collections to supplement the species list.

A total of 118 quadrats and 28 relevés have been sampled in the study area to date (Table 4.1and Figure 4.2). These include 46 quadrats and eight relevés established during the current survey.

Thirty-eight quadrats in the study area have been seasonally resampled to date (with at least one phase of sampling in favourable conditions for plant growth). Thirty-two quadrats were resampled during the current survey and a further six quadrats were resampled during a previous survey (Biota 2009a).

Eleven quadrats established during the survey by Biota (2009a) were both established and resampled at times when conditions for plant growth were unfavourable. These quadrats have not been considered as being effectively resampled, as it is likely that some species may not have been present or identifiable at the time of both surveys (e.g. annual daisies that would germinate mostly after late winter rains, annual grasses, etc.).

Fourteen quadrats that were sampled in the study area have since been cleared for expansion of the mine or the establishment of roads or drill tracks. These are noted in Section 6.2 and Section 6.3.

Table 4.1: Number of quadrats and relevés sampled in the study area.

Survey (Reference)	Survey Timing (conditions for plant growth)	Number of Quadrats Established	Number of Quadrats Resampled	Number of Relevés Recorded	Other Comments
Yandi Billiards Vegetation and Flora Survey – Phase 1 (current survey)	March 2014 (favourable)	46	32	8	
Yandi Additional Areas Level 2 Flora and Vegetation Survey (Biota 2013b)	June 2012 (favourable)	11	0	5	1 quadrat has subsequently been cleared.
Vegetation and Flora Survey of the Billiards Deposit, near Yandi (Biota 2009a)	June 2007 (unfavourable)	29	0	14	2 quadrats have subsequently been cleared.
	July/August 2008 (unfavourable)	7	11	0	Quadrats were both established and resampled under unfavourable conditions, and are therefore not included in the overall resample total.
	June 2009 (favourable)	0	6	0	
Flora and Vegetation Survey of the Yandi Expansion Area (Biota 2004b)	August/ September 2004 (unfavourable)	13	0	1	6 quadrats have subsequently been cleared.
Flora and Vegetation Survey of the Hope Downs Rail Corridor Extension through the Hamersley Range (Biota 2004a)	April 2003 (favourable)	9	0	0	4 quadrats have subsequently been cleared.
Vegetation and Flora of the Hope Downs Rail Corridor from Port Hedland to Weeli Wolli Creek (Biota 2002)	April/May 2001 (favourable)	2	0	0	1 quadrat has subsequently been cleared.
Hope Downs Rail Corridor Biological Surveys (Halpern Glick Maunsell 2000)	November/ December 1999 (favourable)	1	0	0	
	Total	118	38	28	

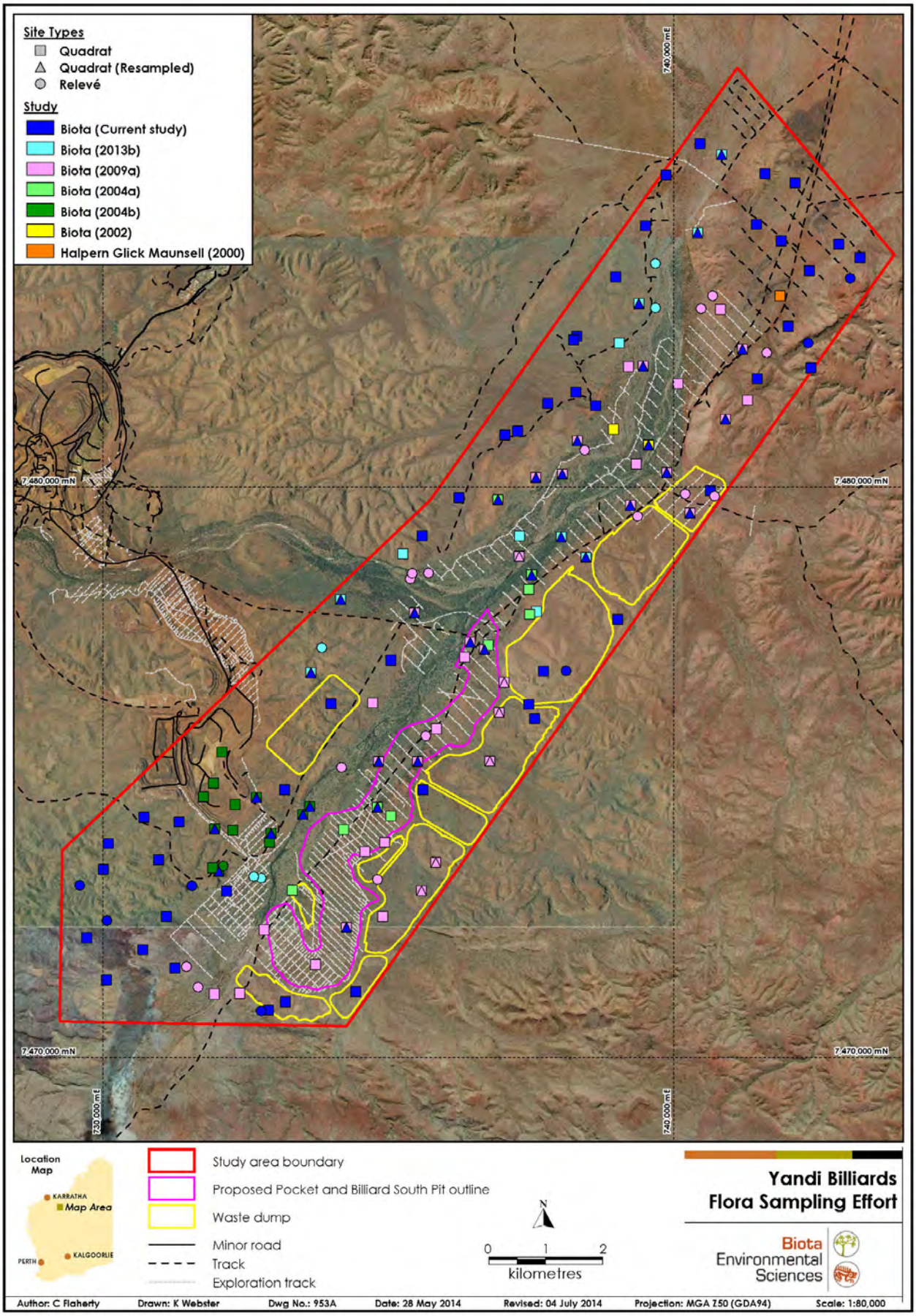

Figure 4.2: Quadrat and relevé locations in the study area.

The following information was recorded for each quadrat and relevé:

- Australian Map Grid (AMG) location co-ordinates (using WGS84 datum, ±5 m), recorded with a hand-held Global Positioning System (GPS);
- a colour photograph of each site (usually taken from the northwest corner of the quadrat, looking southeast);
- habitat description;
- broad soil type;
- fire history (approximate time since last fire, where applicable);
- vegetation description based on the height and estimated cover value of dominant species (Aplin 1979; see Appendix 3);
- vegetation condition ranking (Trudgen 1988; see Appendix 3); and
- the estimated percent foliar cover of each flora species present within the quadrat, or in the vicinity (within a ~30 m radius) of the centre point of the relevé.

Quadrat and relevé locations are shown on the vegetation mapping in Appendix 4. Vegetation condition mapping and weed locations are provided in Appendix 5. All raw data from the sampling sites are presented in Appendix 6. Mapping note locations are presented in Appendix 7.

4.1.4 Vegetation Description and Mapping

Vegetation mapping was undertaken in the study area in previously unsurveyed areas and areas of broader historical mapping (see Figure 3.2), which covered an area of 3,395 ha (39% of the study area).

Vegetation types identified from aerial photography were ground-truthed during foot traverses in the study area. The boundaries of the study area were loaded onto hand-held GPS units to ensure that the correct areas were traversed. Vegetation descriptions for each vegetation type observed in the field were recorded at relevé points and in mapping notes (see Section 4.1.3), and were based on the height and estimated cover value of dominant species using Aplin's (1979) modification of the vegetation classification of Specht (1970). The previous detailed vegetation mapping of the study area (Biota 2013b) was used as a guide for the mapping of the unsurveyed areas. Vegetation was mapped to a similar scale and where possible, vegetation types used in previous surveys were extended or repeated.

The vegetation types were described at the sub-association level (level VI as per the National Vegetation Information System)[4]. The sub-association level includes information about the dominant growth form, height and cover for up to five species in all layers/sub-strata observed (e.g. *Eucalyptus xerothermica* scattered low trees over *Acacia citrinoviridis, Stylobasium spathulatum* tall shrubland over *Ptilotus obovatus* var*. obovatus* scattered shrubs over *Themeda triandra, Chrysopogon fallax, *Cenchrus ciliaris* very open tussock grassland).

Similar vegetation descriptions were grouped to establish the vegetation types for the study area. Vegetation descriptions that shared a suite of perennial species with a similar range of cover values were considered to be alike.

Two coding systems are presented in this report to refer to the individual vegetation types:

1. An alphabetic code that represents the dominant flora species from the tallest stratum to the lowest stratum. Each dominant species was given a unique code by using an abbreviation of the genus to capital letter(s) followed by an abbreviation of the species to lower case letter(s) (e.g. EvAciAcMgCEc denotes a vegetation type dominated by *Eucalyptus victrix, Acacia citrinoviridis, Acacia coriacea* subsp*. pendens, Melaleuca glomerata and *Cenchrus ciliaris*). This coding enables vegetation types from different studies to be quickly compared, although it can sometimes result in long and unwieldy codes.

[4] http://www.environment.gov.au/erin/nvis/publications/avam/section-2-1.html

2. To aid interpretation, each vegetation type was also assigned an alpha-numeric code as a unique precursor to the species-driven code (e.g. C3: EvAciAcMgCEc for the third creekline sub-association). This short code is used to refer more simply to the individual vegetation types.

Although some of the vegetation types were first drafted in the field, the majority of the vegetation mapping was completed in the office after the fieldwork had been completed. Field data and aerial imagery were studied to determine boundaries of vegetation types, which were then mapped to an appropriate scale. The maps were created and consolidated using GIS software (QGIS and MapInfo), and point locations of conservation significant flora and weeds were added. All maps in this report were produced using the MapInfo package (version 11).

4.1.5 Searches for Flora of Conservation Significance and Weeds

The Threatened species *Lepidium catapycnon* was a key search focus for the field survey, given that it is known to occur in the Yandi locality and was previously recorded from two locations in the study area (Hamersley Iron 2006, Biota 2009b).

The locations of the previously recorded populations of *Lepidium catapycnon* were checked so that the populations could be confirmed and number of individuals re-counted (see Section 5.8.1).

Systematic rare flora searches were not conducted over the entire remainder of the study area during the current survey. Instead, searches for *Lepidium catapycnon* were undertaken in habitat determined likely to support this species. Targeted searches for *Lepidium catapycnon* and other conservation significant flora were also conducted during the extensive foot traverses that were required to validate the vegetation mapping and travel between sites, and also while completing quadrats and relevés (these foot traverses are mapped in Appendix 7).

The locations of flora of conservation significance, unknown flora and introduced (weed) species were recorded using a hand-held GPS (WGS84 datum, Zone 50). Where conservation significant flora species were encountered, estimates of the density or numbers of individuals were made, and description of the habitat and associated flora were recorded.

A continuous list of vascular flora species was also recorded during the traverses, which contributed to the overall species list for the study area (see Appendix 8).

All records of conservation significant flora are provided in Appendix 4 and records of introduced flora are provided in Appendix 5.

4.2 Specimen Identification, Nomenclature and Data Entry

Common species that were well known to the survey botanists were identified in the field. Voucher specimens of all other species were collected and assigned a unique number to facilitate tracking of data. These were pressed in the field, and dried using heaters.

Specimens were identified using flora keys, consulting appropriate publications, checking voucher reference collections, and comparing the specimens to the collections held at the WA Herbarium. Biota botanists (Cassie Adam, Prue Anderson, Rachel Butler and Pierre-Louis de Kock) identified most specimens, the majority of which were confirmed by Biota's principal botanist (Michi Maier). A Pilbara flora expert, Malcolm Trudgen (of M.E. Trudgen and Associates), was consulted for the more complex plant identifications, including but not limited to *Abutilon* and *Corchorus* species. Ryonen Butcher, a taxonomist at the WA Herbarium, was consulted for assistance with the genus *Tephrosia*. Andrew Perkins, a taxonomist with the WA Herbarium, provided confirmation of conservation significant specimens and any atypical specimens collected from the study area.

Nomenclature was checked against the current listing of scientific names recognised by the WA Herbarium and updated as necessary. All data were entered into a Microsoft Access Vegetation Database structure held internally at Biota. The database model employed by Biota was developed by Ted Griffin (private consultant) at the request of Malcolm Trudgen (M.E. Trudgen and Associates).

Data from previous surveys (from sites located in the current study area boundaries) were reviewed, and specimen identifications were checked and amended as necessary to reflect recent taxonomic changes.

Provided material is of adequate condition and not already vouchered for the locality, specimens will be lodged with the WA Herbarium for all taxa representing flora of conservation significance, range extensions, undescribed or poorly collected taxa. Threatened and Priority Flora Report Forms will be submitted to DPaW for all Threatened and Priority flora species recorded from the study area following completion of the Phase 2 survey.

4.3 Limitations of this Study

Limitations of this study that should be considered comprise:

- While a portion of the study area was traversed and opportunistic taxa were documented, the entire study area was not systematically searched. The list of vascular flora documented from the study area is therefore not exhaustive. It is also possible that additional locations of Threatened, Priority or weed species may be present.
- Twelve of the previously sampled quadrats discussed in this report have subsequently been cleared to make way for the Junction Southeast (JSE) mine pit or roads or drill pads.
- One vegetation type (H5; see Section 6.2.3) was sampled with relevés rather than quadrats. It was not suitable to establish quadrats in this vegetation due to its narrow dimensions and the steep, rocky terrain.
- Fungi and non-vascular flora (algae, mosses and liverworts) were not sampled, which is consistent with the accepted level of effort for a survey of this type and scale.

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5.0 Existing Environment

5.1 IBRA Bioregion and Subregion

The study area lies within the Pilbara bioregion, one of 89 bioregions defined by the Interim Biogeographic Regionalisation for Australia (IBRA) (Department of Environment 2013).

The study area occurs on the boundary between two subregions:

- Hamersley (PIL3): mountainous area of Proterozoic ranges and plateaus with low Mulga (*Acacia aneura*) woodland over bunch grasses on fine textured soils, and Snappy Gum (*Eucalyptus leucophloia*) over *Triodia brizoides* on the skeletal sandy soils of the ranges (Kendrick 2003a); and
- Fortescue Plains (PIL2): alluvial plains and river frontages with salt marsh, Mulga-bunch grass and short grass communities on alluvial plains and River Gum (*Eucalyptus camaldulensis*) woodlands fringing drainage lines (Kendrick 2003b).

5.2 Conservation Reserves in the Locality of the Study Area

The IBRA provides a national system for assessing the condition of native ecosystems and their level of protection in the National Reserve System (NRS). The NRS is Australia's network of protected areas, including national parks and other Government reserves, indigenous lands, and reserves run by non-profit conservation organisations. The Pilbara bioregion is considered to be under-represented by the NRS, with less than 10% of the bioregion protected. Of the four subregions within the Pilbara bioregion, the Hamersley subregion has the highest percentage of area under some form of protection, while the Fortescue Plains subregion has the lowest (Kendrick 2003a, 2003b).

Karijini National Park (Karijini) is the closest conservation reserve to the study area. The nearest boundary of Karijini to the study area is approximately 64 km west of the study area. Areas surrounding the Fortescue Marsh, approximately 30 km of the study area, are also proposed to be excluded from the Marillana Station pastoral lease in 2015 to assist with management of this important ephemeral wetland.

5.3 Surface Geology

The study area encompasses eight geological units mapped by the Geological Survey of Western Australia (1984). These units are described in Table 5.1 and displayed in Figure 5.1.

Table 5.1: Geological units occurring within the study area (Geological Survey of Western Australia 1984).

Unit Code	Geological Description	Area (ha)
Czc	Colluvium-partly consolidated quartz and rock fragments in silt and sand matrix; old valley-fill deposits.	2,337
Czk	Calcrete-sheet carbonate; found along major drainage lines.	341
Czp	Robe Pisolite: pisolitic limonite deposits developed along river channels.	4
PLHb	Brockman Iron Formation: banded iron-formation, chert, and pelite.	637
PLHj	Weeli Wolli Formation: banded iron-formation (commonly jaspilitic), pelite and numerous metadolerite sills.	2,350
Qa	Alluvium, unconsolidated silt, sand, and gravel; in drainage channels and on adjacent floodplains.	2,413
Qs	Eolian deposit-sand; in sheets and longitudinal dunes.	1
Qw	Alluvium and colluvium-red-brown sandy and clayey soil; on low slopes and sheetwash areas.	557

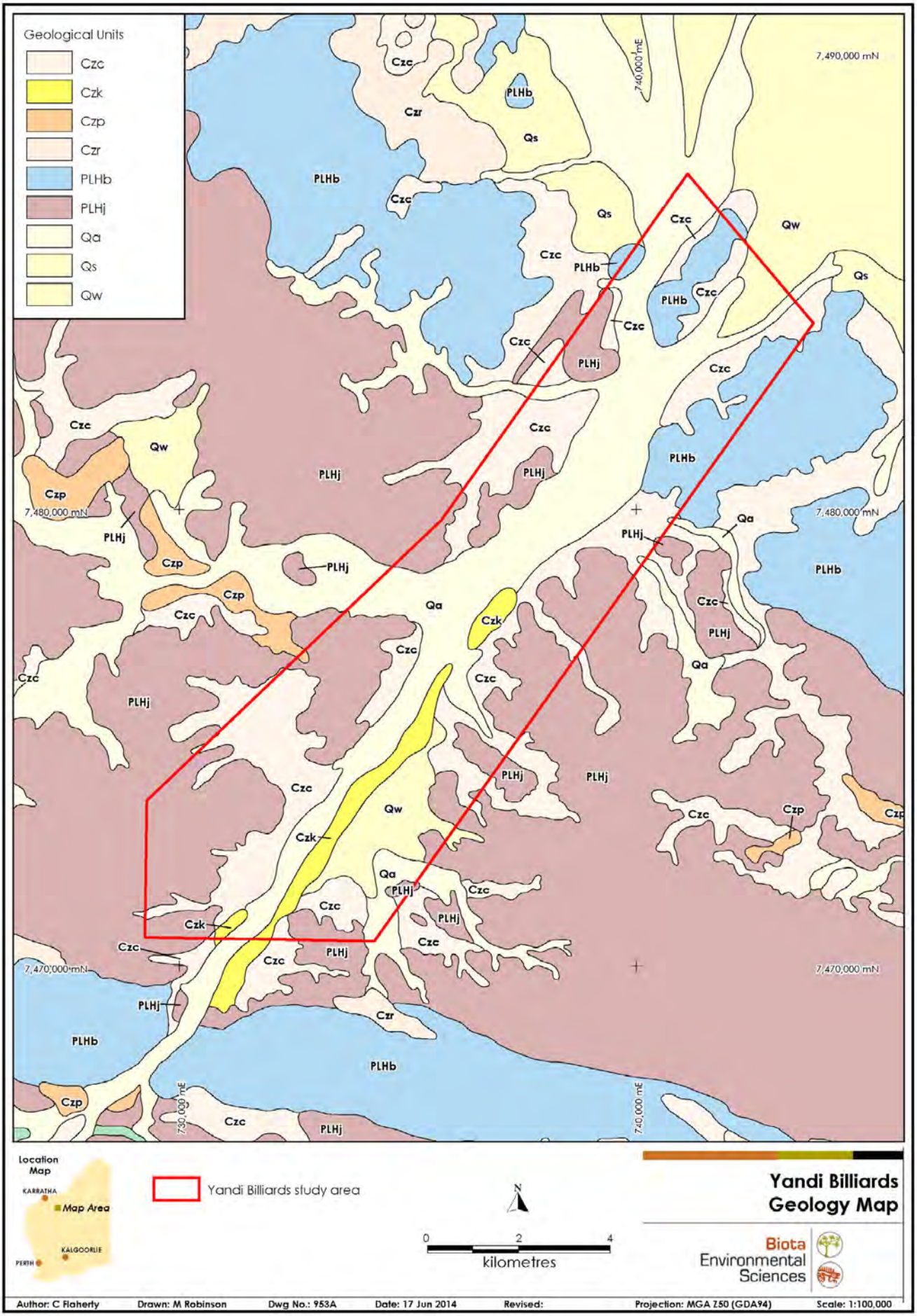

Figure 5.1: Geological units mapped in the vicinity of the study area (Geological Survey of Western Australia 1984).

5.4 Landforms, Surface Hydrology and Soils

The study area encompasses the northern portion of the Weeli Wolli Creek valley, where the valley widens from a shallow gorge to a true valley, and its associated floodplains and hillslopes. Drainage within the study area is dominated by Weeli Wolli Creek, which flows in a northeast direction through the Hamersley range and ends in an alluvial fan. The alluvial fan stretches from the footslopes of the Hamersley range scarp, across the pediment slope to the edge of the Fortescue Marsh. The confluence of Weeli Wolli Creek and Marillana Creek occurs in the centre of the study area just behind the scarp of the Hamersley Range. There are numerous floodout areas adjacent to the creeks, and creek bed islands in the anabranching creek beds of both creek systems. Low crests and hillslopes define the edge of the creek valley. Numerous short minor drainage lines dissect the hills, forming shallow gorges and narrow floodplains before they flow into Weeli Wolli Creek. In an area near the southern end of the eastern boundary of the study area, the creek valley widens considerably and several minor drainage lines flow through a narrow pediment zone before entering the Weeli Wolli Creek floodplain.

Soils in the study area were generally described as red-brown loams, clay loams or sandy clay loams and were covered with a loose surface layer of stones and pebbles. Soils were stonier at the margins of the valley and on the associated footslopes. Heavier soils were found in the lower parts of the valley and in the flood-out areas. Some small areas of light clay supported Mulga woodland on the plains. Soils of the creek beds were a coarse sand-pebble mix.

5.5 Land Systems

Western Australian Rangelands Surveys have been conducted for various parts of the State as part of a program of rangeland classification, mapping and resource evaluation (Waddell et al. 2010). These surveys have been conducted in Western Australia since the 1950s, when they were commenced by the Commonwealth Scientific and Industrial Research Organisation (Speck et al. 1960), and more recently have been conducted as a collaboration between the Department of Agriculture and Food WA and Landgate. The land system approach to mapping different country types has been used in all of the regional rangeland surveys in Western Australia.

The concept of land systems was first used by Christian and Stewart (1953). They define a land system as 'an area with a recurring pattern of topography, soils and vegetation'. These recurring patterns can be mapped using 1:50,000 scale aerial photography or other remotely sensed images (Waddell et al. 2010). It is assumed areas with a similar pattern represent the same land system. The land systems are then ground-truthed during fieldwork.

A total of 105 land systems have been identified and mapped in the Pilbara bioregion[5], with 63 land systems occurring in the Hamersley subregion. Land systems mapping covering the study area has been prepared by van Vreeswyk et al. (2004).

The study area intersects five land systems, which are summarised in Table 5.2. These land systems are widespread and extensive in terms of their area within the Pilbara bioregion. Their location in relation to the study area is shown in Figure 5.2.

[5] This information was obtained by merging the Ashburton land system mapping (Payne et al. 1988) and Pilbara land system mapping (Van Vreeswyk et al. 2004) and intersecting this with the Pilbara bioregion (Environment Australia 2000) in ArcView (v. 3.2).

Table 5.2: Extent of land systems in the study area and the percentage this represents of their total extent in the Pilbara bioregion.

Land System	Description (Van Vreeswyk et al. 2004)	Total Area of Land System in the Pilbara (ha)	Total Area of Land System within the Study Area (ha)	Percentage of Study Area (%)	Percentage of Land System in Study Area
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands. Component landforms include low hills and rises (4%), stony slopes and upper plains (20%), stony lower plains (65%), groves (1%), and narrow drainage and channels (10%).	961,637	2,221	25.8	0.2
McKay	Hills, ridges, plateaus and breakaways of meta-sedimentary rocks supporting hard spinifex grasslands. Component landforms include hills, ridges ad plateaus remnants (60%), breakaways (2%), lower foot slopes (10%), stony plains (20%), and drainage floors (8%).	426,145	1,455	16.8	0.3
Newman	Rugged jaspilite plateaus, ridges and mountains supporting hard spinifex grasslands. Component landforms include plateaus, ridges, mountains and hills (70%), lower slopes (20%), stony plains (5%), and narrow drainage floors with channels (5%).	1,993,745	2,326	26.9	0.1
River	Active flood plains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands. Component landforms include sandy levees and sand sheets (15%), upper terraces (5%), floodplains and lower terraces (50%), stony plains (10%), and minor and major channels (20%).	497,421	2,142	24.8	0.4
Urandy	Stony plains, alluvial plains an drainage lines supporting shrubby soft spinifex grasslands. Component landforms include stony plains (58%), alluvial plains (35%), and drainage zones and channels (7%).	131,975	496	5.7	0.4

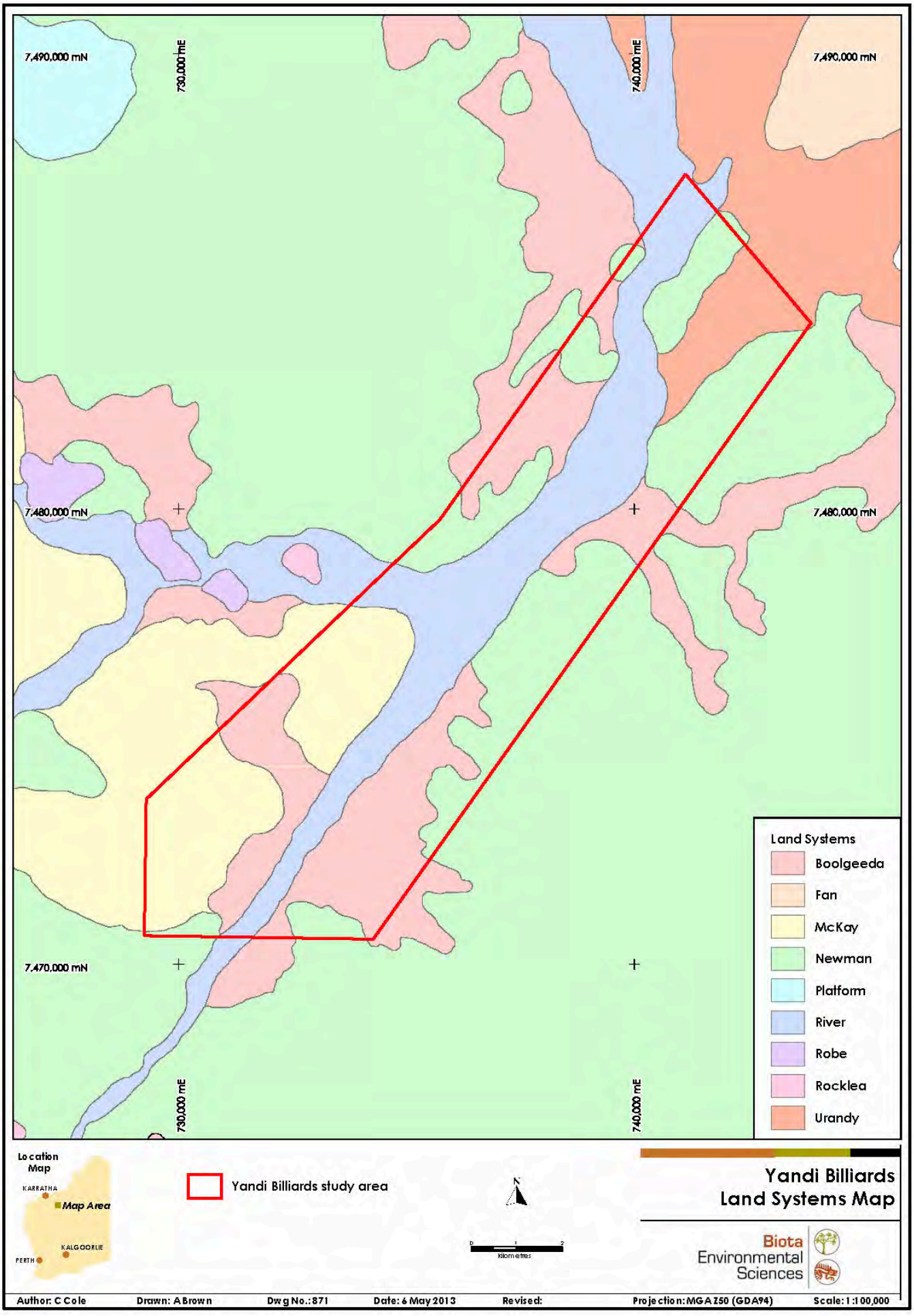

Figure 5.2: Land systems of the locality including the study area.

5.6 Beard's Vegetation Mapping

Beard (1975) mapped the vegetation of the Pilbara at a scale of 1:1,000,000. The study area is located on the Hamersley Plateau, which is within the Fortescue Botanical District of the Eremaean Botanical Province as defined by Beard. The vegetation of this province is typically open, and frequently dominated by spinifex, wattles and occasional eucalypts.

Three vegetation units mapped by Beard (1975) occur within the study area (see Figure 5.3):

- Fortescue Valley 29: Sparse low woodland; mulga, discontinuous in scattered groups;
- Fortescue Valley 82: Hummock grasslands, low tree steppe; Snappy Gum over *Triodia wiseana*;
- Hamersley 82: Hummock grasslands, low tree steppe; Snappy Gum over *Triodia wiseana* (equivalent to Fortescue Valley 82).

Given the broad nature of Beard's mapping, these units are only broadly applicable to the vegetation of the study area (see Section 6.0).

5.7 Significant Vegetation Communities Known from the Locality

The following section describes vegetation of conservation significance known from the Yandi locality. The framework for ranking communities of conservation significance in Western Australia is presented in Appendix 1.

5.7.1 Threatened Ecological Communities

TECs are described by DPaW as "biological (flora or fauna) assemblages occurring in a particular habitat, which are under threat of modification or destruction from various processes" (DEC 2010). TECs listed by DPaW are significant at the State level and are protected as Environmentally Sensitive Areas (ESAs) under the *Environmental Protection Act 1986* (WA). Two TECs are listed for the Pilbara bioregion: the '*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)' and the 'Ethel Gorge aquifer stygobiont community' (DEC 2013).

Twenty-three of the 69 TECs listed in Western Australia are also nationally recognised and listed under the Commonwealth *EPBC Act 1999.* These do not include either of the two TECs listed for the Pilbara bioregion.

The Ethel Gorge stygobiont TEC is approximately 77 km southeast of the study area, while the nearest area of the *Themeda* grasslands TEC is approximately 140 km northwest. Neither TEC is therefore relevant to the study area.

5.7.2 Priority Ecological Communities

PECs include possible TECs that do not meet survey criteria or are not adequately defined. These are added to DPaW's PEC list under Priorities 1 (highest priority), 2 and 3. Ecological Communities that are: 1) adequately known; 2) are rare but not threatened, or meet criteria for Near Threatened; or 3) have been recently removed from the threatened list, are placed in Priority 4. Conservation dependent ecological communities are placed in Priority 5.

Thirty PECs are listed for the Pilbara bioregion (DPaW 2013). No PECs occur in the study area. The nearest PECs to the study area are the Priority 1 'Weeli Wolli Spring community', located approximately 7 km to the south; and two of the Priority 3 'Fortescue Valley Sand Dunes', one area located approximately 5 km to the east and the other area 5 km to the northwest of the study area. The Priority 1 'Fortescue Marsh' PEC is also located in the vicinity of the study area; the marsh itself is located approximately 27 km north of the study area, and is surrounded by fringing vegetation.

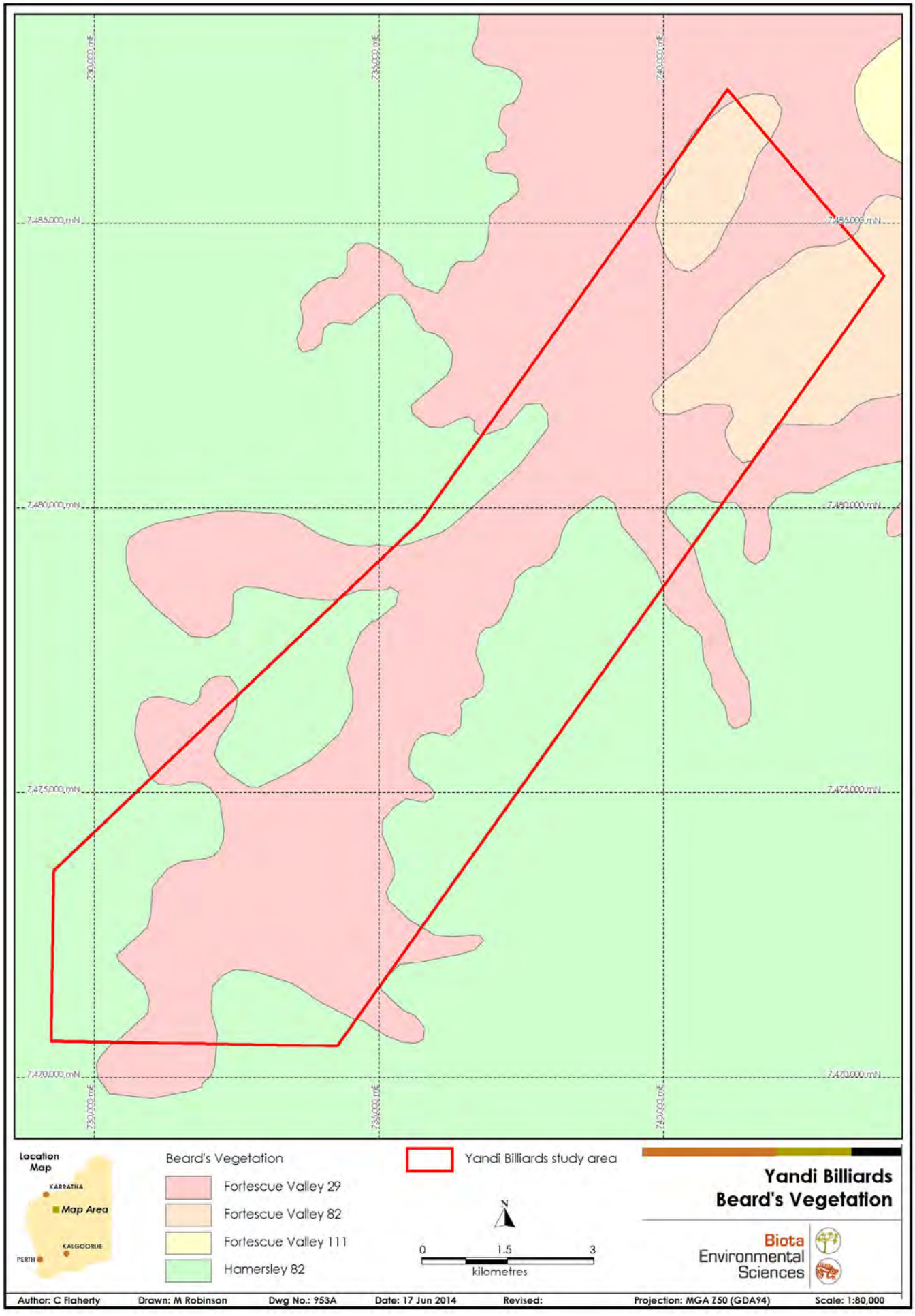

Figure 5.3: Beard's vegetation mapping for the locality including the study area.

5.8 Conservation Significant Flora Known from the Locality

5.8.1 Threatened Flora

Three Threatened flora species (*Aluta quadrata, Lepidium catapycnon* and *Thryptomene wittweri*) are known from the Pilbara bioregion. *Lepidium catapycnon* and *Thryptomene wittweri* are listed as Threatened flora under the Commonwealth *EPBC Act 1999* as well as the WA *Wildlife Conservation Act 1950*. *Aluta quadrata* has only recently been listed (State of Western Australia 2012) and is currently only recognised as Threatened under the *Wildlife Conservation Act 1950.* Each species is described briefly below:

- *Aluta quadrata* is a perennial shrub occurring mainly in rocky gullies, although it sometimes extends down along the creeklines draining the gullies, or out onto the adjacent ridge slopes and crests. This species is currently thought to be restricted to the southern flanks of the range of hills surrounding Paraburdoo, where it occurs over an east-west range of approximately 40 km. *Aluta quadrata* has not been previously recorded within 40 km of the study area. Given the restricted distribution of this species, it would not occur in the study area.
- *Lepidium catapycnon* (Hamersley Lepidium) is a woody perennial herb or low shrub occurring mainly on hillsides in skeletal soils. It typically occurs in hummock grasslands on low stony hills and occasionally stony plains, particularly in association with the Newman land system (see Section 5.5). This relatively short-lived shrub species is often recorded from areas that have been recently disturbed, apparently persisting for only a few years. Now known from a number of locations in the Hamersley Range, *L. catapycnon* extends broadly from Tom Price across to Newman. *Lepidium catapycnon* has been recorded from two locations in the study area (Hamersley Iron 2006, Biota 2009b) and additional suitable habitat for this species is present. *Lepidium catapycnon* may therefore occur at other locations within the study area.

  Table 5.3: Locations of the Threatened flora species, *Lepidium catapycnon*, in the study area.

Species	Source	Number of individuals	Easting	Northing
Lepidium catapycnon	Biota (2009b)	171	733172	7475074
Lepidium catapycnon	Hamersley Iron (2006)	not provided	732596	7470785

- *Thryptomene wittweri* (Mountain Thryptomene) is a spreading, perennial shrub occurring in skeletal stony soils on breakaways and in drainage channels, typically high in the landscape on mountains of greater than 1,000 m elevation. All Pilbara records are restricted to the Mt Bruce area. *Thryptomene wittweri* would not occur in the study area as suitable habitat is not present, and its distribution does not include the study area.

5.8.2 Priority Flora

Based on the results of the database searches and literature reviews conducted for this study, a total of 12 Priority taxa and two species of interest have been recorded within 25 km of the study area. A brief description of these taxa along with an assessment of the likelihood of occurrence of each taxon in the study area is provided in Appendix 2.

Prior to the current survey, no Priority flora had been recorded from within the study area. Based on the known distributions of the Priority flora species, and comparison of their habitat preferences with the habitats that appeared to be present in the study area, the following five Priority flora taxa were identified through the desktop review as:

- Likely to occur:
  - one Priority 4 taxon: *Goodenia nuda*.
- May potentially occur:
  - one Priority 2 taxon: *Stylidium weeliwolli; and*
  - three Priority 3 taxa: *Rostellularia adscendens* var. *latifolia, Sida* sp. Barlee Range (S. van Leeuwen 1642) and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431).

With regards to the species considered likely to occur in the study area:

- *Goodenia nuda* (Priority 4)
  Goodenia nuda is an erect to ascending, slender herb growing to 50 cm in height, with yellow flowers and narrow, pale green glaucous leaves (DPaW 2014). This species is typically found growing near creeklines and in wet areas. It has a broad distribution; most records occur over a range of approximately 450 km through the Pilbara bioregion, with populations known from Karijini and Millstream-Chichester National Parks. There is also an outlying record from the Canning Stock Route in the Gascoyne bioregion. *Goodenia nuda* has been recorded 7.2 km northwest of the study area, next to Marillana Creek (Biota 2010). This species would be likely to occur in the study area, particularly in association with minor flowlines or with Marillana or Weeli Wolli Creeks.

With regards to the species considered to have the potential to occur in the study area:

- *Stylidium weeliwolli* (Priority 2)
  This annual herb grows to 25 cm and produces pink flowers between August and September. This species has a relatively broad range through the Pilbara and Gascoyne bioregions, but is only infrequently recorded. This is probably partly due to its small and delicate stature, and also a reflection of the habitats in which it occurs (seasonally damp or wet areas including root mats of *Melaleuca*, on floodplains and in seepages around granite rocks). In the Pilbara, this species occurs mainly along major watercourses. It is possible that this species occurs along the sections of Marillana Creek and Weeli Wolli Creek within the study area, however to date it has only been recorded in the vicinity of Weeli Wolli Springs (the closest record is approximately 6 km upstream of the study area).

- *Rostellularia adscendens* var. *latifolia* (Priority 3)
  Rostellularia adscendens var. *latifolia* is a small herb to low shrub that occurs in a broad range of habitats, but is most frequently recorded in drainage areas and on plains (DPaW 2014). This taxon has a broad distribution across the Pilbara (over 400 km, extending from the Brockman locality to the Oakover River), with five populations known from Karijini National Park. There is suitable habitat for this species in the study area and it has been recorded from a location 7.6 km to the northwest (Biota 2012a).

- *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)
  This spreading shrub grows to 0.5 m tall and produces yellow flowers in August. It typically occurs on steep slopes with red skeletal soils and exposed rock, often in gorges and gullies. This species has been recorded from rocky habitat along Marillana Creek, approximately 2.3 km northwest of the study area (Biota 2004b). It is possible that this species could occur in rocky habitats within the study area.

- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (Priority 3)
  This tussock grass grows to 1.8 m tall and occurs on red clay pans and grass plains. It differs from the more common and widespread *Themeda triandra* by its larger size, sturdier culms and pale bluish colouring (*T. triandra* has yellowish colouring). There is a record of this species from 2.8 km northwest of the study area (Biota 2004b), and it could potentially occur in the study area, particularly along the floodplains associated with Marillana or Weeli Wolli Creek.

5.8.3 Other Species of Interest

Two other taxa of potential conservation interest have been recorded near Yandi and may occur in the study area (see Appendix 2). These are:

- *Eulalia* sp. (Three Rivers Station, B. Forsyth AQ6789133)
  This currently undescribed species of Eulalia has been recorded from one location on a plain on the southern side of Marillana Creek (Biota 2013b), 900 m west of the current study area. Dr. Ken Tinley first collected this species in 2008 on Three Rivers Homestead (approximately 290 km south of the Yandi project) and the phrase name *Eulalia* sp. (Three Rivers Station) was applied (Bryan Simon, Queensland Herbarium, pers. comm. 2012). *Eulalia* sp. (Three Rivers Station) differs from the common *Eulalia* species occurring in the Pilbara (*E. aurea*) by its broader leaves, elongated rhizomes and the inflorescences remaining closed at maturity

(Simon and Alfonso 2012). Currently, the phrase name is not recognised on FloraBase or Australia's Virtual Herbarium. It is likely that this taxon has been under-collected given its similarity to the common species *Eulalia aurea*. A formal description of *Eulalia* sp. (Three Rivers Station) is currently being progressed by Rachel Butler (Biota) and Mr. Malcolm Trudgen (M.E. Trudgen and Associates).

- *Glycine* sp. aff. *arenaria*
  This creeper with apparent affinities to *Glycine arenaria* was collected from a single site in Marillana Creek (Biota 2012a), approximately 11 km upstream of the current study area. This taxon was identified by Malcolm Trudgen (M.E. Trudgen and Associates), who described it as uncommon in the Pilbara. To date, no specimens of *G. arenaria* have been vouchered from outside the Northern Kimberley. The voucher specimen collected by Biota (2012a) was submitted to the WA Herbarium for lodgment in February 2013, but is believed to be awaiting incorporation to the collection.

6.0 Vegetation of the Study Area

6.1 Overview

A total of 496 ha (5.7%) of the study area had been cleared and was mapped as "Disturbed". Twenty-three vegetation units have been described for the study area, as summarised in Section 6.2. These vegetation units were broadly associated with the following habitat types:

- major creeklines and tributaries;
- minor creeklines, floodplains and valleys;
- hills, ridges and breakaways; and
- plains.

Table 6.1: Area of each unit mapped in the study area.

Mapping Unit Code	Area Mapped in Study Area (ha)	Percent of Study Area
Vegetation of Major Creeklines and Tributaries		
C1: EcEvMaMgAc	73.1	0.8
C2: EvChAtuGwTErCYpERItTHt	22.6	0.3
C3: EvAciAcMgCEc	269.3	3.1
C4: EvAciAprAThCEc	1,059.2	12.3
Vegetation of Minor Creeklines, Floodplains and Valleys		
F1: ChAtuGwTp	95.2	1.1
F2: AprAciCEc	314.7	3.6
F3: ElChAtuAaAbGwTspp	93.6	1.1
F4: ChAtuAaPcAtenBONeARhPAmTp	41.7	0.5
F5: ChAciAaAiSENsppTp	31.4	0.4
Vegetation of Hills, Ridges and Breakaways		
H1: ElHcAiGwTsps	1,315.0	15.2
H2: ElAiTwTsps	1,345.8	15.6
H3: ElGwAarTsps	210.4	2.4
H4: ChAarTspsTw	74.2	0.9
H5: ElCfERImTHspp	7.7	0.1
Vegetation of Plains		
P1: ElEgAprAbAaAdTwTpTsps	43.4	0.5
P2: ChAprAiAsclApaTp	563.5	6.5
P3: AprAciAiAsclTlo	177.9	2.1
P4: AprAsyAiTw	352.1	4.1
P5: ElEgAbAaTb	1,461.3	16.9
P6: AapERfoERl/g	144.2	1.7
P7: ERf/g	35.6	0.4
P8: EgAiTs	32.4	0.4
P9: ChEgAiAaAprPcTb	380.2	4.4
Other Units		
Disturbed	496.1	5.7
Total	8,640.6	100.0

6.2 Description of the Vegetation Types

6.2.1 Vegetation of Major Creeklines and Tributaries

C1: EcEvMaMgAc	*Eucalyptus camaldulensis* subsp. *refulgens, E. victrix* woodland over *Melaleuca argentea, M. glomerata, Acacia coriacea* subsp. *pendens* low open woodland
Distribution and Comments	This riparian vegetation type occurred in the bed of Weeli Wolli Creek and Marillana Creek (Plate 6.1). Cadjeputs (*Melaleuca argentea*) occurred in patches along the creek. In wetter areas, an open sedgeland of *Cyperus vaginatus* was present, sometimes with patches of Native Bulrush (*Typha domingensis*). In drier areas, a tussock grassland stratum was typically present; this was dominated by a combination of *Eriachne tenuiculmis, Eulalia aurea* and *Themeda triandra.*
Associated Species	Trees/Tall Shrubs: *Acacia citrinoviridis, A. pyrifolia* var. *pyrifolia, Atalaya hemiglauca* and *Gossypium robinsonii.* Low Shrubs: *Corchorus crozophorifolius, Heliotropium pachyphyllum, Hybanthus aurantiacus, Indigofera monophylla, Sesbania cannabina, Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186) and *Waltheria indica.* Herbs and Grasses: *Amaranthus undulatus, *Argemone ochroleuca* subsp. *ochroleuca, Cleome viscosa, Crotalaria medicaginea* var. *neglecta, Euphorbia alsiniflora, E. biconvexa, Evolvulus alsinoides* var. *villosicalyx, *Flaveria trinervia, Gomphrena cunninghamii, Ipomoea muelleri, *Malvastrum americanum, Phyllanthus maderaspatensis, Pluchea dentex, P. rubelliflora, Polycarpaea longiflora, Rhynchosia minima, *Solanum nigrum, *Sonchus oleraceus, Stemodia grossa, Trachymene oleracea* subsp. *oleracea* and *Wahlenbergia tumidifructa.*
Vegetation Condition	Good; several weed species have been recorded however none were abundant, and they typically occurred only as scattered individuals. There was some evidence of disturbance by cattle, which are widespread in the Yandi area.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	YBI30S^ and YBI23 (Biota 2009a).
Other Notes	Quadrat YBI23 was not resampled during the current survey as the creek was inundated (Plate 6.2).

Plate 6.1: Vegetation type C1 (YBI30S).

Plate 6.2: Quadrat YBI23 inundated in 2014.

C2: EvChAtuGwTErCYpERItTHt	*Eucalyptus victrix, Corymbia hamersleyana* scattered low trees over *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula* tall shrubland over *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) low shrubland over *Cymbopogon ambiguus, C. procerus, Eriachne tenuiculmis, Themeda triandra* very open tussock grassland
Distribution and Comments	This vegetation occurred in the study area in three moderate-sized creeklines (tributaries feeding into Weeli Wolli Creek; Plate 6.3). Patches of the tall shrub *Androcalva luteiflora* were also present in places, and *Triodia pungens* sometimes occurred as a very open hummock grassland. **Cenchrus ciliaris* and **C. setiger* were present as an open tussock grassland in some places.
Associated Species	Tall Shrubs: *Acacia pyrifolia* var. *pyrifolia, Atalaya hemiglauca* and *Gossypium robinsonii.* Shrubs: *Corchorus crozophorifolius, Eremophila longifolia, Gossypium australe, Senna artemisioides* subsp. *oligophylla* x subsp. *helmsii* and *Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90). Low Shrubs: *Crotalaria medicaginea* var. *neglecta, Hybanthus aurantiacus, Indigofera georgei, Ptilotus astrolasius* and *Waltheria indica.* Herbs and Grasses: *Amaranthus undulatus*, *Aristida holathera* var. *holathera*, *Boerhavia coccinea, *Cenchrus ciliaris*, **C. setiger, Enneapogon polyphyllus, Gomphrena cunninghamii, Goodenia stobbsiana, Paraneurachne muelleri, Polycarpaea longifolia* and *Triodia pungens.*
Vegetation Condition	Good; **Cenchrus ciliaris* and **C. setiger* often occurred as scattered tussock grasses to an open tussock grassland.
Quadrats in the Study Area	BIL02 and BIL31 (current survey).
Other Notes	This vegetation was originally mapped as EvAtuGwTErCYpERItTHt (Biota 2013b). The unit has been updated with the addition of *Corymbia hamersleyana* in the low tree stratum; this species occurred as a co-dominant with *Eucalyptus victrix* in some creeklines in the study area.

Plate 6.3: Vegetation type C2 (BIL02).

C3: EvAciAcMgCEc	*Eucalyptus victrix* scattered trees over *Acacia citrinoviridis, A. coriacea* subsp. *pendens, Melaleuca glomerata* tall open shrubland over **Cenchrus ciliaris* scattered tussock grasses
Distribution and Comments	This was the predominant vegetation of the creek beds of Marillana and Weeli Wolli Creek (Plate 6.4). It occurred in scoured channels that occurred in a braided pattern through the broader creekline vegetation.
Associated Species	Tall Shrubs: *Acacia pyrifolia* var. *pyrifolia* and *Atalaya hemiglauca*. Shrubs: *Corchorus crozophorifolius, Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186) and *Waltheria indica*. Low Shrubs: *Crotalaria medicaginea* var. *neglecta* and *Indigofera monophylla.* Herbs and Grasses: **Argemone ochroleuca* subsp. *ochroleuca*, *Amaranthus undulatus*, *Boerhavia coccinea, Cleome viscosa, Cymbopogon procerus, Enneapogon lindleyanus, Eriachne tenuiculmis, Eulalia aurea, Gomphrena cunninghamii, Goodenia lamprosperma, Phyllanthus maderaspatensis, Pluchea rubelliflora* and *Polycarpaea longiflora.*
Vegetation Condition	Very Good; scattered individuals of several weed species were recorded, along with minor disturbance from cattle (scats and low levels of grazing).
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	YBI01^ (Biota 2009a) and BIL30 (current survey).
Relevés in the Study Area	YBI-RRWB (Biota 2009a).

Plate 6.4: Vegetation type C3 (BIL03).

C4: EvAciAprAThCEc	*Eucalyptus victrix* open *woodland* over *Acacia citrinoviridis, A. pruinocarpa, Atalaya hemiglauca* low woodland over **Cenchrus ciliaris* tussock grassland
Distribution and Comments	This vegetation type occurred on the broad floodplains of Marillana and Weeli Wolli Creeks (Plate 6.5). It was also recorded from two moderate-sized creeklines (tributaries of Weeli Wolli Creek) in the southern end of the study area. **Cenchrus ciliaris* formed a closed tussock grassland in some sites situated on floodplains. Scattered *Triodia pungens* was often present in the understorey.
Associated Species	Trees/Tall Shrubs: *Acacia coriacea* subsp. *pendens, A. pyrifolia* var. *pyrifolia, A. sclerosperma, Corymbia hamersleyana, Gossypium robinsonii, Hakea lorea* subsp. *lorea and Stylobasium spathulatum.* Shrubs: *Corchorus crozophorifolius, Gossypium sturtianum, Ptilotus obovatus* var. *obovatus, Rhagodia eremaea, Senna artemisioides* subsp. *helmsii, Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186) and *Waltheria indica.* Low Shrubs: *Hybanthus aurantiacus, Indigofera monophylla, Melhania oblongifolia* and *Ptilotus astrolasius.* Herbs, Grasses and Sedges: **Bidens bipinnata, *Cenchrus setiger, Cymbopogon procerus, Cyperus vaginatus, Dicladanthera forrestii, Enneapogon lindleyanus, E. robustissimus, Eulalia aurea, Evolvulus alsinoides* var. *decumbens, Evolvulus alsinoides* var. *villosicalyx, *Malvastrum americanum, Notoleptopus decaisnei* var. *decaisnei, Phyllanthus maderaspatensis, *Setaria verticillata, Themeda triandra* and *Triodia pungens.*
Vegetation Condition	Good to Very Poor: much of this vegetation type was extensively invaded by **Cenchrus ciliaris* (often with **C. setiger* as a co-dominant). Several other weed species were present as scattered individuals and disturbance from cattle was also recorded. Historical (mostly overgrown) drill lines were also noted in this vegetation type.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	H051 and H050^ (Biota 2002); HDA09^ (Biota 2004a); YBI02, YBI03, YBI04 and YBI08^ (Biota 2009a); YAQ12^ and YAQ21 (Biota 2013b); and YEX02^ (Biota 2004b).
Relevés in the Study Area	YBI-RBMK, YBI-RPHB and YBI-RPHA from the Yandi Billiards survey (Biota 2009a) and YAQ-CSRA from the Yandi Additional Areas survey (Biota 2013b).
Other Notes	Quadrat H051 has been cleared.

Plate 6.5: Vegetation type C4 (YAQ12).

6.2.2 Vegetation of Minor Creeklines, Floodplains and Valleys

F1: ChAtuGwTp	*Corymbia hamersleyana* scattered low trees to low open woodland over *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* tall open shrubland over *Triodia pungens* hummock grassland
Distribution and Comments	This vegetation type occurred throughout the study area in minor creeklines on plains and in between low hills (Plate 6.6). It was also found in a broad valley in the northern end of the study area, where the vegetation was regenerating after being recently burnt (less than 3 years ago).
Associated Species	Trees: *Eucalyptus gamophylla*. Tall Shrubs: *Acacia ancistrocarpa, A. bivenosa, A. dictyophleba, A. pyrifolia* var. *pyrifolia, Androcalva luteiflora* and *Gossypium robinsonii.* Shrubs: *Gossypium australe, Senna artemisioides* subsp. *helmsii, S. artemisioides* subsp. *oligophylla, S. artemisioides* subsp. *oligophylla x* subsp. *helmsii* and *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186). Low Shrubs: *Corchorus lasiocarpus* subsp. *lasiocarpus, C. tectus, Hybanthus aurantiacus* and *Waltheria indica.* Herbs and Grasses: *Aristida holathera* var. *holathera, Bothriochloa ewartiana, *Cenchrus ciliaris, Cymbopogon ambiguus, Digitaria brownii, Eriachne mucronata, Goodenia muelleriana, Hibiscus sturtii* var. *platychlamys, Pterocaulon sphacelatum, Rhynchosia minima, Sida cardiophylla, Stemodia grossa, Themeda triandra* and *Trichodesma zeylanicum* var. *zeylanicum*.
Vegetation Condition	Very Good to Good: scattered weed species were present at some sites. **Cenchrus ciliaris* formed a very open tussock grassland in some areas.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	YBI20^, YBI25 and YBI35S^ (Biota 2009a); BIL16 (current survey).
Relevés in the Study Area	YBI-RBME (Biota 2009a); BIL-RCFC and BIL-RSWA (current survey).

Plate 6.6: Vegetation type F1 (BIL16).

F2: AprAciCEc	*Acacia pruinocarpa, A. citrinoviridis* tall open shrubland over **Cenchrus ciliaris* tussock grassland
Distribution and Comments	This vegetation type occurred on broad floodplains fringing Weeli Wolli Creek in the north of the study area, and in broad tributaries of Weeli Wolli Creek at the southern end of the study area (Plate 6.7). *Corymbia hamersleyana* and *Eucalyptus victrix* trees were occasionally scattered in areas close to the creekline. **Cenchrus ciliaris* formed a continuous tussock grassland in the understorey however occasional *Triodia pungens* hummocks were also present.
Associated Species	Trees: *Corymbia hamersleyana* and *Eucalyptus victrix.* Tall Shrubs: *Acacia bivenosa, A. pyrifolia* var. *pyrifolia, A. synchronicia, A. tumida* var. *pilbarensis, Androcalva luteiflora, Atalaya hemiglauca, Gossypium robinsonii* and *Hakea lorea* subsp. *lorea.* Shrubs: *Ptilotus obovatus* var. *obovatus and Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186). Low Shrubs: *Corchorus lasiocarpus* subsp. *lasiocarpus, Crotalaria medicaginea* var. *neglecta* and *Hybanthus aurantiacus.* Herbs and Grasses: *Abutilon lepidum, Bothriochloa ewartiana, Chrysopogon fallax, Enneapogon polyphyllus, Eulalia aurea, *Flaveria trinervia, Duperreya commixta, *Malvastrum americanum, Streptoglossa decurrens* and *Themeda triandra.*
Vegetation Condition	Poor; extensively invaded by **Cenchrus ciliaris* (and sometimes **C. setiger*), and scattered other weeds of various species also present; some disturbance from cattle (grazing and scats).
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	YEX38^ (Biota 2004b); YAQ30^ (Biota 2013b); BIL23 and BIL24 (current survey).
Relevés in the Study Area	YBI-RBMF and YBI-RBMH (Biota 2009a); YAQ-CSRC and YAQ-CSRD (Biota 2013b).

Plate 6.7: Vegetation type F2 (BIL24).

F3: ElChAtuAaAbGwTspp	*Eucalyptus leucophloia, Corymbia hamersleyana* low open woodland over *Acacia tumida* var. *pilbarensis*, *A. ancistrocarpa, A. bivenosa, Grevillea wickhamii* tall open scrub over mixed *Triodia* hummock grassland
Distribution and Comments	This vegetation type occurred in numerous minor creeklines amongst low hills in the south of the study area near the JSE mine (Plate 6.8). These creeklines had a defined rocky bed and narrow banks. Most of the creeklines were too narrow to establish a standard flora quadrat (50 x 50 m). The composition of the shrub stratum was variable but was typically dominated by a combination of the species listed above. The dominant spinifex varied with location and usually reflected the species present in the surrounding plains.
Associated Species	Trees: *Eucalyptus victrix* and *E. xerothermica*. Tall Shrubs: *Acacia coriacea* subsp. *pendens, A. dictyophleba, Androcalva luteiflora, Atalaya hemiglauca, Eremophila longifolia* and *Gossypium robinsonii.* Shrubs: *Acacia tenuissima, Ptilotus obovatus* var. *obovatus, Santalum lanceolatum, Senna artemisioides* subsp. *helmsii* and *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186). Low Shrubs: *Crotalaria medicaginea* var. *neglecta, Indigofera monophylla, Melhania oblongifolia* and *Waltheria indica.* Herbs and Grasses: *Aristida holathera* var. *holathera, Boerhavia coccinea, Bonamia erecta, *Cenchrus ciliaris, Enneapogon robustissimus, Eriachne mucronata, Eulalia aurea, Evolvulus alsinoides* var. *villosicalyx, Goodenia microptera, G. muelleriana, Indigofera colutea, Jasminum didymum* subsp. *lineare, Polycarpaea longiflora, *Setaria verticillata, Triodia pungens, T. basedowii, T. wiseana.*
Vegetation Condition	Good; **Cenchrus ciliaris* was the dominant weed species, forming a very open tussock grassland in some creeklines. Several other weed species were present as scattered individuals.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	YEX07, YEX08^ (Biota 2004b); BIL35 and BIL36 (current survey).
Relevés in the Study Area	YAQ-RPLA, established in the Yandi Additional Areas survey (Biota 2013b).
Other Notes	Quadrat YEX07 has been cleared.

Plate 6.8: Vegetation type F3 (BIL35).

F4: ChAtuAaPcAtenBONeARhPAmTp	*Corymbia hamersleyana* scattered low trees over *Acacia tumida* var. *pilbarensis* tall open shrubland over *A. ancistrocarpa, Petalostylis cassioides, A. tenuissima* open shrubland over *Bonamia erecta* very open herbland over *Aristida holathera* var. *holathera, Paraneurachne muelleri* very open tussock grassland and *Triodia pungens* very open hummock grassland.
Distribution and Comments	This vegetation type occurred on a floodout located on a plain and fed by minor creeklines that flow through low hills to the east (Plate 6.9).
Associated Species	Trees: *Eucalyptus gamophylla*. Tall Shrubs: *Acacia citrinoviridis, A. dictyophleba, A. inaequilatera, A. pruinocarpa* and *Gossypium robinsonii*. Shrubs: *Acacia pyrifolia* var. *pyrifolia, Gossypium australe, Senna artemisioides* subsp. *oligophylla* and *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186). Low Shrubs: *Corchorus tectus, Dicrastylis cordifolia, Hibiscus sturtii* var. *platychlamys, Hybanthus aurantiacus, Indigofera georgei, Ptilotus astrolasius* and *Sida cardiophylla*. Herbs and Grasses: *Boerhavia coccinea, *Cenchrus ciliaris, Eriachne aristidea, Gomphrena cunninghamii, Polymeria ambigua, Themeda triandra* and *Triodia basedowii.*
Vegetation Condition	Very Good; some scattered individuals of **Cenchrus ciliaris* and **Setaria verticillata*; minor disturbance from cattle.
Quadrats in the Study Area	BIL11, BIL14 and BIL46 (current survey).

Plate 6.9: Vegetation type F4 (BIL46).

F5: ChAciAaAiSENsppTp	*Corymbia hamersleyana* scattered low trees over *Acacia citrinoviridis, A. ancistrocarpa, A. inaequilatera* tall open shrubland over *Senna* spp. open shrubland over *Triodia pungens* open hummock grassland.
Distribution and Comments	This vegetation type occurred on a small area of floodplain in the southernmost part of the study area. The shrub stratum consisted of a mixture of *Senna* spp. including *Senna artemisioides* subsp. *helmsii, S. artemisioides* subsp. *oligophylla* and *S. glutinosa* subsp. x *luerssenii.*
Associated Species	Trees: *Acacia aptaneura*. Tall Shrubs: *Acacia bivenosa, A. tumida* var. *pilbarensis, Eremophila longifolia, Gossypium robinsonii, Grevillea wickhamii, Hakea chordophylla, Santalum lanceolatum* and *Senna glutinosa* subsp. x *luerssenii.* Shrubs: *Indigofera monophylla* and *Tephrosia* sp. Fortescue (A.A. Mitchell 606). Low Shrubs: *Corchorus lasiocarpus* subsp. *lasiocarpus, C. tectus, Hybanthus aurantiacus, Isotropis atropurpurea, Pluchea ferdinandi-muelleri* and *Waltheria indica*. Herbs and Grasses: **Cenchrus ciliaris, Cleome viscosa, Digitaria ctenantha, Enneapogon polyphyllus, Paraneurachne muelleri, Polycarpaea corymbosa, Sida* sp. verrucose glands (F.H. Mollemans 2423) and *Themeda triandra.*
Vegetation Condition	Good; **Cenchrus ciliaris* occurred as a very open tussock grassland in some areas.
Quadrats in the Study Area	BIL21 (current survey).
Notes	This vegetation type will be refined and an additional quadrat will be added during the Phase 2 survey in July 2014 to achieve sampling replication.

Plate 6.10: Vegetation type F5 (BIL21).

6.2.3 Vegetation of Hills, Ridges and Breakaways

H1: ElHcAiGwTsps	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Hakea chordophylla, Acacia inaequilatera, Grevillea wickhamii* tall open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland
Distribution and Comments	This vegetation type occurred throughout the study area on the crests and slopes of low stony hills (Plate 6.11). Scattered individuals of *Triodia wiseana* were also recorded at some sites. Some areas of this vegetation type also had *Acacia adoxa* var. *adoxa* and/or *Acacia hilliana* present as scattered low shrubs to a low open shrubland.
Associated Species	Tall Shrubs: *Acacia bivenosa* and *A. pruinocarpa*. Shrubs: *Ptilotus rotundifolius, Senna artemisioides* subsp. *oligophylla, S. glutinosa* subsp. *glutinosa, S. glutinosa* subsp. *x luerssenii* and *S. glutinosa* subsp. *pruinosa*. Low Shrubs: *Acacia hilliana, A. spondylophylla, Corchorus lasiocarpus* subsp. *lasiocarpus, Ptilotus astrolasius, Sida echinocarpa, Sida* sp. Pilbara (A.A. Mitchell PRP 1543), *Solanum lasiophyllum* and *Tribulus suberosus.* Herbs, Grasses and Sedges: *Amphipogon sericeus, Aristida holathera* var. *holathera, Eriachne mucronata, Fimbristylis dichotoma, F. simulans, Goodenia stobbsiana, G. triodiophila, Ptilotus calostachyus, Schizachyrium fragile* and *Triodia wiseana.*
Vegetation Condition	Excellent.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	YBI31S^ and YBI33S^ (Biota 2009a); YEX01^, YEX06^ and YEX37 (Biota 2004b); YAQ14^, YAQ25^ and YAQ27^ (Biota 2013b); BIL05, BIL17, BIL19, BIL20, BIL28, BIL34, BIL37 and BIL43.

Plate 6.11: Vegetation type H1 (BIL20).

H2: ElAiTwTsps	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia inaequilatera* scattered tall shrubs over *Triodia wiseana*, (*T.* sp. Shovelanna Hill (S. van Leeuwen 3835)) open hummock grassland
Distribution and Comments	This vegetation type occurred throughout the study area on the crests and slopes of low to moderate-sized stony hills (Plate 6.12). Although the dominant spinifex species in this vegetation type was *Triodia wiseana, Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) was co-dominant in some places. Scattered low shrubs to a low open shrubland of *Indigofera rugosa* and/or *Acacia adoxa* var. *adoxa* was sometimes present. Minor drainage lines (too small to map) dissected this vegetation type and consisted of *Gossypium australe, Acacia pyrifolia* and *A. maitlandii* open shrublands over mixed tussock grasslands. A small area of this vegetation type along the eastern edge of the study area had been recently burnt (1-2 years prior; Plate 6.13).
Associated Species	Tall Shrubs: *Acacia bivenosa, A. pruinocarpa, Grevillea wickhamii* and *Hakea lorea* subsp. *lorea*. Shrubs: *Indigofera monophylla, Senna artemisioides* subsp. *oligophylla, S. glutinosa* subsp. *glutinosa, S. glutinosa* subsp. *x luerssenii, S. glutinosa* subsp. *pruinosa* and *Tephrosia* sp. Fortescue (A.A. Mitchell 606). Low Shrubs: *Acacia adoxa* var. *adoxa, Calytrix carinata, Dampiera candicans, Indigofera rugosa, Ptilotus rotundifolius, Solanum lasiophyllum* and *Tribulus suberosus.* Herbs, Grasses and Sedges: *Aristida holathera* var. *holathera, Boerhavia gardneri, Bonamia* sp. Dampier (A.A. Mitchell PRP 217), *Bulbostylis barbata, Enneapogon polyphyllus, Eriachne aristidea, Fimbristylis dichotoma, Goodenia muelleriana, G. stobbsiana, G. triodiophila, Mollugo molluginea, Ptilotus calostachyus, P. nobilis* subsp. *nobilis* and *Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356).
Vegetation Condition	Excellent.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	HDA16, HDA24^ (Biota 2004a); YBI05^, YBI36^, YBI32S^ (Biota 2009a); YAQ19, YAQ18 (Biota 2013b); BIL03, BIL15,BIL26, BIL27, BIL29, BIL39, BIL40, BIL44 (current survey).
Relevés in the Study Area	BIL-RCFA (current survey).

Plate 6.12: Vegetation type H2 (BIL40).

Plate 6.13: Burnt hills in vegetation type H2.

H3: ElGwAarTsps	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Grevillea wickhamii* tall open shrubland over *Acacia arida* shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland
Distribution and Comments	This vegetation type occurred on the crests and slopes of low rocky hills in the northeast of the study area (Plate 6.14). The northern half of this vegetation type had been recently burnt at the time of the survey (within the last 2 years; Plate 6.15).
Associated Species	Tall Shrubs: *Acacia bivenosa* (wispy/weeping form) and *A. inaequilatera.* Shrubs: *Senna artemisioides* subsp. *oligophylla* and *S. glutinosa* subsp. *glutinosa* x subsp. *pruinosa.* Low Shrubs: *Acacia adoxa* var. *adoxa* and *Ptilotus astrolasius.* Herbs, Grasses and Sedges: *Eriachne lanata, E. pulchella, Fimbristylis dichotoma, F. simulans, Goodenia stobbsiana, Ptilotus calostachyus* and *Triodia pungens.*
Vegetation Condition	Excellent.
Quadrats in the Study Area	BIL01 and BIL06 (current survey).
Relevés in the Study Area	BIL-RPCA (current survey).

Plate 6.14: Vegetation type H3 (BIL06).

Plate 6.15: Burnt hillslopes supporting vegetation type H3.

H4: ChAarTspsTw	*Corymbia hamersleyana* scattered low trees over *Acacia arida* open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *T. wiseana* hummock grassland
Distribution and Comments	This vegetation type occurred on the crests and upper slopes of two low stony hills in the northeast of the study area (Plate 6.16).
Associated Species	Tall Shrubs: *Acacia inaequilatera, Grevillea wickhamii* and *Hakea chordophylla.* Shrubs: *Acacia pachyacra, Senna artemisioides* subsp. *oligophylla, S. glutinosa* subsp. *glutinosa, S. glutinosa* subsp. *x luerssenii* and *S. glutinosa* subsp. *pruinosa.* Low Shrubs: *Acacia adoxa* var. *adoxa, Calytrix carinata, Dampiera candicans, Ptilotus astrolasius, P. rotundifolius* and *Solanum lasiophyllum.* Herbs, Grasses and Sedges: *Amphipogon sericeus, Aristida holathera* var. *holathera, Cymbopogon obtectus, Eriachne pulchella, Fimbristylis simulans, Goodenia stobbsiana, Pterocaulon sphacelatum, Ptilotus calostachyus* and *Schizachyrium fragile.*
Vegetation Condition	Excellent.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	YBI24^ (Biota 2009a) and BIL04 (current survey).

Plate 6.16: Vegetation type H4 (YBI24).

H5: ElCfERImTHspp	*Eucalyptus leucophloia* subsp. *leucophloia, Corymbia ferriticola* scattered low trees over *Eremophila latrobei* subsp. *filiformis,* Senna spp. scattered shrubs over *Cymbopogon ambiguus, Eriachne mucronata, Themeda* sp. Mt Barricade, *T. triandra* open tussock grassland
Distribution and Comments	This vegetation type occurred on several narrow ridgelines in the southern half of the study area (Plate 6.17). The ridgelines were steep-sided and were characterised by exposed rocky outcrops and skeletal soil.
Associated Species	Tall Shrubs: *Clerodendrum floribundum* var. *angustifolium* and *Grevillea wickhamii*. Shrubs: *Dodonaea coriacea, Ptilotus obovatus* var. *obovatus, Rhagodia eremaea, Senna glutinosa* subsp. *glutinosa, S. glutinosa* subsp. *x luerssenii* and *Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90). Low Shrubs: *Abutilon lepidum, Maireana planifolia, Sida* sp. Excedentifolia (J.L. Egan 1925), *Hibiscus* sp. Mt Robinson (G. Byrne 3537) and *Solanum lasiophyllum.* Herbs and Grasses: *Aristida holathera* var. *holathera, Enneapogon polyphyllus, Goodenia microptera, G. muelleriana, G. stobbsiana* and *Triodia pungens.*
Vegetation Condition	Typically Excellent; one individual of **Cenchrus ciliaris* was recorded on one ridgeline.
Relevés in the Study Area	YEX-J (Biota 2004b); BIL-RCFB and BIL-RCFD (current survey).
Other Notes	As this vegetation type was too narrow for quadrat sampling, only relevés were completed.

Plate 6.17: Vegetation type H5 (BIL-RCFB).

6.2.4 Vegetation of Plains

P1: ElEgAprAbAaAdTwTpTsps	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *E. gamophylla* scattered low mallees over *Acacia pruinocarpa* scattered tall shrubs over *A. bivenosa, A. ancistrocarpa, A. dictyophleba* shrubland over *Triodia wiseana, T. pungens*, *T.* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland
Distribution and Comments	This vegetation type occurred over undulating, colluvial stony plains near the JSE mine, located between Weeli Wolli Creek and a range of low hills to the west (Plate 6.18). The proportion of the dominant spinifex varied considerably with location, with *Triodia wiseana* and/or *T. pungens* dominating the majority of the lower-lying areas and *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) tending to dominate more elevated areas.
Associated Species	Tall Shrubs: *Acacia inaequilatera, A. pachyacra, A. synchronicia, Codonocarpus cotinifolius* and *Hakea chordophylla.* Shrubs: *Acacia hilliana, Eremophila fraseri* subsp. *fraseri, Senna glutinosa* subsp. *x luerssenii* and *S. glutinosa* subsp. *pruinosa.* Low Shrubs: *Acacia adoxa* var. *adoxa, Bonamia erecta, Corchorus lasiocarpus* subsp. *lasiocarpus, Hybanthus aurantiacus, Sida arenicola, S. echinocarpa* and *Solanum lasiophyllum.* Herbs and Grasses: *Aristida contorta, Cymbopogon obtectus, Goodenia microptera, G. stobbsiana, Paraneurachne muelleri, Ptilotus nobilis* subsp. *nobilis, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356) and *Themeda triandra.*
Vegetation Condition	Excellent.
Quadrats in the Study Area	YEX05 (Biota 2004b) and BIL38 (current survey).
Other Notes	Quadrat YEX05 has been cleared.

Plate 6.18: Vegetation type P1 (BIL38).

P2: ChAprAiAsclApaTp	*Corymbia hamersleyana, Acacia pruinocarpa* scattered low trees over *A. inaequilatera, A. sclerosperma* subsp. *sclerosperma, A. pachyacra* tall open shrubland over *Triodia pungens* hummock grassland
Distribution and Comments	This vegetation type occurred broadly over plains between low hills in the north of the study area, as well as on plains fringing the floodplains of both Marillana and Weeli Wolli Creeks (Plate 6.19). Shrub species varied with location; the typical dominant species are listed in the description above, however *Acacia dictyophleba* was also abundant in some places. Shrub cover tended to be higher in areas closer to the major creeks. *Triodia pungens* was the dominant spinifex species, however occasional hummocks of *T. basedowii* were also recorded.
Associated Species	Tall Shrubs: *Acacia ancistrocarpa, A. citrinoviridis, A. pyrifolia* var. *pyrifolia, Atalaya hemiglauca* and *Hakea chordophylla.* Shrubs: *Acacia dictyophleba, Eremophila longifolia, Gossypium australe, Ptilotus obovatus* var. *obovatus, Senna artemisioides* subsp. *helmsii, S. artemisioides* subsp. *oligophylla, S. glutinosa* subsp. *x luerssenii* and *S. glutinosa* subsp. *pruinosa.* Low Shrubs: *Corchorus sidoides* subsp. *sidoides, Dicrastylis cordifolia, Dodonaea coriacea, Hibiscus sturtii* var. *platychlamys, Indigofera monophylla, Sida arsiniata, S. cardiophylla, S.* sp. verrucose glands (F.H. Mollemans 2423), *Solanum lasiophyllum* and *Tephrosia supina.* Herbs, Grasses and Sedges: *Boerhavia coccinea, Bulbostylis barbata, *Cenchrus ciliaris, Enneapogon polyphyllus, Eragrostis eriopoda, Eriachne pulchella, Mollugo molluginea, Paraneurachne muelleri* and *Tribulus astrocarpus.*
Vegetation Condition	Good; scattered individuals to a very open tussock grassland of **Cenchrus ciliaris* in places, along with scattered individuals of several other weed species.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	YBI10^ and YBI26 (Biota 2009a); YAQ16^, YAQ29 (Biota 2013b); BIL07, BIL08, BIL09, BIL10 (current survey).
Relevés in the Study Area	YBI-RBMC and YBI-RBMD (Biota 2009a).
Other Notes	YBI26 and YAQ29 have since been cleared.

Plate 6.19: Vegetation type P2 (BIL10).

P3: AprAciAiAsclTlo	*Acacia pruinocarpa* low open woodland over *A. citrinoviridis, A. inaequilatera, A. sclerosperma* subsp. *sclerosperma* open shrubland over *Triodia longiceps* hummock grassland
Distribution and Comments	This vegetation type occurred on plains fringing the floodplains on either side of Weeli Wolli Creek in the central section of the study area (Plate 6.20).
Associated Species	Trees: *Acacia aptaneura, A. coriacea* subsp. *pendens* and *Corymbia hamersleyana.* Tall Shrubs: *Acacia bivenosa, A. dictyophleba, A. pyrifolia* var. *pyrifolia, A. tenuissima, Atalaya hemiglauca, Eremophila longifolia, Hakea lorea* subsp. *lorea, Stylobasium spathulatum.* Shrubs: *Corchorus crozophorifolius, C. lasiocarpus* subsp. *lasiocarpus, Gossypium sturtianum, Ptilotus obovatus* var. *obovatus, Senna artemisioides* subsp. *helmsii* and *S. artemisioides* subsp. *oligophylla.* Low Shrubs: *Corchorus sidoides* subsp. *sidoides, Sida* sp. verrucose glands (F.H. Mollemans 2423) and *Solanum lasiophyllum.* Herbs and Grasses: *Abutilon otocarpum, A. lepidum, Aristida holathera* var. *holathera, Boerhavia coccinea, *Cenchrus ciliaris, Cymbopogon ambiguus, Enneapogon caerulescens, Goodenia microptera, Pterocaulon sphacelatum, Sclerolaena cornishiana, Themeda triandra* and *Triodia basedowii.*
Vegetation Condition	Typically Very Good (occasionally Poor); the cover of **Cenchrus ciliaris* ranged from scattered individuals to a very open tussock grassland. One site (YBI17) was rated as Poor: a **Malvastrum americanum* open herbland was present, and several other weed species occurred as scattered individuals.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	HDA14 (Biota 2004a); YBI11^ and YBI17^ (Biota 2009a).
Relevés in the Study Area	YBI-RBMJ (Biota 2009a).
Other Notes	HDA14 has been cleared.

Plate 6.20: Vegetation type P3 (YBI11).

P4: AprAsyAiTw	*Acacia pruinocarpa* low open woodland over *A. synchronicia, A. inaequilatera* scattered tall shrubs over *Triodia wiseana* open hummock grassland
Distribution and Comments	This vegetation type occurred on the plains at the southernmost end of the study area, fringing the floodplain on both sides of Weeli Wolli Creek (Plate 6.21).
Associated Species	Trees: *Acacia aptaneura, A. sibirica, Corymbia hamersleyana* and *Eucalyptus xerothermica.* Tall Shrubs: *Acacia bivenosa, A. pachyacra* and *A. sericophylla*. Shrubs: *Capparis spinosa* var. *nummularia, Corchorus lasiocarpus* subsp. *lasiocarpus, Eremophila forrestii* subsp. *forrestii, Gossypium australe, Ptilotus obovatus* var. *obovatus, Senna artemisioides* subsp. *helmsii, S. glutinosa* subsp. *glutinosa* and *S. glutinosa* subsp. *x luerssenii.* Low Shrubs: *Indigofera monophylla, Maireana planifolia* and *Ptilotus astrolasius.* Herbs and Grasses: *Abutilon otocarpum, *Cenchrus ciliaris, Chrysopogon fallax, Enneapogon polyphyllus, Eragrostis cumingii, E. eriopoda, Hibiscus burtonii, Sida* sp. verrucose glands (F.H. Mollemans 2423), *Paraneurachne muelleri, Polymeria ambigua, Pterocaulon sphacelatum, Streptoglossa decurrens* and *Themeda triandra.*
Vegetation Condition	Very Good to Good; scattered **Cenchrus ciliaris* and some sites have other weedy herbs present as scattered individuals.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	HDA07, HDA15 (Biota 2004a); YBI19 (Biota 2009a); YEX03, YEX04^, YEX32 (Biota 2004b).
Relevés in the Study Area	YAQ-CSRB (Biota 2013b).
Other Notes	Quadrats HDA07, HDA15, YEX03, YEX32 and YBI19 have been cleared.

Plate 6.21: Vegetation type P4 (YEX04).

P5: ElEgAbAaTb	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *E. gamophylla* scattered low mallees over *Acacia bivenosa, A. ancistrocarpa* open shrubland over *Triodia basedowii* open hummock grassland
Distribution and Comments	This vegetation type occurred on plains throughout the study area (Plate 6.22). It was particularly common on the eastern side of Weeli Wolli Creek. *Triodia basedowii* was the dominant spinifex species in this vegetation type, however occasional *T. pungens* hummocks were also recorded. (Note that *T. basedowii* was identified as *T. lanigera* in previous reporting.) A small area of this vegetation had been recently burnt (approximately 1-2 years prior to the survey).
Associated Species	Trees: *Acacia aptaneura* and *Corymbia hamersleyana*. Tall Shrubs: *Acacia dictyophleba, A. inaequilatera, A. pachyacra, A. tumida* var. *pilbarensis, Eremophila longifolia, Gossypium robinsonii, Grevillea wickhamii* subsp. *hispidula* and *Hakea chordophylla.* Shrubs: *Acacia adsurgens, Indigofera monophylla, Ptilotus obovatus* var. *obovatus, Senna artemisioides* subsp. *helmsii, S. artemisioides* subsp. *oligophylla* and *S. artemisioides* subsp. *oligophylla x* subsp. *helmsii.* Low Shrubs: *Abutilon lepidum, Bonamia erecta, Corchorus sidoides* subsp. *sidoides, C. tectus, Dicrastylis cordifolia, Ptilotus astrolasius, Scaevola parvifolia* subsp. *pilbarae, Sida cardiophylla* and *Solanum phlomoides.* Herbs, Grasses and Sedges: *Abutilon otocarpum, Aristida contorta, A. holathera* var. *holathera, Bulbostylis barbata, Cymbopogon obtectus, Enneapogon polyphyllus, Eragrostis eriopoda, Eriachne aristidea, Perotis rara, Ptilotus calostachyus, Themeda triandra, Tribulus macrocarpus, Trichodesma zeylanicum* var. *zeylanicum* and *Yakirra australiensis* var. *australiensis.*
Vegetation Condition	Excellent to Good; scattered weeds were present at some sites. **Cenchrus ciliaris* was the most common weed species and formed a very open tussock grassland in some areas. Historical drill lines (mostly overgrown) were found in this vegetation type.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	WW30 (Halpern Glick Maunsell 2000); HDA12 (Biota 2004a); YEX33 (Biota 2004b); YBI06^, YBI07^, YBI09^, YBI14, YBI16, YBI21, YBI22, YBI27^, YBI28, YBI29 and YBI34S^ (Biota 2009a); YAQ23^ (Biota 2013b); BIL18 and BIL33 (current survey).
Relevés in the Study Area	YBI-RBMB, YBI-RBMA and YBI-RROA (Biota 2009a).
Other Notes	Quadrats HDA12 and YEX33 have been cleared.

Plate 6.22: Vegetation type P5 (BIL18).

Plate 6.23: Burnt vegetation in vegetation type P5 (YAQ23).

P6: AapERfoERI/g	*Acacia aptaneura* low open forest over *Eremophila forrestii* subsp. *forrestii* open shrubland over *E. lanceolata* low open shrubland over mixed very open grassland
Distribution and Comments	This vegetation type occurred in narrow stands adjacent to the floodplains along either side of Weeli Wolli Creek (Plate 6.24). Several small patches of this vegetation also occurred on plains and hill crests in the study area. Tussock grasses typically dominated the understorey, however scattered hummock grasses were often present.
Associated Species	Trees: *Acacia ayersiana, A. catenulata, A. pruinocarpa* and *Corymbia candida*. Tall Shrubs: *Acacia citrinoviridis, A. coriacea* subsp. *pendens, Atalaya hemiglauca* and *Hakea lorea* subsp. *lorea.* Shrubs: *Gossypium australe, Ptilotus obovatus* var. *obovatus, Rhagodia eremaea, Senna artemisioides* subsp. *helmsii* and *S. artemisioides* subsp. *oligophylla.* Low Shrubs: *Abutilon fraseri, A. lepidum, A. macrum, A. otocarpum, Corchorus sidoides* subsp. *sidoides, Hybanthus aurantiacus, Indigofera linifolia, Maireana planifolia, M. villosa, Sida platycalyx* and *Waltheria indica.* Herbs and Grasses: *Abutilon lepidum, Bothriochloa ewartiana, *Cenchrus ciliaris, *C. setiger, Chrysopogon fallax, Cleome viscosa, Cymbopogon ambiguus, Dactyloctenium radulans, Dichanthium sericeum* subsp. *humilius, Digitaria brownii, D. ctenantha, Dipteracanthus australasicus* subsp. *australasicus, Dysphania melanocarpa, D. rhadinostachya* subsp. *rhadinostachya, Enteropogon ramosus, Eragrostis cumingii, Evolvulus alsinoides* var. *villosicalyx, Goodenia nuda* (Priority 4), *G. prostrata, *Malvastrum americanum, Pterocaulon sphacelatum, Sida* sp. verrucose glands (F.H. Mollemans 2423), *Sporobolus australasicus, Trianthema pilosa, Triodia basedowii, T. longiceps, T. pungens* and *T. wiseana.*
Vegetation Condition	Good; minor disturbance from of cattle (scats and grazing); presence of several weed species as scattered individuals. Existing drill lines dissect much of this vegetation type.
Quadrats in the Study Area (^ denotes the quadrat has been seasonally sampled)	HDA08^, HDA13 (Biota 2004a); YEX09 (Biota 2004b); YBI12^, YBI13, YBI15^ (Biota 2009a); BIL32 (current survey).
Relevés in the Study Area	YBI-RBMI (Biota 2009a); BIL-RSPA (current survey).
Other Notes	Quadrat YEX09 has been cleared.

Plate 6.24: Vegetation type P6 (BIL32).

P7: ERf/g	*Eremophila fraseri* subsp. *fraseri* open shrubland over mixed very open grassland
Distribution and Comments	This vegetation type was recorded from three small areas on a plain in the south of the study area (Plate 6.25). The understorey was variable, consisting of either a mixed tussock grassland (with the dominant species comprising *Aristida contorta, Enneapogon polyphyllus, Eragrostis eriopoda, Paraneurachne muelleri*) or a *Triodia wiseana* hummock grassland.
Associated Species	Tall Shrubs: *Acacia citrinoviridis, A. synchronicia* and *Hakea lorea* subsp. *lorea.* *Shrubs: Corchorus lasiocarpus* subsp. *lasiocarpus, Gossypium australe, Rhagodia eremaea* and *Senna artemisioides* subsp. *helmsii.* Low Shrubs: *Melhania oblongifolia, Sclerolaena cornishiana, Sida echinocarpa* and *Solanum lasiophyllum* Herbs and Grasses: *Abutilon lepidum, A. otocarpum, Aristida contorta, A. holathera* var. *holathera, Chrysopogon fallax, Enneapogon polyphyllus, Eragrostis eriopoda, Indigofera colutea, Paraneurachne muelleri, Sida* sp. verrucose glands (F.H. Mollemans 2423) and *Triodia wiseana.*
Vegetation Condition	Good; scattered **Cenchrus ciliaris*; signs of cattle.
Quadrats in the Study Area	BIL25 (current survey).
Relevés in the Study Area	YBI-RBMG (Biota 2009a).
Other Notes	Another quadrat will be established during the Phase 2 survey to achieve replicated sampling in this vegetation type.

Plate 6.25: Vegetation type P7 (BIL25).

P8: EgAiTs	*Eucalyptus gamophylla* scattered low mallees over *Acacia inaequilatera* scattered tall shrubs over *Triodia schinzii* hummock grassland
Distribution and Comments	This vegetation type was recorded from loamy sands on gently sloping pediment slopes and colluvial plains at the base of a range of low hills in the northern section of the study area (Plate 6.26).
Associated Species	Tall Shrubs: *Acacia bivenosa* and *A. pruinocarpa*. Shrubs: *Acacia dictyophleba, A. pachyacra, A. trudgeniana*, *Santalum lanceolatum* and *Senna artemisioides* subsp. *oligophylla*. Low Shrubs: *Corchorus tectus, Dicrastylis cordifolia, Scaevola parvifolia* subsp. *pilbarae, Senna notabilis* and *Sida cardiophylla*. Herbs and Grasses: *Abutilon otocarpum, Aristida holathera* var. *holathera, Bonamia erecta, Chrysopogon fallax, Eragrostis eriopoda, Trianthema pilosa* and *Trichodesma zeylanicum* subsp. *zeylanicum*.
Vegetation Condition	Excellent.
Quadrats in the Study Area	BIL22 and BIL42 (current survey).

Plate 6.26: Vegetation type (BIL22).

P9: ChEgAiAaAprPcTb	*Corymbia hamersleyana* scattered low trees over *Eucalyptus gamophylla* scattered low mallees over *Acacia inaequilatera, A. ancistrocarpa, A. pruinocarpa* tall open shrubland over *Petalostylis cassioides* open shrubland over *Triodia basedowii* open hummock grassland
Distribution and Comments	This vegetation type occurs broadly over the plains on the western side of Weeli Wolli Creek, north of Marillana Creek. While the dominant spinifex species was *Triodia basedowii*, occasional hummocks of *T. pungens* were sometimes found in this vegetation type. (Note that *Triodia basedowii* was identified as *T. lanigera* in previous reporting.)
Associated Species	Tall Shrubs: *Acacia bivenosa, A. citrinoviridis, A. dictyophleba, A. pyrifolia* var. *pyrifolia, A. tumida* var. *pilbarensis, Gossypium robinsonii, Grevillea wickhamii, Hakea chordophylla* and *H. lorea* subsp. *lorea.* Shrubs: *Gossypium australe, Senna artemisioides* subsp. *helmsii, S. artemisioides* subsp. *oligophylla* and *S. glutinosa* subsp. *glutinosa.* Low Shrubs: *Corchorus lasiocarpus* subsp. *lasiocarpus, C. tectus, Dicrastylis cordifolia, Dodonaea coriacea, Hybanthus aurantiacus, Indigofera monophylla, Ptilotus astrolasius, Sida cardiophylla* and *S. echinocarpa.* Herbs and Grasses: *Aristida holathera* var. *holathera, Cleome viscosa, Cymbopogon obtectus, Eragrostis eriopoda, Gomphrena cunninghamii, Goodenia microptera, Mollugo molluginea, Paraneurachne muelleri* and *Triodia pungens.*
Vegetation Condition	Typically Very Good; scattered **Cenchrus ciliaris* present. Occasional areas with **Cenchrus ciliaris* and **C. setiger* open tussock grassland.
Quadrats in the Study Area	BIL12, BIL13, BIL41 and BIL45 (current survey).

Plate 6.27: Vegetation type P9 (BIL41).

6.3 Vegetation Condition

Vegetation condition mapping for the study area is presented in Appendix 4. The vegetation condition ranking was based on the degree of weed presence, human impact, feral animals and livestock activities, and the perceived structural integrity of the vegetation as a whole, given the impact of these disturbance factors. Appendix 3 presents the vegetation condition scale, developed by Trudgen (1988), that was used in determining the vegetation condition rankings.

A total of 5.7% of the study area was mapped as Disturbed, which is equivalent to a Completely Degraded vegetation condition (Trudgen 1988). These areas comprised current vehicle tracks, drill lines, drill pads and the JSE main mine pit. These areas were mapped from the Rio Tinto disturbance footprint layer. Fourteen quadrats that were previously sampled in the study area have since been cleared (Table 6.2). At the time of the field survey, additional drill lines were being cleared on the east side of Weeli Wolli Creek, south of the confluence with Marillana Creek. These new drill lines are not mapped as disturbed as they are too new to be visible on aerial photography or captured in the Rio Tinto disturbance footprint layer.

Table 6.2: Quadrats in the study area that have been cleared.

Vegetation Type	Quadrats that Have Been Cleared: Total Number (Name/s)
C4: EvAciAprAThCEc	1 (H051).
F3: ElChAtuAaAbGwTspp	1 (YEX07).
P1: ElEgAprAbAaAdTwTpTsps	1 (YEX05).
P2: ChAprAiAsclApaTp	2 (YBI26, YAQ29).
P3: AprAciAiAsclTlo	1 (HDA14).
P4: AprAsyAiTw	5 (HDA07, HDA15, YEX03, YEX32, YBI19).
P5: ElEgAbAaTb	2 (HDA12, YEX33).
P6: AapERfoERI/g	1 (YEX09).

The intact vegetation of the study area ranged from Excellent to Very Poor condition. The main disturbance factors in the study area were weed invasion and disturbance from livestock (cattle) including grazing, tracks, trampled vegetation and scats.

Dense weed infestations and high cattle activity were generally restricted to the creeklines and floodplains of the study area (Sections 6.2.1 and 6.2.2). **Cenchrus ciliaris* (Plate 6.28) was the most prolific weed in these habitats, sometimes occurring together with **Cenchrus setiger*. **Cenchrus* species were present as a continuous population along the edges of Weeli Wolli and Marillana Creeks and on adjacent floodplains. In some places, where the **Cenchrus* formed a closed tussock grassland, a lack of understorey diversity was observed.

Parts of the study area appear to have shown an increase in the infestation of **C. ciliaris* over time. In some cases this can be attributed to differing estimates of the proportion of **Cenchrus ciliaris* and **C. setiger;* the two species are indistinguishable without flowering material, which is less abundant during dry conditions. For example, an apparent increase in **C. ciliaris* at quadrat HDA09 was mirrored by a decrease in **C. setiger*, with the overall cover remaining stable. In other cases, the increase may be partly explained by variation in seasonal conditions between the two sampling phases. For example, although quadrats YEX08 and YBI10 both showed a large increase (approximately 25%) in the cover of **C. ciliaris* since they were first sampled, the first survey was undertaken during dry conditions, while the second survey was undertaken following substantial rainfall. However, given the aggressively invasive nature of these grasses, it is probable that the abundance of **Cenchrus* species will increase over time in areas of suitable habitat, and populations may also spread to surrounding areas. Dispersal may be aided by factors such as flowing water, cattle activity, and clearing for tracks and other infrastructure; all of which are present in the study area.

Several other weed species were found in the creeklines of the study area, but these were usually present as scattered individuals (see Section 7.6 for more information on weed species found in the study area). While most creekline and floodplain vegetation types were rated as being in Good

condition, some areas were rated as Very Poor due to the high weed cover (>70% cover) and evidence of extensive grazing and trampling by cattle (Plate 6.29).

Plate 6.28: **Cenchrus ciliaris*, the most prolific weed species in the study area.

Plate 6.29: Creekline vegetation in the study area with a dense **Cenchrus ciliaris* understorey grazed by cattle.

The plains of the study area (Section 6.2.4) also contained some weed species, although they were usually only present as scattered individuals. Occasionally a very open tussock grassland of **Cenchrus ciliaris* was present, usually on plains adjacent to creeklines or floodplains. Evidence of cattle was also occasionally noted on the plains. The vegetation of the plains therefore ranged from Good to Excellent condition.

The hills, ridges and breakaways of the study area (Section 6.2.3) were in Excellent condition and were mostly free from any form of disturbance.

There was a small amount of older historical clearing in the study area. Some parts of the study area contained old drill pads and tracks that were mostly overgrown (and therefore not mapped as disturbed). These areas were visible on aerial photography (imagery from 2011 was used) in vegetation types P5 and C4 (Section 6.2). As these areas were in the latter stages of regeneration they were not mapped as Disturbed and they had only a small impact on the overall vegetation condition of these vegetation types.

6.4 Vegetation of Conservation Significance

6.4.1 TECs and PECs

None of the vegetation types represent TECs listed either under the Commonwealth *EPBC Act 1999* or the State *Environmental Protection Act 1986* (see Section 5.7.1), nor do they represent PECs listed by DPaW (see Section 5.7.2).

6.4.2 Ecosystems At Risk

While not formally listed as TECs or PECs or protected by any legislation, a number of "other ecosystems at risk" are identified for the Hamersley and Fortescue Plains subregions of the Pilbara bioregion (see Kendrick 2003a, 2003b). These are ecosystems of some conservation significance that are at risk of degradation from a variety of factors, including development, groundwater drawdown, frequent fires, grazing and weed invasion. One of these is relevant to the study area:

- 'All major ephemeral water courses' in the Hamersley subregion are listed as an ecosystem at risk by Kendrick (2003a). These water courses are described as supporting "*Eucalyptus* forests with a shrubby understorey", and are under threat of degradation from weed invasion and grazing and trampling by feral herbivores (Kendrick 2003a). Groundwater drawdown could also potentially impact such vegetation if it included phreatophytic (groundwater dependent) species such as *Melaleuca argentea* (Cadjeput) or *Eucalyptus camaldulensis* (River Red Gum).

Three vegetation units described in the study area are considered to represent this ecosystem at risk (Table 6.3). These units are associated with Marillana Creek and Weeli Wolli Creek, two of the major ephemeral creek systems for the locality.

Table 6.3: Vegetation units considered to be "ecosystems at risk" after Kendrick (2003a).

Vegetation Code	Vegetation Description	Area (ha)	Percentage of the Study Area
C1: EcEvMaMgAc	*Eucalyptus camaldulensis* subsp. *refulgens, E. victrix* woodland over *Melaleuca argentea, M. glomerata, Acacia coriacea* subsp. *pendens* low open woodland	73.1	0.8
C2: EvChAtuGwTErCYpERItTHt	*Eucalyptus victrix, Corymbia hamersleyana* scattered low trees over *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula* tall shrubland over *Tephrosia rosea* low shrubland over *Cymbopogon ambiguus*, *C. procerus, Eriachne tenuiculmis, Themeda triandra* very open tussock grassland	22.7	0.3
C3: EvAciAcMgCEc	*Eucalyptus victrix* scattered trees over *Acacia citrinoviridis, A. coriacea* subsp. *pendens, Melaleuca glomerata* tall open shrubland over **Cenchrus ciliaris* scattered tussock grasses	269.3	3.1
	Total	365.1	4.2

Vegetation type C1 is currently in Good condition; although several weed species were recorded, they were generally present in only low numbers. Vegetation association C1 also supported both *Melaleuca argentea* and *Eucalyptus camaldulensis*, two species that could be affected by groundwater drawdown from the adjacent mining operations. Similar vegetation is widespread in major creek systems through the Pilbara, including the Robe River, Harding River, Caves Creek/Duck Creek and Marillana Creek/Weeli Wolli Creek systems. This vegetation is therefore considered significant at a local, rather than regional, scale.

Vegetation types C2 and C3 are similarly in Good to Very Good condition, with **Cenchrus* spp. present as only scattered individuals. These vegetation associations were dominated by trees of *Eucalyptus victrix* rather than the phreatophytic species present in C1, but similarly occurred along Marillana Creek and Weeli Wolli Creek. Similar vegetation is widespread in major creek systems through the Pilbara including the Caves Creek/Duck Creek, Hardey River, tributaries of Beasley River, and Marillana Creek/Weeli Wolli Creek systems. This vegetation is thus considered significant at a local, rather than regional, scale.

While vegetation type C4 also occurred in the major creeklines of the study area (mainly on the broad floodplains of Weeli Wolli and Marillana Creek), it has been extensively degraded by invasion of **Cenchrus ciliaris* (often together with **C. setiger*) in the understorey. This vegetation has therefore already been substantially impacted by the identified threatening processes.

6.4.3 Other Conservation Values

All of the habitats in the study area are widespread in the locality, and none of the vegetation types are considered to be restricted in distribution.

The remaining vegetation types in the study area are considered to be of low conservation significance, being representative of the vegetation occurring in similar habitats throughout the local area. Note that this is not meant to imply that the vegetation in the study area is of no conservation value, as all intact native vegetation is inherently valuable (DEWHA 2010).

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7.0 Flora of the Study Area

7.1 Overview

A total of 451 native vascular flora taxa from 147 genera and 47 families have been recorded from the study area, based on all survey effort to date. This includes one Threatened species (discussed in Section 7.4.1) and one Priority flora species (discussed in Section 7.4.2). Eighteen introduced flora species have also been recorded (see Section 7.6).

7.2 Dominant Families and Genera

The dominant families and genera (native taxa only) recorded from the study area are presented in Table 7.1. These are typical of the most well represented families and genera in the Pilbara bioregion.

Table 7.1: Dominant plant families and genera in the study area.

Family	No. of Native Taxa	Genus	No. of Native Taxa
Fabaceae	88	*Acacia*	39
Poaceae	80	*Senna*	20
Malvaceae	52	*Euphorbia*	13
Amaranthaceae	21	*Ptilotus*	13
Asteraceae	19	*Sida*	11

7.3 Species Richness – Regional Context

Species richness tends to vary on a logarithmic scale with the size of the study area. However, the array of habitats (and therefore vegetation types) present also has a large influence on the number and type of species recorded, as different habitats provide a greater variety of ecological niches that can be occupied by a greater number of different species. The shape of the survey area may also influence the number of species recorded, with long linear survey areas tending to intersect a greater variety of habitats and, depending on the length, sometimes different biogeographic regions.

Figure 7.1 shows the species richness of the study area compared to eight other study areas from the locality: Yandi Additional Areas (Biota 2013b), Koodaideri Northern Extension (Biota 2012b), Koodaideri Mining Lease (Biota 2012c), Koodaideri Southern Infrastructure Corridor (Biota 2012d), Junction South West Deposit (Biota 2010), Oxbow Deposit (Biota 2010), Billiards Deposit (Biota 2009a) and Yandi Expansion (Biota 2004b). When compared to these other study areas that have been surveyed in the broader locality in recent years, the total number of native flora taxa recorded from the study area is in the range that would be expected for a study area of this size.

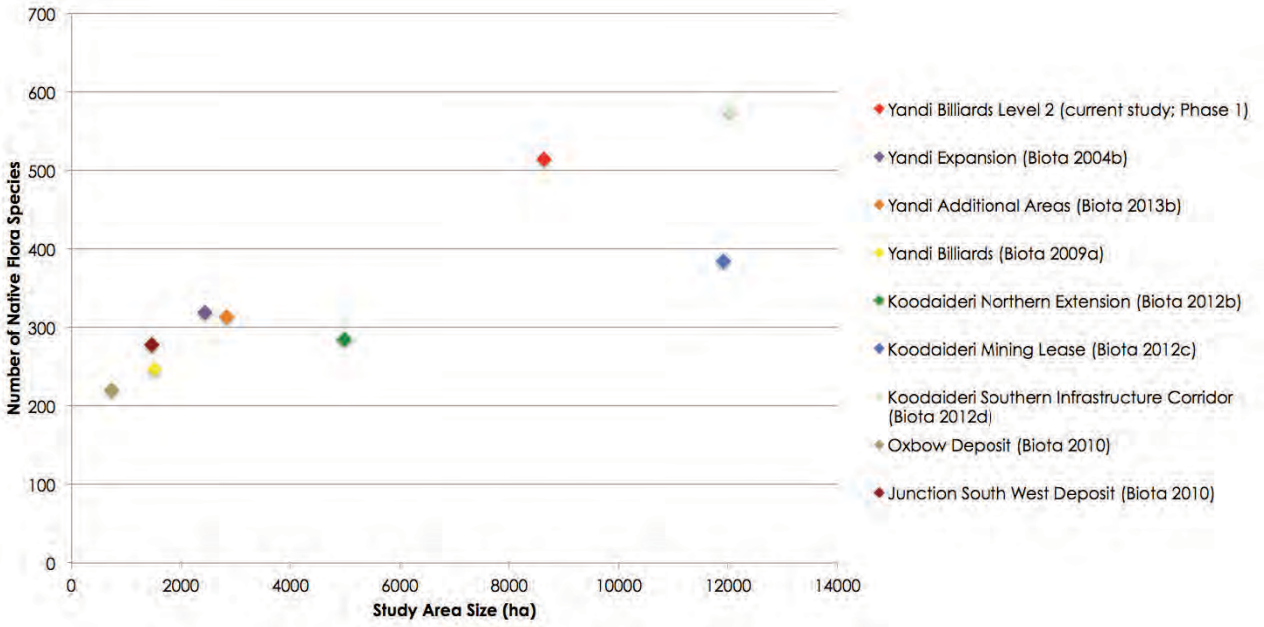

Figure 7.1: The number of native taxa recorded in the study area in comparison with other recent surveys in the locality.

7.4 Flora of Conservation Significance

7.4.1 Threatened Flora

No Threatened flora listed under the Commonwealth *EPBC Act 1999* or the WA *Wildlife Conservation Act 1950* were recorded within the study area during the current survey.

The locations of the two populations of *Lepidium catapycnon* that had previously been recorded in the study area (see Section 5.8.1) were revisited. A radius of approximately 50-100 m immediately surrounding the location coordinates was searched, however no individuals of *Lepidium catapycnon* were located. In both cases the habitat appeared suitable to support the species and there were no obvious signs of clearing or other disturbance at the sites of the records. *Lepidium catapycnon* is a relatively short-lived perennial species that favours disturbed ground, apparently persisting for only a few years. It is possible that all plants have died since the records were made (one record was made six years ago, the other eight years ago) and that no recruitment has occurred to renew the populations. It is likely that the populations would re-establish following disturbance (particularly following a fire).

No additional populations of *Lepidium catapycnon* were identified in the study area during the foot traverses of suitable habitat during the current survey. A map of the traverses through the study area is provided in Appendix 7 as an indication of survey effort. As only a portion of the suitable habitat was searched (and particularly given that the two previously recorded populations were no longer apparent), it is possible that *Lepidium catapycnon* occurs at other locations in the study area.

7.4.2 Priority Flora

One Priority 4 flora species, *Goodenia nuda,* was recorded in the study area during the field survey. The distribution of this species in the study area and the location coordinates are provided in Appendix 4.

A description of this species is provided in Section 5.8.2. Discussion of the populations in the study area is provided below:

- *Goodenia nuda* (Priority 4)
  A total of 76 individuals of *Goodenia nuda* were recorded from nine locations in the study area. Seven of the locations were in Mulga woodlands (vegetation type P6; Section 6.2.4) on the eastern side of Weeli Wolli Creek. The two other records were from the plains vegetation types P2 and P3 (Section 6.2.4) adjacent to the Marillana Creek and Weeli Wolli Creek floodplains.

Plate 7.1: *Goodenia nuda* inflorescence (photo not from the study area).

Of the other Priority flora that were identified as having potential to occur in the study area based on the desktop review (see Section 5.8.2 and Appendix 2), *Sida* sp. Barlee Range (S. van Leeuwen 1642) and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (both Priority 3) are now considered unlikely to occur in the study area: it is thought that these species would have been recorded at the time of the survey if they were present in the study area.

Stylidium weeliwolli (Priority 2) is still considered as having the potential to occur in the study area. This species is a small annual herb that may be present within the creek beds of Weeli Wolli and Marillana Creek. Although conditions were favourable for annual species at the time of the survey, there is still a possibility that individuals could have been missed during the survey due to the small size of this species.

Rostellularia adscendens var. *latifolia* (Priority 3) is also still considered to have the potential to occur in the study area. This species is also small in size and there is the possibility that individuals could have been missed during the survey. There is still a possibility that this species may occur within the study area, particularly in creekline or floodplain habitat.

7.4.3 Other Species of Conservation Interest

The currently undescribed taxon *Eulalia* sp. (Three Rivers Station, B. Forsyth AQ6789133) was recorded from three locations in the study area in a minor creekline, on a floodplain and on a plain. One of the records of this taxon was from a resampled quadrat. It is likely that this taxon has been confused with the more common species, *E. aurea,* in past surveys.

A description of *Eulalia* sp. (Three Rivers Station, B. Forsyth AQ6789133) is provided in Section 5.8.3

7.5 Unresolved Taxa

Numerous apparently undescribed taxa are regularly recorded from the Pilbara bioregion. A number of the taxa recorded from the study area could not be conclusively resolved, however none of these are considered likely to be of conservation significance. Where possible these taxa will be checked by relevant experts so they can be resolved for the final report. These species are described briefly below.

Family: Asteraceae

- *Peripleura hispidula* var. *hispidula*
  A single specimen resembling *Peripleura hispidula* var. *hispidula* was collected from the study area. Material that appears consistent with the characters distinguishing this taxon is regularly recorded from the Pilbara, however this taxon has not previously been considered to occur in WA. It is therefore not clear if the Pilbara specimens represent this taxon or a separate species. The specimen from Yandi has been sent to Andrew Perkins, a taxonomist at the WA Herbarium, for further consideration.

Family: Boraginaceae

- *Heliotropium glabellum*
  A single specimen that appears to be *Heliotropium glabellum* was collected from the study area. This taxon is relatively uncommon in the Pilbara, with only a few voucher records from the far east of the region. This specimen has been sent to Andrew Perkins for confirmation.

Family: Euphorbiaceae

- *Euphorbia australis* var. *australis*
  Two specimens keying to *Euphorbia australis* var. *australis* were collected from the study area. This taxon has a predominantly coastal distribution with only one vouchered record from the central Pilbara. These specimens have been sent to Andrew Perkins for confirmation.
- *Euphorbia australis* var. *erythrantha*
  A single specimen keying to *Euphorbia australis* var. *erythrantha* was collected from the study area. As this taxon is not currently known from the Pilbara region, the specimen has been sent to Andrew Perkins for confirmation.

Family: Fabaceae

- *Indigofera monophylla*
  Several forms of *Indigofera monophylla* were identified by Malcolm Trudgen (M.E. Trudgen and Associates) amongst the specimens from the study area. All forms are considered to be widespread in the Pilbara. For the purpose of this report, the different forms of *Indigofera monophylla* have not been distinguished and they are recognised as one entity.
- *Senna artemisioides* subsp. *oligophylla* (thinly sericeus form MET 15,035)
  This taxon is a form of *Senna artemisioides* subsp. *oligophylla* recognised by Malcolm Trudgen (M.E. Trudgen and Associates), which can be identified from the very appressed hairs on the leaflets. Although not formally recognised, this taxon has been included in this report because it is considered to be distinctly different to *S. artemisioides* subsp. *oligophylla* and easily recognised. It is also present in the study area as a hybrid with *Senna artemisioides* subsp. *helmsii*.
- *Senna* sp. Meekatharra (E. Bailey 1-26)
  Two specimens of this taxon were collected from the study area during previous surveys; one specimen was collected by Biota (2004a) and the other by Biota (2009a). These specimens have been sent to Andrew Perkins for confirmation.

Family: Goodeniaceae

- *Goodenia* aff. *muelleriana*
  A single specimen collected from the study area resembles *Goodenia muelleriana* but has longer pedicels and larger seeds. This specimen has been sent to Andrew Perkins for confirmation. For the purpose of this report, this entity is referred to as *Goodenia* aff. *muelleriana*.

Family: Malvaceae

- *Abutilon lepidum*
  Three apparently undescribed entities in this species were identified from the study area, all of which are widespread: *Abutilon* aff. *lepidum, A.* aff. *lepidum* (4) and *A. otocarpum* (acute leaf form). For the purpose of this report, they are recognised as one entity: *Abutilon lepidum* sens lat.

- *Gossypium australe*
  Two apparently undescribed forms of *Gossypium* were recorded from the study area: *G. australe* (Burrup Peninsula form) and *G. australe* (Whim Creek form). These entities are widespread in the Pilbara. For the purpose of this report they are recognised as a single entity: *Gossypium australe*.
- *Hibiscus coatesii*
  Considerable variation is observed within Pilbara specimens of this taxon. Two apparently undescribed entities were identified from the study area during past surveys, both of which are widespread: *Hibiscus* aff. *coatesii* (MET 16,542) and *H.* aff. *coatesii* (site 664). For the purpose of this report, they are recognised as a single entity: *Hibiscus coatesii.*
- *Hibiscus* sp. Mt Robinson (G. Byrne 3537)
  A single specimen of this taxon was collected from the study area. As *Hibiscus* sp. Mt. Robinson (G. Byrne 3537) is a relatively newly recognised taxon, the specimen has been sent to Andrew Perkins for confirmation.
- *Sida fibulifera*
  Sida fibulifera is a very variable taxon. In past surveys, six apparently undescribed entities were identified from the study area: *Sida* aff. *fibulifera* (FMG 125-20), *S.* aff. *fibulifera* (HD12-39), *S.* aff. *fibulifera* (HD237-9), *S.* aff. *fibulifera* (oblong; MET 15 220), *S.* aff. *fibulifera* (site 1394) and *Sida* aff. *fibulifera* (prostrate A.A. Mitchell 3 572). None of these taxa are considered to be rare, and it is likely that more entities exist within this group. For the purpose of this report, all entities have been assigned to *Sida fibulifera* sens lat.

Family Poaceae

- *Enneapogon* aff. *caerulescens*
  Two specimens that resembled *Enneapogon caerulescens* were collected from the study area. These have been sent to Andrew Perkins to determine whether the variation observed is within the range expected for this species. For the purpose of this report, this entity is referred to as *Enneapogon* aff. *caerulescens.*
- *Eriachne mucronata*
  Two forms of *Eriachne mucronata* were present in the study area: the 'typical form' (culms with sparse hairs) and one designated as 'arid form', which has white woolly hairs on the culms. Both forms are widespread in the Pilbara bioregion and although not formally recognised, they have been treated as separate entities for this report.
- *Themeda* aff. *triandra*
  One specimen of *Themeda triandra* with particularly hairy leaves and culms was collected from the study area. This has been sent to Andrew Perkins to determine whether the variation observed is within the range expected for this species. For the purpose of this report, this entity is referred to as *Themeda* aff. *triandra*.
- *Triodia basedowii*
  All specimens of *Triodia lanigera* that have been collected from the study area (from the current survey and previous surveys) have been re-identified as *T. basedowii* following discussion with Dr Matthew Barrett (Kings Park and Botanic Garden). To confirm that this identification is correct, a relevant specialist taxonomist will be consulted.

Family: Portulacaceae

- *Portulaca oleracea/Portulaca intraterranea*
  The taxonomy of "*Portulaca oleracea*" in the Pilbara is currently unresolved. It is not clear whether specimens from this region with weakly developed tubercles on the seeds belong to *Portulaca oleracea, P. intraterranea* and/or one or more undescribed taxa (S. Dillon, WA Herbarium, pers. comm. 2012). For the purposes of this report, all specimens (with the exception of the taxon described below) have been allocated to "*Portulaca oleracea/P. intraterranea*".

- *Portulaca intraterranea*
  A single specimen of *Portulaca* collected from the study area had seeds with very prominent elongated tubercles with star-shaped bases, conspicuously different to the specimens designated as "*Portulaca oleracea/intraterranea*". As this character best fits the description of *P. intraterranea*, this specimen has been designated as this species for the current report. The specimen has been sent to Andrew Perkins for further consideration.

Family: Pteridaceae

- *Cheilanthes brownii*
  Two specimens keying to *Cheilanthes brownii* were collected from the study area. As the two specimens had varying indumentum, they have been sent to Andrew Perkins for confirmation.

7.6 Introduced Flora (Weeds)

Eighteen introduced flora (weeds) have been recorded from the study area during the current and previous surveys at Yandi Billiards. Table 7.2 present the number of records made for each weed species and the total number of locations from which each weed was recorded (the latter was to account for weeds being recording multiple times at resampled quadrats). Weed locations are mapped and coordinates are provided in Appendix 5. Note that some of these locations have subsequently been cleared.

None of the weeds recorded are listed as Weeds of National Significance (Thorp and Lynch 2000)[6]. However, **Argemone ochroleuca* (Mexican Poppy) is listed under the State *Biosecurity and Agriculture Management Act 2007 (BAM Act)* as a Declared Pest for the whole of WA in category C3 (management).

The draft Environmental Weed Strategy for WA developed by the then Department of Conservation and Land Management (CALM 1999) ranked weed species according to their invasiveness, distribution and environmental impacts. Under this process **Aerva javanica*, **Acetosa vesicaria*, **Cenchrus ciliaris, *C. setiger, *Typha orientalis* and **Vachellia farnesiana* were ranked as weeds with High ecological impact, while **Datura leichhardtii, *Malvastrum americanum, *Sigesbeckia orientalis, *Sisymbrium orientale, *Solanum nigrum* and **Sonchus oleraceus* were ranked as Moderate, **Argemone ochroleuca* subsp. *ochroleuca* was ranked as Mild, and **Setaria verticillata* was ranked as Low. **Bidens bipinnata*, **Cucumis melo* subsp. *agrestis*, **Flaveria trinervia* and **Tribulus terrestris* were not rated.

**Acetosa vesicaria, *Aerva javanica, *Cenchrus ciliaris, *C. setiger, *Malvastrum americanum, *Setaria verticillata* and **Vachellia farnesiana* were also ranked as weeds with High ecological impact according to DPaW's Invasive Plant Prioritisation Process (DEC 2012).

[6] For the current listing of Weeds of National Significance, go to http://www.weeds.org.au/WoNS/

Table 7.2: Introduced species recorded from the study area.

Family	Species	Source and Number of Records							Total No. of Records	Total No. of Weed Locations
		Biota (2002)	Biota (2004a)	Biota (2004b)	Biota (2009a)	Biota (2013b)	Biota (current study)	Other		
Amaranthaceae	**Aerva javanica*				1	4	11		16	16
Asteraceae	**Bidens bipinnata*		3	1	4		16		24	21
	**Flaveria trinervia*		1		1		3		5	5
	**Sigesbeckia orientalis*		1				1		2	2
	**Sonchus oleraceus*		1			1			2	2
Brassicaceae	**Sisymbrium orientale*				1				1	1
Cucurbitaceae	**Cucumis melo* subsp. *agrestis*				1	2			3	3
Fabaceae	**Vachellia farnesiana*		1		1	2	3		7	4
Malvaceae	**Malvastrum americanum*		4	3	13	2	19	3	44	34
Papaveraceae	**Argemone ochroleuca* subsp. *ochroleuca*				3	1			4	4
Poaceae	**Cenchrus ciliaris*	2	6	5	25	15	88	16	157	139
	**Cenchrus setiger*	2	1		11	5	35		54	46
	**Setaria verticillata*	2	2	1	10	1	16		32	27
Polygonaceae	**Acetosa vesicaria*							3	3	3
Solanaceae	**Datura leichhardtii*		2						2	2
	**Solanum nigrum*				1				1	1
Typhaceae	**Typha orientalis*							3	3	3
Zygophyllaceae	**Tribulus terrestris*						9		9	9

Each weed species recorded in the study area is discussed briefly below:

- **Acetosa vesicaria* (Ruby Dock)
  Ruby Dock is a stout, fleshy-leaved and hollow-stemmed herb that grows up to 1 m in height and has red to pink fruit from winter to spring. It prefers sandy alluvial or ironstone soils and is commonly encountered on roadsides or in disturbed areas. It grows throughout the State with the exception of the Northern province (DPaW 2014). This species was recorded from a creekline near the JSE mine pit by Pilbara Iron botanists (unpublished data). The remaining two records were made by GHD (2009); both of these locations have been subsequently cleared for the JSE mine footprint.

- **Aerva javanica* (Kapok)
  Kapok is a perennial herb to low shrub that grows to 1.6 m. It has white woolly flowers from January to October (DPaW 2014). Kapok is a widespread weed that occurs through the Pilbara and the Kimberley regions, which can form dense infestations. It is known from a variety of habitats including rocky outcrops, coastal areas, sand-dunes, creeklines and floodplains, along with disturbed areas (Hussey et al. 1997). This species reproduces by seed, which are only produced on the female plants. The small fruit are probably dispersed by animals and wind. They may also be spread by vehicles and in soil, as infestations often first appear along roadsides and near mine sites (The University of Queensland 2011). There were 16 records of **Aerva javanica* from the study area, all from creekline or floodplain habitats.

- **Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy)
  This annual daisy grows to 1 m tall and has spiny leaves. The white to pale yellow flowers are produced in February to March or July to November, and the resulting seed pods contain vast quantities of very fine seed. This species is commonly found in sandy or clay loam substrates on riverbanks, creek edges or roadsides throughout the State (DPaW 2014). Mexican Poppy is difficult to control as it produces large quantities of seed and flooding of its habitat can spread the seed for large distances. It was recorded from four locations in the study area, all in the major creeklines of Weeli Wolli Creek and Marillana Creek.

- **Bidens bipinnata* (Bipinnate Beggartick)
  Bipinnate Beggartick is an annual daisy, which grows to 90 cm tall and produces yellow flowers between March and September (DPaW 2014). This species is commonly observed in association with Mulga vegetation and creeklines in the Pilbara. **Bidens bipinnata* may occur in high densities within suitable habitats and given appropriate conditions, but on its own does not appear to cause exclusion of native flora species. **Bidens bipinnata* has been recorded from 21 locations in the study area. Large populations (comprising up to 8,000 individuals) were found in Mulga woodlands, and populations were also found in floodplains and minor creeklines.

- **Cenchrus ciliaris* (Buffel Grass)
  Buffel Grass was introduced by pastoralists as a fodder species. It grows on white, red or brown sand, stony red loam, black cracking clay of creeklines, floodplains and in sandy, coastal areas (DPaW 2014). This perennial grass forms dense tussock grasslands, particularly along creeklines, floodplains and in sandy areas. **Cenchrus ciliaris* grows to 1 m tall and flowers for most the year. This species has demonstrated allelopathic capacities, whereby it releases chemicals that inhibit the growth of other plants, and it competes aggressively and effectively with native flora species (Cheam 1984a, 1984b). It reproduces by seed and short rhizomes and is thought to be dispersed primarily by wind and water, but can also be spread through movement of mammals, birds and vehicles (DPaW 2014). **Cenchrus ciliaris* was the most prolific weed in the study area, recorded from 139 locations in the study area, and was a dominant species in three of the vegetation types found in the study area (C3, C4 and F2; see Section 6.2). The predominant habitat of this species were the creeklines and floodplains of Weeli Wolli and Marillana Creeks, where it often formed a continuous tussock grass understorey (see Section 6.3), however it was also found in lower abundance on some of the plains of the study area.

- **Cenchrus setiger* (Birdwood Grass)
  Birdwood Grass is an erect, stoloniferous grass that forms tussocks to 80 cm tall, with a compact, spike inflorescence (DPaW 2014). Originally a fodder plant, Birdwood Grass has become a serious weed of sand dunes, rangelands, plains, stony hillsides and floodplains from Geraldton to the Kimberley (Hussey et al. 1997). This species is less common than Buffel Grass but it is a similarly serious environmental weed and often infests the same riparian habitats. This species was recorded from 46 locations in the study area.

- **Cucumis melo* subsp. *agrestis* (Ulcardo Melon)
  Ulcardo Melon is a trailing annual herb with bristly or softly hairy leaves and yellow flowers in autumn and spring (DPaW 2014). The mature fruit are ellipsoid, 2-5 cm in length, green to yellow in colour, and become glabrescent with age (The Royal Botanic Gardens and Domain Trust 2014). Ulcardo Melon has been recorded from a variety of habitats including grasslands on cracking clays, *Eucalyptus*, *Corymbia*, *Acacia* or *Grevillea* grassy woodlands on clay flats, and damp areas (DPaW 2014). This species was recorded from three locations in the study area, all of which were in creekline habitats.

- **Datura leichhardtii* (Native Thornapple)
  Native Thornapple is a stout annual herb that grows to 1 m tall. It has white flowers present from June to October, followed by spiny fruits (DPaW 2014). It is widespread through the Carnarvon, Gascoyne, Little Sandy Desert and Pilbara bioregions and is often located along watercourses and drainage areas (DPaW 2014). This species was recorded twice in the study area, once in a Mulga woodland and once on a floodplain of Weeli Wolli Creek.

- **Flaveria trinervia* (Speedy Weed)
  Speedy Weed is an annual daisy that is common and widespread in various habitats with sandy or loamy soils throughout the north of Western Australia, from approximately Carnarvon through to the Kimberley (DPaW 2014). The inflorescence consists of a large dense cluster of yellowish flower heads. This species has been recorded from five locations in Weeli Wolli Creek.

- **Malvastrum americanum* (Spiked Malvastrum)
  Spiked Malvastrum typically occurs in Mulga vegetation, drainage lines and on floodplains, and can also be recorded on steep hill slopes and on rockpiles. It is an erect, perennial herb or shrub to 1.3 m tall, with yellow or orange flowers from April to July (DPaW 2014). This species has been recorded from 34 locations in the study area. It was found in Mulga woodlands, minor creeklines, and on the floodplains of Weeli Wolli and Marillana Creeks.

- **Setaria verticillata* (Whorled Pigeon Grass)
  Whorled Pigeon Grass is a loosely tufted annual grass that grows to 1.3 m tall (DPaW 2014). This species commonly occurs in disturbed areas, on the edges of rivers and creeks and in shrublands from the Kimberley to the Pilbara (Hussey et al. 1997). Whorled Pigeon Grass has been recorded from 27 locations in the study area, most of which were associated with creeklines or floodplains.

- **Sigesbeckia orientalis* (Indian Weed)
  Indian Weed is a slender, annual herb that grows to 1 m tall and has yellow flowers all year round. It is found growing in loamy soils in rocky gullies, limestone ranges and creek beds (DPaW 2014). It was recorded twice in the study area, once from a Mulga woodland and once from a floodplain of Weeli Wolli Creek.

- **Sisymbrium orientale* (Indian Hedge Mustard)
  Indian Hedge Mustard is an annual or biennial herb occurring in disturbed areas of the Eremaean and South-West provinces. It grows up to 1 m tall and has yellow flowers from autumn to spring (DPaW 2014). This species has been recorded from a single location in Weeli Wolli Creek.

- **Solanum nigrum* (Black Berry Nightshade)
  This perennial herb or short-lived shrub grows to 1 m tall and has white flowers all year. It is distributed across most of the State from the south to the north, with the exception of the central portion (DPaW 2014). This species has been recorded from a single location in Weeli Wolli Creek.

- **Sonchus oleraceus* (Common Sowthistle)
  Common Sowthistle is a short-lived annual herb that grows to 1.5 m tall (DPaW 2014). This species is common and widespread in disturbed areas from Wittenoom to the Nullarbor in Western Australia (Hussey et al. 1997). This species has been recorded twice in the study area from a creek bed and floodplain of Weeli Wolli Creek.

- **Tribulus terrestris* (Caltrop)
  Caltrop is a prostrate vine with greyish pinnate leaves and small yellow flowers that prefers sandy soils (DPaW 2014). It is widespread weed and occurs across most of Western Australia. This species was recorded from nine locations in the study area. It was found in a variety of habitats including plains, floodplains, Mulga woodlands and minor creeklines.

- **Typha orientalis* (Bulrush)
  Bulrush is a rhizomatous emergent perennial herb with brown flower spikes, which can grow to 4.5 m tall (DPaW 2014). **Typha orientalis* is known from the southwest of WA where it grows in winter-wet depressions, permanent wetland and irrigation channels (DPaW 2014). There are currently no vouchered specimens of this species from the Pilbara region, however a native Bulrush species (*Typha domingensis*) that is similar in appearance is widespread. **Typha orientalis* was recorded from three locations in the study area during a weed survey by GHD (2009): two of these locations have subsequently been cleared for the JSE mine footprint, while the remaining record is located on Weeli Wolli Creek, in the south of the study area adjacent to the JSE mine. *Typha domingensis* has been recorded from Weeli Wolli creek in the study area, and it is possible that the records of **T. orientalis* from GHD (2009) represent this taxon. The remaining location for **Typha orientalis* will be checked during the Phase 2 survey to ensure the correct identification has been made.

- **Vachellia farnesiana* (Mimosa Bush)
  Mimosa Bush is a spreading, thorny shrub to 4 m tall, with dark grey bark, pinnate leaves, and yellow flowers in winter. It typically occurs growing in stony sand, clay or loam soils, or gravel (DPaW 2014). This species is widespread from the Kimberley to near Perth, typically occurring along drainage systems and in adjacent low-lying areas (Hussey et al. 1997). Mimosa Bush has been recorded from four locations in the study area and was found predominantly on floodplains.

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8.0 Key Findings

Key findings of this study are as follows:

- Twenty-three vegetation units have been described and mapped for the study area, none of which represent TECs or PECs (Section 6.0, Appendix 4). This is considered to be within the range expected for a study area of this size in this locality, taking into account the habitats present.
- One ecosystem at risk is present in the study area: "major ephemeral water courses" as described by Kendrick (2003a). Three vegetation units (C1, C2 and C3) that occur in Marillana Creek and Weeli Wolli Creek comprise this ecosystem at risk (Section 6.4.2). Weed infestation (mainly scattered weeds) and disturbance from cattle have been noted in these vegetation units and they are mostly in Very Good to Good condition. Similar vegetation is widespread through the Pilbara in various major creek systems, and these vegetation associations would therefore be of significance at the local, rather than regional, scale.
- A total of 5.7% of the study area was mapped as Disturbed or Completely Degraded. These areas consisted of cleared areas associated with the mining footprint, roads or drill lines. Fourteen quadrats that had been previously sampled in the study area have since been cleared (Section 6.3, Appendix 4).
- Overall, the vegetation of the study area was in Excellent to Very Poor condition (Section 6.3, Appendix 5). The main disturbance factors noted were weeds and disturbance from cattle. **Cenchrus ciliaris* (Buffel Grass) was the most prolific weed in the study area often formed dense populations in the understorey in some creekline and floodplain vegetation types (particularly C3, C4 and F2, where it was a dominant species in the vegetation description).
- A total of 451 native vascular flora species were recorded from the study area. The total number of species recorded is within the range expected for a study area of this size in this locality.
- Two species of conservation significance are known from the study area:
  - *Lepidium catapycnon* (Threatened) has been recorded from two locations in the study area during previous surveys (Sections 5.8.1 and 7.4.1). No individuals were recorded at these locations during the current survey, nor were any additional populations located during the targeted searches in the study area. Given that this species is known from the study area and that suitable habitat is present, it is possible that other populations of *L. catapycnon* exist in the study area.
  - *Goodenia nuda* (Priority 4) was recorded during the current survey at nine locations in the study area, all from Mulga woodlands or plains (Section 7.4.2). A total of 72 individuals were counted.
- While no individuals have been recorded to date, two other Priority species may potentially occur in the study area: *Stylidium weeliwolli* (Priority 2) may potentially occur in Weeli Wolli or Marillana Creeks and *Rostellularia adscendens* var. *latifolia* (Priority 3) may potentially occur in creekline or floodplain habitat (Section 7.4.2).
- Eighteen weed species have been recorded in the study area, all of which are commonly encountered in the locality (Section 7.6). **Argemone ochroleuca* (Mexican Poppy) is listed under the WA *BAM Act 2007* as a Declared Pest for the whole of WA, while **Aerva javanica*, **Acetosa vesicaria*, **Cenchrus ciliaris*, **C. setiger* and **Vachellia farnesiana* are ranked by DPaW as weeds with High ecological impact (CALM 1999).

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9.0 Glossary

*	Used prior to a species name to denote a weed species.
Alluvial	Loose, unconsolidated (not cemented together into a solid rock) soil or sediments, which have been eroded, reshaped by water in some form, and redeposited in a non-marine setting.
Anabranching	An anabranching river consists of multiple channels separated by vegetated (sometimes semi permanent) alluvial islands.
Annual (plant)	A plant that lives for only one year.
BAM Act 2007	The WA *Biosecurity and Agriculture Management Act 2007.*
Conservation Significant	A plant that is recognised to be rare, unusual, new or poorly sampled; may have a formally assigned conservation ranking (see Appendix 1 for more on the WA conservation framework).
Culm	The stem of a grass or sedge.
DPaW	WA Department of Parks and Wildlife (formerly the Department of Environment and Conservation (DEC)).
EPA	Environmental Protection Authority of Western Australia.
EPBC Act 1999	The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
Ephemeral	A plant that lives a very short time; less than one year, usually less than six months.
Floodout	An area subject to inundation when flooding occurs.
Flora keys	Botanical publications containing a series of questions regarding the characteristics of plants, aiding in the identification of different taxa.
Foot Traverse	Consists of walking through an area to confirm or note vegetation boundaries or to search for flora (usually sampling a narrow corridor/cross section of vegetation).
GIS	Geographic Information System.
IBRA	Interim Biogeographic Regionalisation for Australia.
NRS	National Reserve System.
NVCP	Native Vegetation Clearing Permit.
Opportunistic	A plant or animal species collected or recorded outside a formal sampling site (e.g. flora quadrats or relevés, or fauna trapping sites). Opportunistic collections are usually made during foot traverses and when travelling between sites.
PEC	Priority Ecological Community (see Appendix 1 for more on the WA conservation framework).
Perennial	A plant that lives for more than two growing seasons.
Priority flora	Flora species listed by DPaW as requiring additional information to properly evaluate their conservation significance; see Appendix 1 for more on the WA conservation framework.
sens lat.	Abbreviation of *sensu lato* (Latin), meaning “in the broad sense”.
Stratum (plural: strata)	A horizontal level of vegetation defined by growth habit (and sometimes height); e.g. low trees, tall trees, tussock grasses, hummock grasses.
subsp.	Abbreviation of subspecies.
Taxon (plural: taxa)	A taxonomic distinction at species level or below.
TEC	Threatened Ecological Community (see Appendix 1 for more on the WA conservation framework).

Threatened flora	Flora species protected by legislation, either listed under the Commonwealth *EPBC Act 1999* or the State *Wildlife Conservation Act 1950* (flora species formerly known as Declared Rare Flora); see Appendix 1 for more on the WA conservation framework.
var.	Abbreviation of variety.

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Appendix 1

Framework for Conservation Significance Ranking of Communities and Species in WA

A. Definitions, Categories and Criteria for Threatened and Priority Ecological Communities

1. General Definitions

Ecological Community
A naturally occurring biological assemblage that occurs in a particular type of habitat.

Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A threatened ecological community (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Possible threatened ecological communities that do not meet survey criteria are added to DPaW's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An assemblage is a defined group of biological entities.

Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (eg. substrate and topography), and the biotic factors.

Occurrence: a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres of a different ecological community, an artificial surface or a totally destroyed community.

By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.

Adequately Surveyed is defined as follows:
"An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts."

Community structure is defined as follows:
"The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage" (eg. Eucalyptus salmonophloia woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, eg. dominance by feeders on detritus as distinct from feeders on live plants).

Definitions of Modification and Destruction of an ecological community:

Modification: "changes to some or all of ecological processes (including abiotic processes such as hydrology), species composition and community structure as a direct or indirect result of human activities. The level of damage involved could be ameliorated naturally or by human intervention."

Destruction: "modification such that reestablishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention."

Note: Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Examples of modification and total destruction are cited below:

Modification of ecological processes: The hydrology of Toolibin Lake has been altered by clearing of the catchment such that death of some of the original flora has occurred due to dependence on fresh water. The system may be bought back to a semblance of the original state by redirecting saline runoff and pumping waters of the rising underground watertable away to restore the hydrological balance. Total destruction of downstream lakes has occurred due to hydrology being altered to the point that few of the original flora or fauna species are able to tolerate the level of salinity and/or water logging.

Modification of structure: The understorey of a plant community may be altered by weed invasion due to nutrient enrichment by addition of fertiliser. Should the additional nutrients be removed from the system the balance may be restored, and the original plant species better able to compete. Total destruction may occur if additional nutrients continue to be added to the system causing the understorey to be completely replaced by weed species, and death of overstorey species due to inability to tolerate high nutrient levels.

Modification of species composition: Pollution may cause alteration of the invertebrate species present in a freshwater lake. Removal of pollutants may allow the return of the original inhabitant species. Addition of residual highly toxic substances may cause permanent changes to water quality, and total destruction of the community.

Threatening processes are defined as follows:
"Any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community."

Examples of some of the continuing threatening processes in Western Australia include: general pollution; competition, predation and change induced in ecological communities as a result of introduced animals; competition and displacement of native plants by introduced species; hydrological changes; inappropriate fire regimes; diseases resulting from introduced micro-organisms; direct human exploitation and disturbance of ecological communities.

Restoration is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

Rehabilitation is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

2. Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities

ECOLOGICAL COMMUNITIES

Presumed Totally Destroyed (PD)
An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):

A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or

B) All occurrences recorded within the last 50 years have since been destroyed

Critically Endangered (CR)
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):

   i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);

   ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.

B) Current distribution is limited, and one or more of the following apply (i, ii or iii):

   i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);

ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;

iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.

C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Endangered (EN)
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):

A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):

i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);

ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, and one or more of the following apply (i, ii or iii):

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);

ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;

iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.

C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Vulnerable (VU)
An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

3. Definitions and Criteria for Priority Ecological Communities

PRIORITY ECOLOGICAL COMMUNITY LIST
Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities
Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities
Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;

(iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

(c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities
Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Department of Parks and Wildlife

CONSERVATION CODES

for Western Australian Flora and Fauna

T: **Threatened species -** Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Species* 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.

X: **Presumed extinct species -** Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora).

Species* which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.

IA: **Migratory birds protected under an international agreement -** Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Birds that are subject to an agreement between governments of Australia and Japan, China and The Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.

S: **Other specially protected fauna -** Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Threatened Fauna and Flora are further recognised by the Department according to their level of threat using IUCN Red List criteria. For example Carnaby's Cockatoo *Calyptorynchus latirostris* is specially protected under the *Wildlife Conservation Act 1950* as a threatened species with a ranking of endangered.

Ranking:

CR: Critically Endangered - considered to be facing an extremely high risk of extinction in the wild.

EN: Endangered – considered to be facing a very high risk of extinction in the wild.

VU: Vulnerable - considered to be facing a high risk of extinction in the wild.

A list of the current rankings can be downloaded from the Listing of species and ecological communities webpage http://dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/84-listing-of-species-and-ecological-communities .

Species that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora and Priority Fauna Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.

1: Priority One: Poorly-known species

Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, rail reserves and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

2: Priority Two: Poorly-known species

Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.

3: Priority Three: Poorly-known species

Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

4: Priority Four: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

5: Priority Five: Conservation Dependent species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies, variety or forma).

Appendix 2

Results of the Flora Desktop Review: Summary of Conservation Significant Flora Species Recorded within 25 km of the Study Area

Species	Habit; Habitat Preference (DPaW 2014)	Source										Likelihood of Occurrence in the Study Area	
		Nature Map	Mattiske (1995b)	Mattiske (1995a)	Biota (2000)	Biota (2002)	Biota (2004a)	Biota (2004b)	Biota (2010)	Biota (2012a)	Biota (2013b)	Initial Ranking Based on Desktop Review	Final Ranking Including Results of Field Survey
Priority 1													
Brunonia sp. Long hairs (D.E. Symon 2440)	Erect herb; Along creeklines	✓										Unlikely: creeklines within the study area may provide suitable habitat, however this species has not been recorded by previous surveys around Yandi.	Unlikely.
Priority 2													
Indigofera ixocarpa	Shrub; Skeletal red soils over massive ironstone					✓						Unlikely; rocky slopes within the study area may provide suitable habitat, however this species has not previously been recorded by other surveys close to the study area.	Unlikely.
Stylidium weeliwolli	Annual herb; Edge of major watercourses	✓		✓								May potentially occur; the sections of Weeli Wolli Creek and Marillana Creek within the study area provide suitable habitat.	May potentially occur.
Priority 3													
Acacia subtiliformis	Slender, spindly, erect shrub; Stony calcrete plains	✓										Would not occur; no suitable calcrete habitat in the study area.	Would not occur.
Fimbristylis sieberiana	Shortly rhizomatous, tufted perennial sedge; Mud and skeletal soil pockets at pool edges and on sandstone cliffs	✓										Unlikely: the sections of Weeli Wolli Creek and Marillana Creek within the study area may provide suitable habitat, however this species has not been recorded by previous surveys close to the study area. There are records from approximately 5-6 km upstream in Weeli Wolli Creek, but these are from the permanently wet areas associated with Weeli Wolli Springs.	Unlikely.
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Annual to biennial herb; Low undulating plains, typically on calcrete	✓					✓					Would not occur; no suitable calcrete habitat in the study area.	Would not occur.
Gymnanthera cunninghamii	Erect woody shrub; In sandy soils surrounding permanent or semi-permanent watercourses	✓				✓						Unlikely; creeklines within the study area provide suitable habitat, however this species has not previously been recorded by other surveys close to the study area.	Would not occur; this tall shrub would have been recorded during the field survey, if present.
Rhagodia sp. Hamersley (M. Trudgen 17794)	Shrub; Under Mulga		✓	✓								Unlikely; there is only a minimal amount of Mulga shrublands in the study area.	Would not occur; this shrub would have been recorded during the survey if present.
Rostellularia adscendens var. *latifolia*	Herb or shrub; Creeks, rocky hills				✓					✓		May potentially occur; there is suitable habitat in the study area.	May potentially occur.

Species	Habit; Habitat Preference (DPaW 2014)	Source										Likelihood of Occurrence in the Study Area	
		Nature Map	Mattiske (1995b)	Mattiske (1995a)	Biota (2000)	Biota (2002)	Biota (2004a)	Biota (2004b)	Biota (2010)	Biota (2012a)	Biota (2013b)	Initial Ranking Based on Desktop Review	Final Ranking Including Results of Field Survey
Sida sp. Barlee Range (S. van Leeuwen 1642)	Low spreading shrub; Skeletal soils on steep slopes							✓				May potentially occur; there are some areas of rocky slopes in the study area that may provide suitable habitat.	Unlikely.
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Annual tussock grass; Clay pan, grass plain	✓			✓	✓		✓				May potentially occur; creeklines and adjacent plains within the study area provide suitable habitat.	Unlikely
Priority 4													
Goodenia nuda	Herb; Drainage areas or floodplains on clay loam to clay	✓			✓	✓			✓	✓	✓	Likely; creeklines and plains within the study area provide suitable habitat.	Recorded during the field survey from several locations in Mulga woodland and on the floodplains of Weeli Wolli Creek and Marillana Creek.
Species of Interest													
Glycine sp. aff. *arenaria*	Creeper; Creeks and riverbeds									✓		May potentially occur; this species has been recorded in Marillana Creek, upstream of the study area.	Unlikely.
Eulalia sp. (Three Rivers Station, B. Forsyth AQ6789133)	Perennial tussock grass; Creeks and riverbeds										✓	Likely; this species has been recorded from a plain adjacent to Marillana Creek, upstream of the study area. The creeklines and adjacent plains in the study area would provide suitable habitat.	Recorded during the field survey from three locations.

Appendix 3

Vegetation Structural Classes and Condition Scale

Vegetation Structural Classes*

Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland	Scattered tall trees
Trees 10-30 m	Closed forest	Open forest	Woodland	Open woodland	Scattered trees
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Shrubs over 2 m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland	Scattered tall shrubs
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland	Scattered shrubs
Shrubs under 1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland	Scattered low shrubs
Hummock grasses	Closed hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland	Scattered hummock grasses
Grasses, Sedges, Herbs	Closed tussock grassland / bunch grassland / sedgeland / herbland	Tussock grassland / bunch grassland / sedgeland / herbland	Open tussock grassland / bunch grassland / sedgeland / herbland	Very open tussock grassland / bunch grassland / sedgeland / herbland	Scattered tussock grasses / bunch grasses / sedges / herbs

* Based on Muir (1977), and Aplin's (1979) modification of the vegetation classification system of Specht (1970): Aplin T.E.H. (1979). The Flora. Chapter 3 In O'Brien, B.J. (ed.) (1979). *Environment and Science*. University of Western Australia Press; Muir B.G. (1977). Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve. *Records of the Western Australian Museum*, Suppl. No. 3; Specht R.L. (1970). Vegetation. In: *The Australian Environment*. 4th edn (Ed. G.W. Leeper). Melbourne.

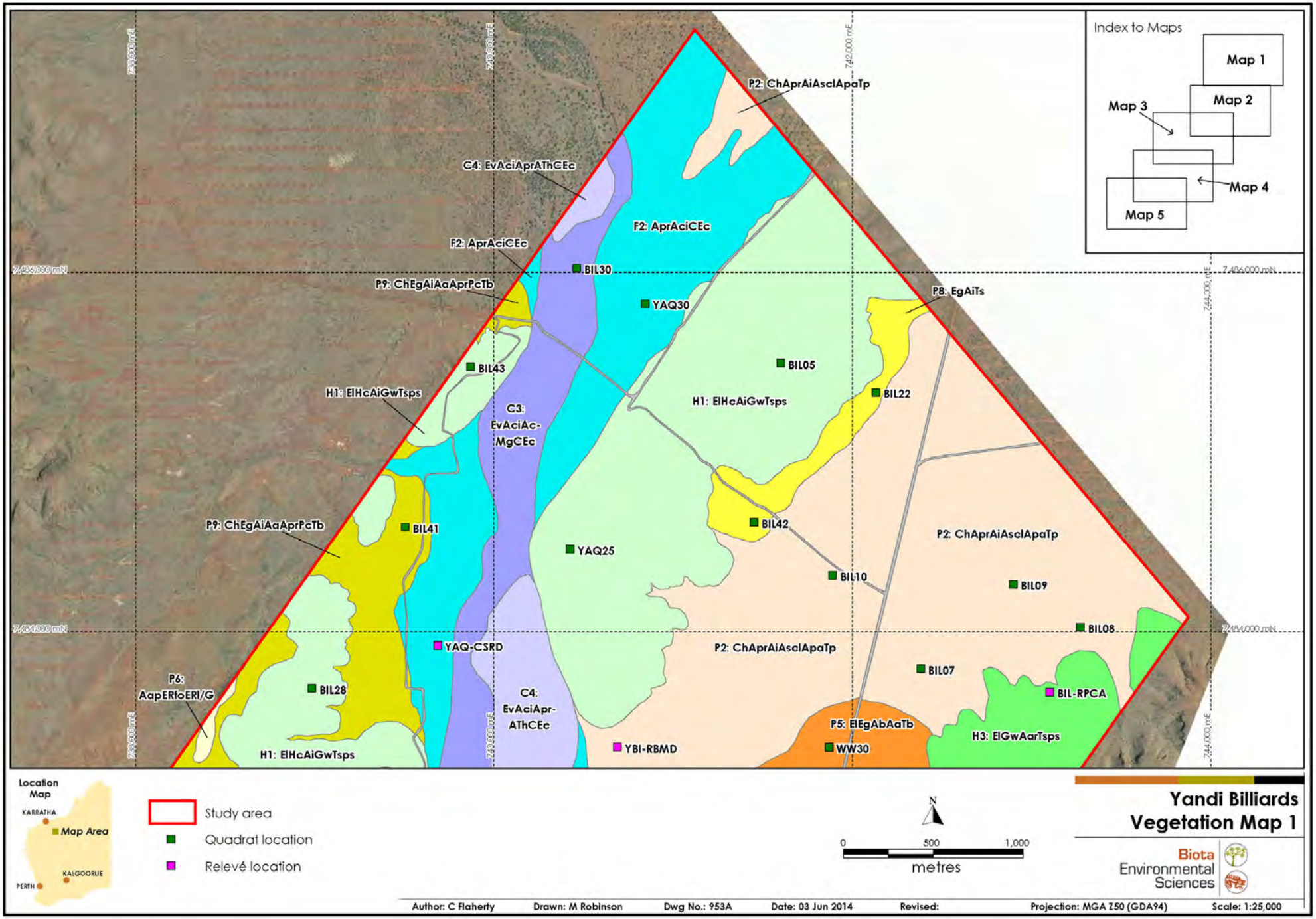
Vegetation Condition Scale for use on Pilbara surveys*

E = Excellent (=Pristine of BushForever) Pristine or nearly so; no obvious signs of damage caused by the activities of European man.
VG = Very Good (= Excellent of BushForever) Some relatively slight signs of damage caused by the activities of European man. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds such as **Ursinia anthemoides* or **Briza* spp., or occasional vehicle tracks.
G = Good (= Very Good of BushForever) More obvious signs of damage caused by the activities of European man, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones such as **Ehrharta* spp.
P = Poor (= Good of BushForever) Still retains basic vegetation structure or ability to regenerate to it after very obvious impacts of activities of European man, such as grazing, partial clearing (chaining) or frequent fires. Weeds as above, probably plus some more aggressive ones such as **Ehrharta* spp.
VP = Very Poor (= Degraded of BushForever) Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species including very aggressive species.
D = Completely Degraded (= Completely Degraded of BushForever) Areas that are completely or almost completely without native species in the structure of their vegetation; ie. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

* Based on Trudgen M.E. (1988). A Report on the Flora and Vegetation of the Port Kennedy Area. Unpublished report prepared for Bowman Bishaw and Associates, West Perth.

Appendix 4

Vegetation Mapping and Locations of Conservation Significant Flora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C4: EvAciAprAThCEc
F2: AprAciCEc
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YAQ30
P8: EgAiTs
BIL43
BIL05
H1: ElHcAiGwTsps
H1: ElHcAiGwTsps
BIL22
C3: EvAciAc-MgCEc
P9: ChEgAiAaAprPcTb
BIL41
BIL42
P2: ChAprAiAsclApaTp
YAQ25
BIL10
BIL09
BIL08
YAQ-CSRD
P2: ChAprAiAsclApaTp
BIL07
P6: AapERfoERI/G
BIL28
C4: EvAciApr-AThCEc
BIL-RPCA
P5: ElEgAbAaTb
H3: ElGwAarTsps
YBI-RBMD
WW30
H1: ElHcAiGwTsps
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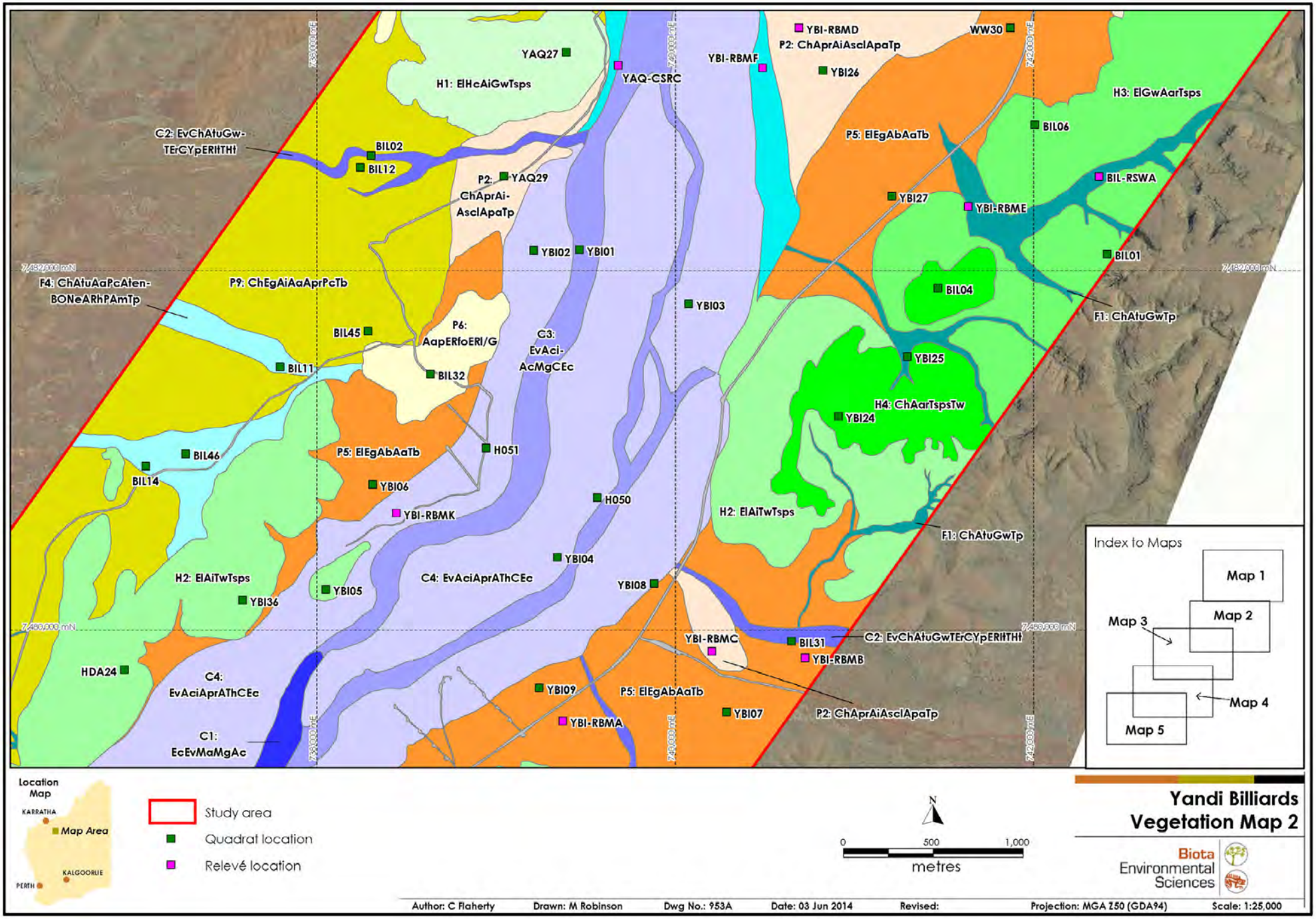
7,406,000 mN
7,403,000 mN
742,000 mE
744,000 mE
Location Map
KARRATHA
Map Area
KALGOORLIE
PERTH
Study area
Quadrat location
Relevé location
N
0
500
1,000
metres
Yandi Billiards Vegetation Map 1
Biota Environmental Sciences
Author: C Flaherty
Drawn: M Robinson
Dwg No.: 953A
Date: 03 Jun 2014
Revised:
Projection: MGA Z50 (GDA94)
Scale: 1:25,000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BIL12
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BIL06
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YBI02
YBI01
BIL01
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BIL04
YBI03
F1: ChAtuGwTp
BIL45
P6: AapERfoERI/G
C3: EvAci-AcMgCEc
YBI25
BIL11
BIL32
H4: ChAarTspsTw
YBI24
BIL46
P5: ElEgAbAaTb
H051
BIL14
YBI06
H050
YBI-RBMK
H2: ElAiTwTsps
F1: ChAtuGwTp
YBI04
H2: ElAiTwTsps
C4: EvAciAprAThCEc
YBI05
YBI08
YBI36
YBI-RBMC
BIL31
C2: EvChAtuGwTErCYpERHTHt
YBI-RBMB
HDA24
C4: EvAciAprAThCEc
YBI09
P5: ElEgAbAaTb
YBI07
P2: ChAprAiAsclApaTp
YBI-RBMA
C1: EcEvMaMgAc
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KARRATHA
Map Area
KALGOORLIE
PERTH
Study area
Quadrat location
Relevé location
N
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metres
Yandi Billiards Vegetation Map 2
Biota Environmental Sciences
Author: C Flaherty
Drawn: M Robinson
Dwg No.: 953A
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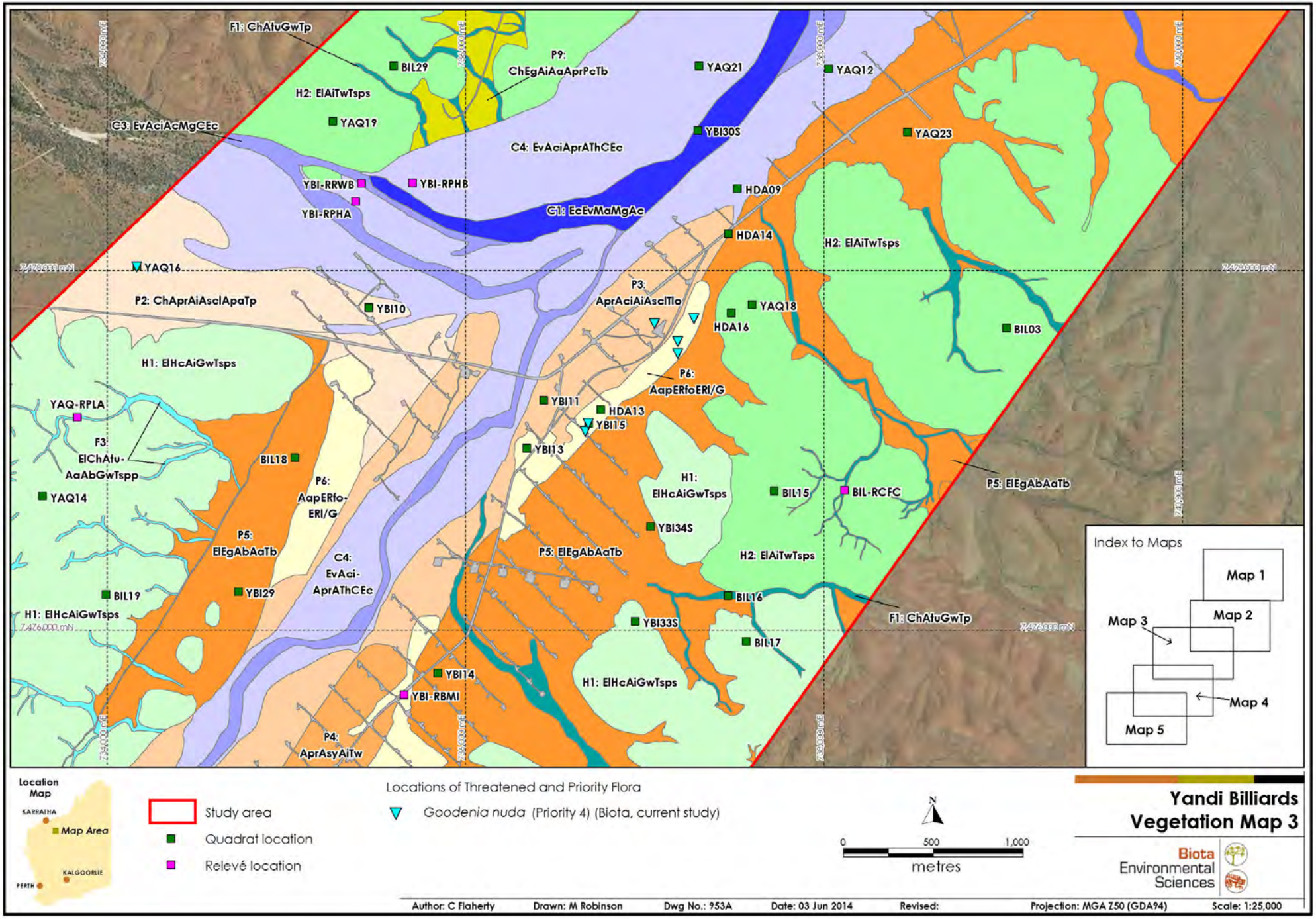
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HDA14
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HDA16
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YBI11
HDA13
YAQ-RPLA
YBI15
YBI13
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BIL19
YBI29
BIL16
H1: ElHcAiGwTsps
F1: ChAtuGwTp
YBI33S
BIL17
YBI14
H1: ElHcAiGwTsps
YBI-RBMI
P4: AprAsyAiTw
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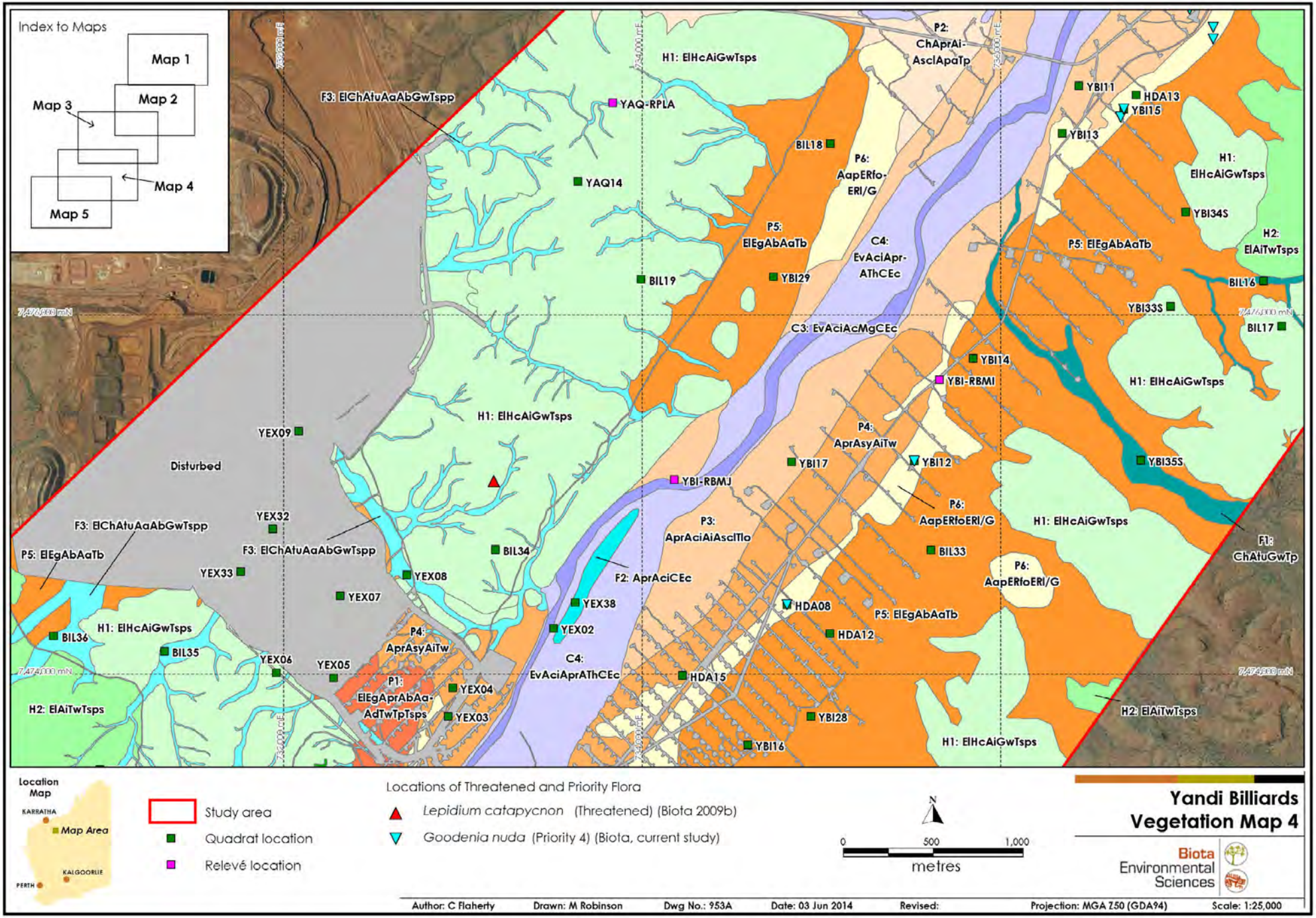
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YEX08
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YEX04
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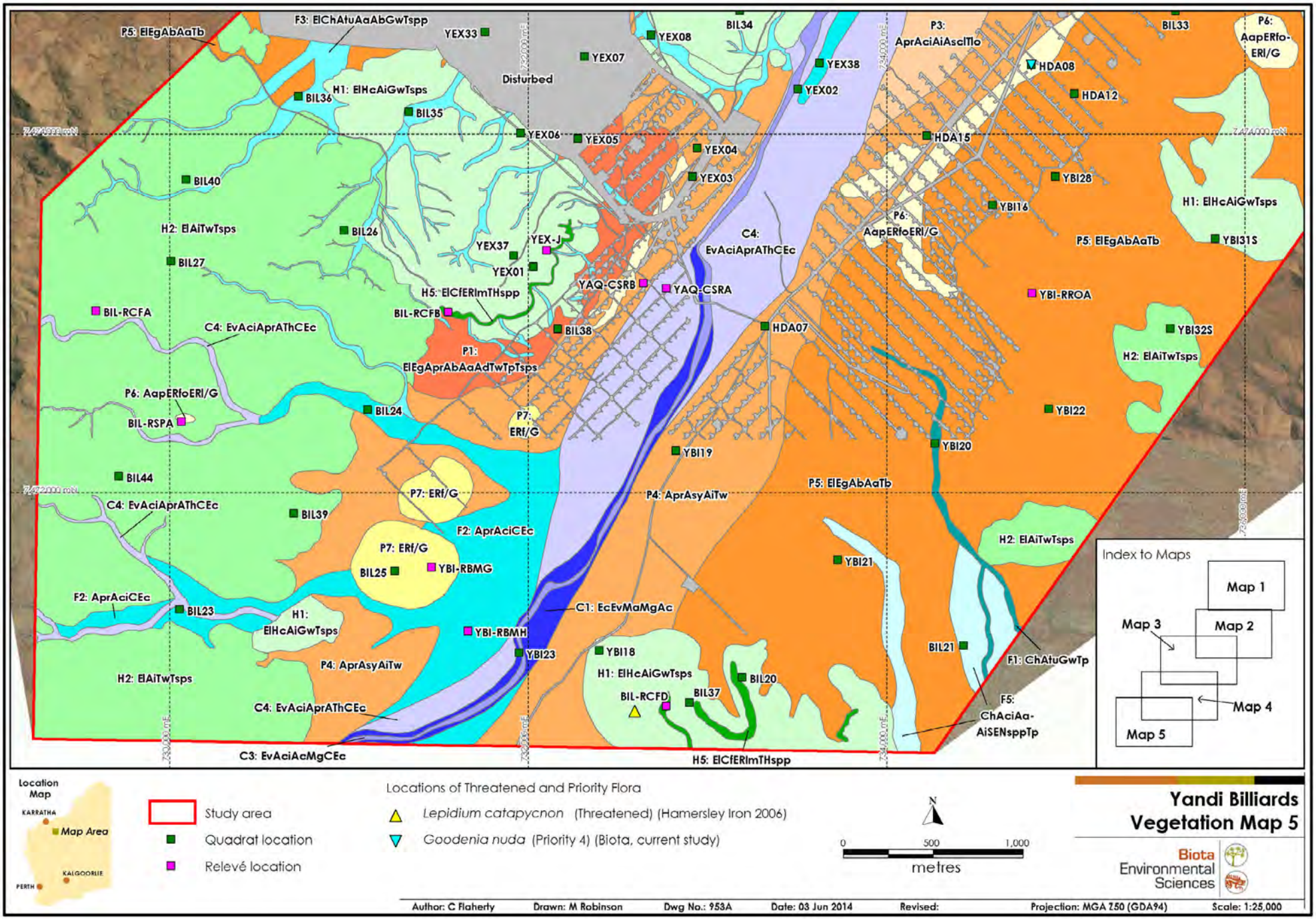
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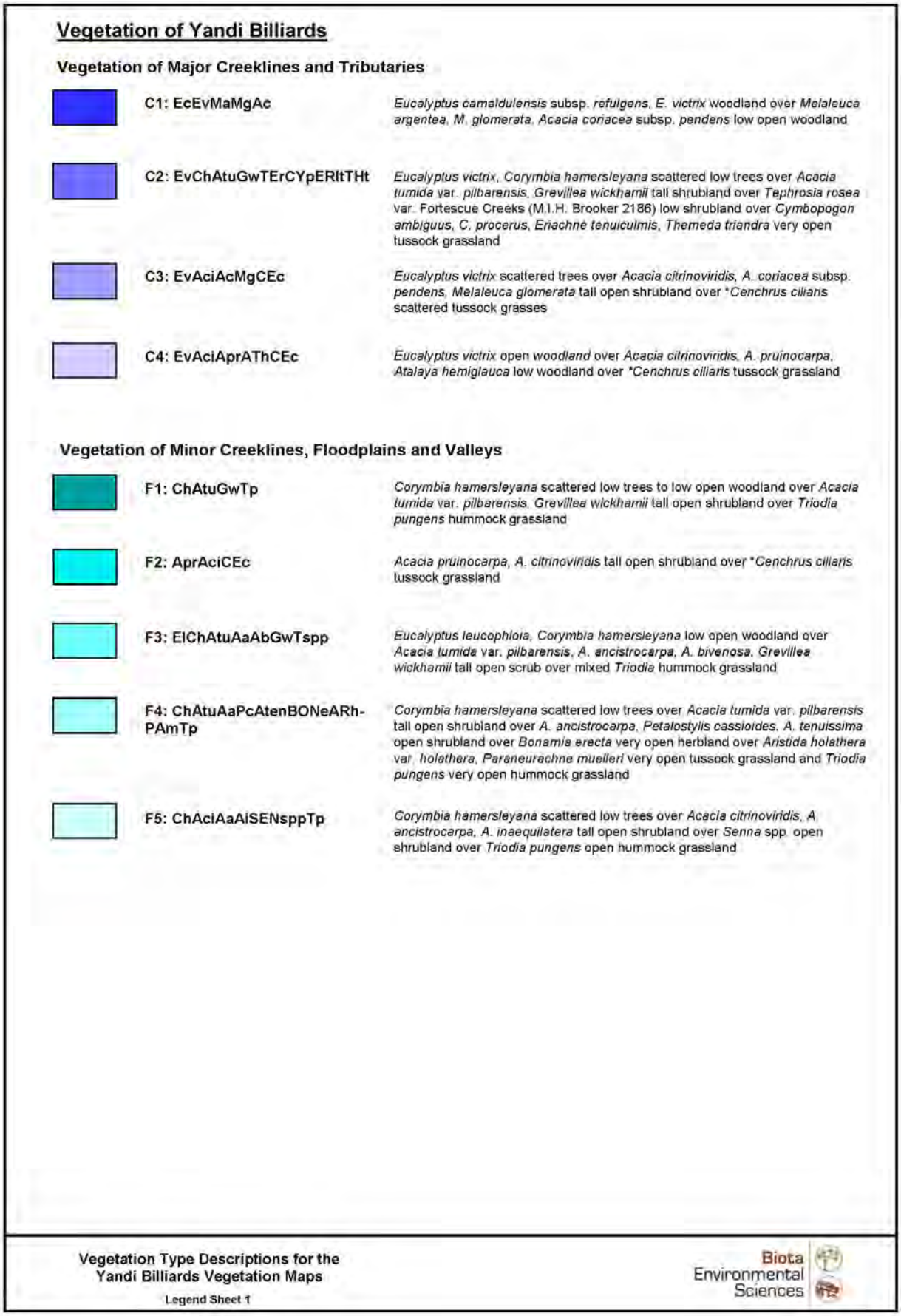
Vegetation of Yandi Billiards
Vegetation of Major Creeklines and Tributaries
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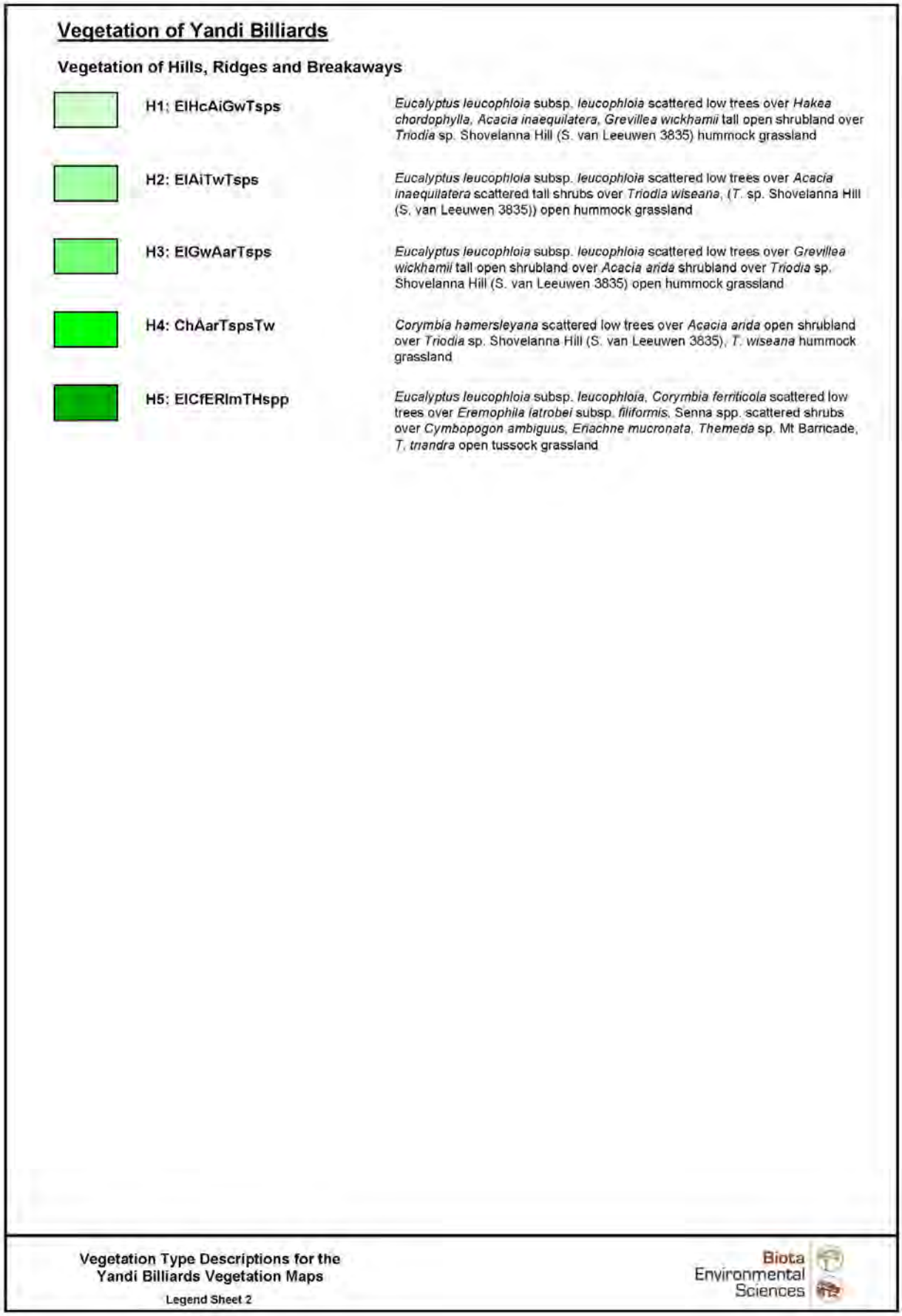
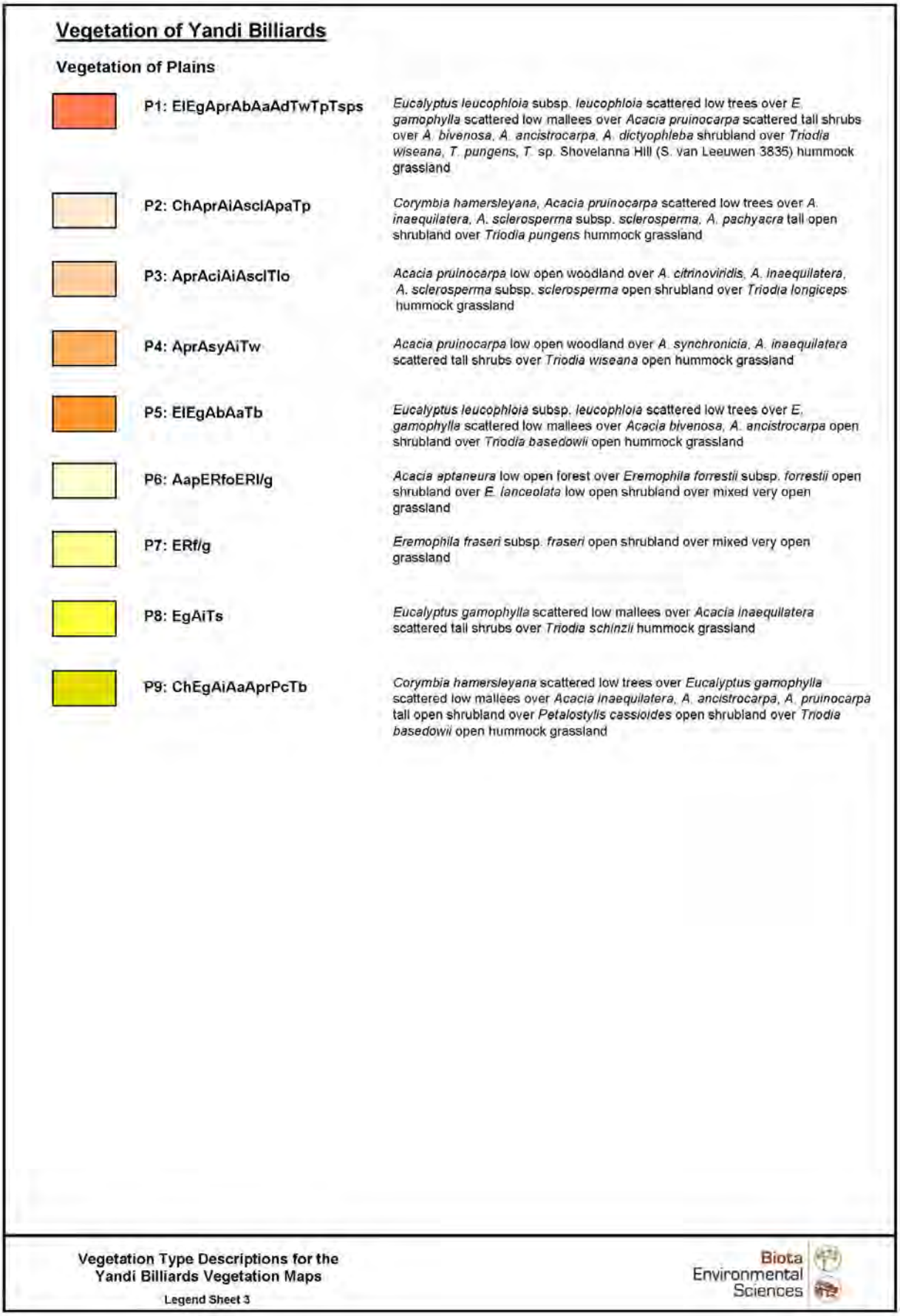
Eucalyptus camaldulensis subsp. refulgens, E. victrix woodland over Melaleuca argentea, M. glomerata, Acacia coriacea subsp. pendens low open woodland
C2: EvChAtuGwTErCYpERItTHt
Eucalyptus victrix, Corymbia hamersleyana scattered low trees over Acacia tumida var. pilbarensis, Grevillea wickhamii tall shrubland over Tephrosia rosea var. Fortescue Creeks (M.I.H. Brooker 2186) low shrubland over Cymbopogon ambiguus, C. procerus, Eriachne tenuiculmis, Themeda triandra very open tussock grassland
C3: EvAciAcMgCEc
Eucalyptus victrix scattered trees over Acacia citrinoviridis, A. coriacea subsp. pendens, Melaleuca glomerata tall open shrubland over *Cenchrus ciliaris scattered tussock grasses
C4: EvAciAprAThCEc
Eucalyptus victrix open woodland over Acacia citrinoviridis, A. pruinocarpa, Atalaya hemiglauca low woodland over *Cenchrus ciliaris tussock grassland
Vegetation of Minor Creeklines, Floodplains and Valleys
F1: ChAtuGwTp
Corymbia hamersleyana scattered low trees to low open woodland over Acacia tumida var. pilbarensis, Grevillea wickhamii tall open shrubland over Triodia pungens hummock grassland
F2: AprAciCEc
Acacia pruinocarpa, A. citrinoviridis tall open shrubland over *Cenchrus ciliaris tussock grassland
F3: ElChAtuAaAbGwTspp
Eucalyptus leucophloia, Corymbia hamersleyana low open woodland over Acacia tumida var. pilbarensis, A. ancistrocarpa, A. bivenosa, Grevillea wickhamii tall open scrub over mixed Triodia hummock grassland
F4: ChAtuAaPcAtenBONeARh-PAmTp
Corymbia hamersleyana scattered low trees over Acacia tumida var. pilbarensis tall open shrubland over A. ancistrocarpa, Petalostylis cassioides, A. tenuissima open shrubland over Bonamia erecta very open herbland over Aristida holathera var. holathera, Paraneurachne muelleri very open tussock grassland and Triodia pungens very open hummock grassland
F5: ChAciAaAiSENsppTp
Corymbia hamersleyana scattered low trees over Acacia citrinoviridis, A. ancistrocarpa, A. inaequilatera tall open shrubland over Senna spp. open shrubland over Triodia pungens open hummock grassland
Vegetation Type Descriptions for the Yandi Billiards Vegetation Maps
Legend Sheet 1
Biota Environmental Sciences


Vegetation of Yandi Billiards
Vegetation of Hills, Ridges and Breakaways
H1: ElHcAiGwTsps
Eucalyptus leucophloia subsp. leucophloia scattered low trees over Hakea chordophylla, Acacia inaequilatera, Grevillea wickhamii tall open shrubland over Triodia sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland
H2: ElAiTwTsps
Eucalyptus leucophloia subsp. leucophloia scattered low trees over Acacia inaequilatera scattered tall shrubs over Triodia wiseana, (T. sp. Shovelanna Hill (S. van Leeuwen 3835)) open hummock grassland
H3: ElGwAarTsps
Eucalyptus leucophloia subsp. leucophloia scattered low trees over Grevillea wickhamii tall open shrubland over Acacia arida shrubland over Triodia sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland
H4: ChAarTspsTw
Corymbia hamersleyana scattered low trees over Acacia arida open shrubland over Triodia sp. Shovelanna Hill (S. van Leeuwen 3835), T. wiseana hummock grassland
H5: ElCfERlmTHspp
Eucalyptus leucophloia subsp. leucophloia, Corymbia ferriticola scattered low trees over Eremophila latrobei subsp. filiformis, Senna spp. scattered shrubs over Cymbopogon ambiguus, Eriachne mucronata, Themeda sp. Mt Barricade, T. triandra open tussock grassland
Vegetation Type Descriptions for the Yandi Billiards Vegetation Maps
Legend Sheet 2
Biota Environmental Sciences


Vegetation of Yandi Billiards
Vegetation of Plains
P1: ElEgAprAbAaAdTwTpTsps
Eucalyptus leucophloia subsp. leucophloia scattered low trees over E. gamophylla scattered low mallees over Acacia pruinocarpa scattered tall shrubs over A. bivenosa, A. ancistrocarpa, A. dictyophleba shrubland over Triodia wiseana, T. pungens, T. sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland
P2: ChAprAiAsclApaTp
Corymbia hamersleyana, Acacia pruinocarpa scattered low trees over A. inaequilatera, A. sclerosperma subsp. sclerosperma, A. pachyacra tall open shrubland over Triodia pungens hummock grassland
P3: AprAciAiAsclTlo
Acacia pruinocarpa low open woodland over A. citrinoviridis, A. inaequilatera, A. sclerosperma subsp. sclerosperma open shrubland over Triodia longiceps hummock grassland
P4: AprAsyAiTw
Acacia pruinocarpa low open woodland over A. synchronicia, A. inaequilatera scattered tall shrubs over Triodia wiseana open hummock grassland
P5: ElEgAbAaTb
Eucalyptus leucophloia subsp. leucophloia scattered low trees over E. gamophylla scattered low mallees over Acacia bivenosa, A. ancistrocarpa open shrubland over Triodia basedowii open hummock grassland
P6: AapERfoERl/g
Acacia aptaneura low open forest over Eremophila forrestii subsp. forrestii open shrubland over E. lanceolata low open shrubland over mixed very open grassland
P7: ERf/g
Eremophila fraseri subsp. fraseri open shrubland over mixed very open grassland
P8: EgAiTs
Eucalyptus gamophylla scattered low mallees over Acacia inaequilatera scattered tall shrubs over Triodia schinzii hummock grassland
P9: ChEgAiAaAprPcTb
Corymbia hamersleyana scattered low trees over Eucalyptus gamophylla scattered low mallees over Acacia inaequilatera, A. ancistrocarpa, A. pruinocarpa tall open shrubland over Petalostylis cassioides open shrubland over Triodia basedowii open hummock grassland
Vegetation Type Descriptions for the Yandi Billiards Vegetation Maps
Legend Sheet 3
Biota Environmental Sciences

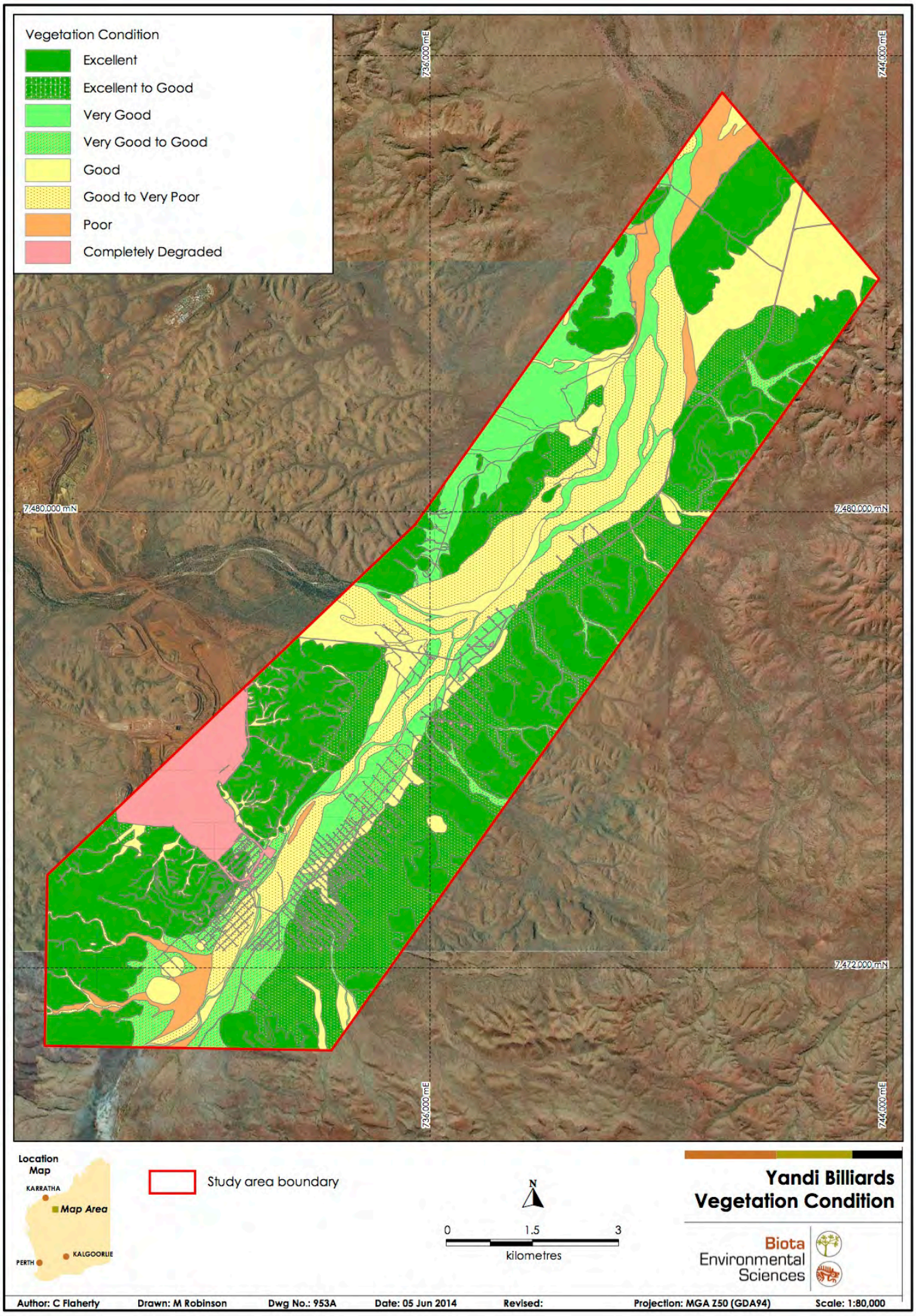
Locations of Priority Flora recorded during the Phase 1 survey.

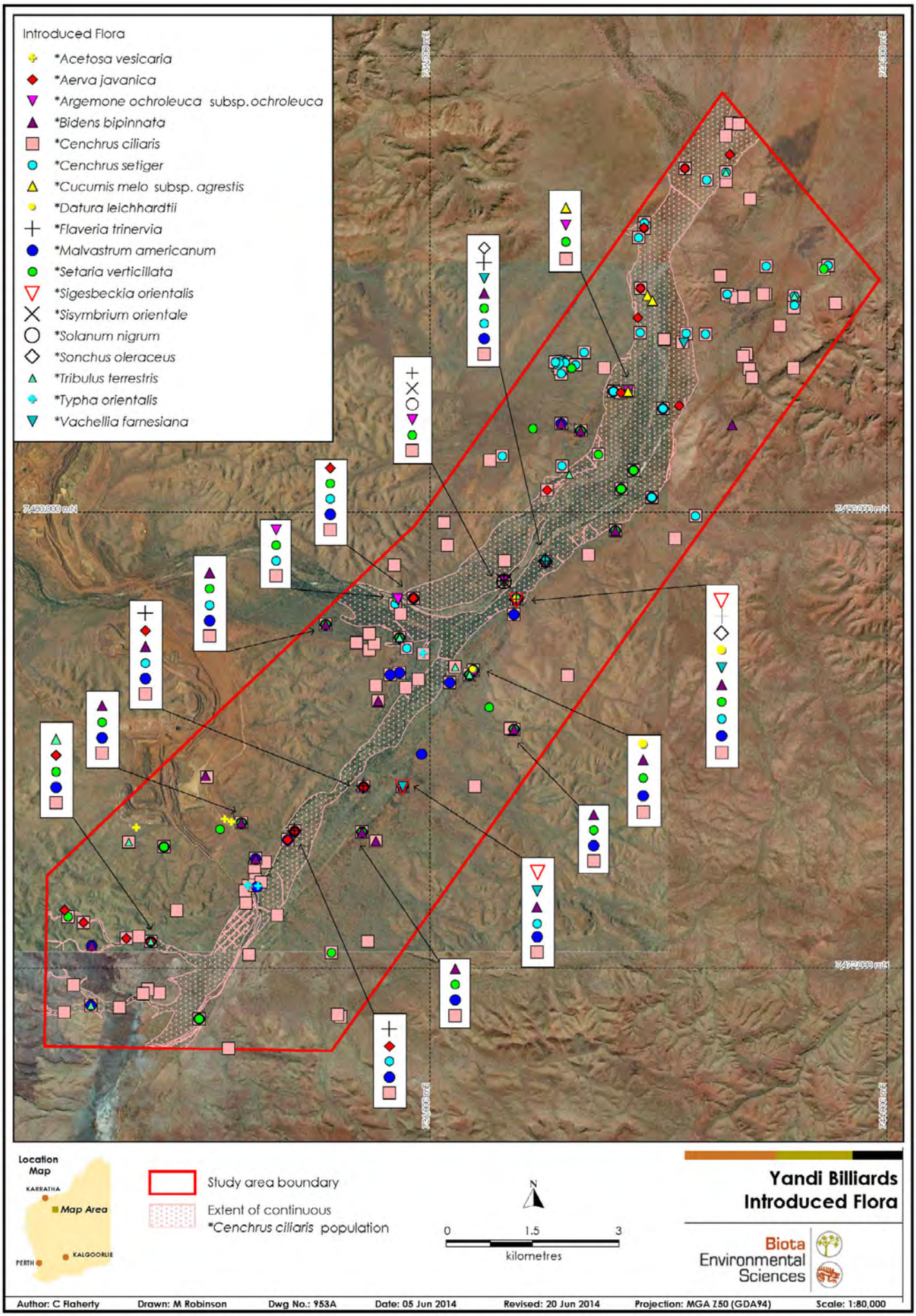
Goodenia nuda (Priority 4)

Source	Site	Easting (mE)	Northing (mN)	Number of Individuals
Current survey	YAQ16	734166	7478024	4
Current survey	HDA08	734807	7474387	5
Current survey	YBI12	735517	7475187	1
Current survey	Opportunistic record	736668	7477105	8
Current survey	YBI15	736686	7477149	23
Current survey	Opportunistic record	737054	7477706	6
Current survey	Opportunistic record	737185	7477540	26
Current survey	Opportunistic record	737185	7477606	2
Current survey	Opportunistic record	737274	7477733	1

Appendix 5

Vegetation Condition Mapping and Weed Locations


Vegetation Condition
Excellent
Excellent to Good
Very Good
Very Good to Good
Good
Good to Very Poor
Poor
Completely Degraded
736,000 mE
744,000 mE
7,480,000 mN
7,472,000 mN
Location Map
KARRATHA
Map Area
PERTH
KALGOORLIE
Study area boundary
N
0
1.5
3
kilometres
Yandi Billiards
Vegetation Condition
Biota Environmental Sciences
Author: C Flaherty
Drawn: M Robinson
Dwg No.: 953A
Date: 05 Jun 2014
Revised:
Projection: MGA Z50 (GDA94)
Scale: 1:80,000


Introduced Flora
*Acetosa vesicaria
*Aerva javanica
*Argemone ochroleuca subsp.ochroleuca
*Bidens bipinnata
*Cenchrus ciliaris
*Cenchrus setiger
*Cucumis melo subsp. agrestis
*Datura leichhardtii
*Flaveria trinervia
*Malvastrum americanum
*Setaria verticillata
*Sigesbeckia orientalis
*Sisymbrium orientale
*Solanum nigrum
*Sonchus oleraceus
*Tribulus terrestris
*Typha orientalis
*Vachellia farnesiana
Location Map
KARRATHA
Map Area
PERTH
KALGOORLIE
Study area boundary
Extent of continuous *Cenchrus ciliaris population
N
0
1.5
3
kilometres
Yandi Billiards Introduced Flora
Biota Environmental Sciences
Author: C Flaherty
Drawn: M Robinson
Dwg No.: 953A
Date: 05 Jun 2014
Revised: 20 Jun 2014
Projection: MGA Z50 (GDA94)
Scale: 1:80,000

Coordinates of Weed Records from the Study Area

Species	Source	Site	Easting (mE)	Northing (mN)	Number of Individuals/ % Cover Estimation
**Acetosa vesicaria*	Pilbara Iron (unpub'ld data)	Opportunistic Record	730860	7474450	Not recorded
	GHD (2009)	Opportunistic Record	732412	7474595	Not recorded
	GHD (2009)	Opportunistic Record	732526	7474550	Not recorded
**Aerva javanica*	Current survey	BIL24	731105	7472466	10
	Current survey	BIL30	740462	7486024	3
	Current survey	Opportunistic Record	741254	7486273	1
	Current survey	Opportunistic Record	739743	7484980	1
	Current survey	Opportunistic Record	730676	7472521	20
	Current survey	Opportunistic Record	729924	7472803	20
	Current survey	Opportunistic Record	738051	7480388	30
	Current survey	BIL-RCFA	729589	7473017	8
	Current survey	YBI17	734832	7475182	3
	Current survey	YEX02	733504	7474254	1
	Current survey	YEX38	733626	7474399	10
	Biota (2009a)	YBI-RPHB	735704	7478491	0.1%
	Biota (2013b)	Opportunistic Record	739338	7482094	7
	Biota (2013b)	Opportunistic Record	739635	7483408	20
	Biota (2013b)	YAQ-CSRD	739685	7483923	0.1%
	Biota (2013b)	Opportunistic Record	740365	7481867	1
**Argemone ochroleuca* subsp. *ochroleuca*	Biota (2009a)	YBI-RRWB	735420	7478487	0.1%
	Biota (2013b)	Opportunistic Record	735434	7478464	1
	Biota (2009a)	YBI30S	737297	7478783	0.1%
	Biota (2009a)	YBI01	739465	7482118	0.1%
**Bidens bipinnata*	Current survey	BIL16	737466	7476191	1000
	Current survey	BIL32	738634	7481425	5
	Current survey	Opportunistic Record	738298	7481550	30
	Current survey	Opportunistic Record	735087	7476683	50
	Current survey	BIL-RSPA	730066	7472398	8000
	Current survey	HDA08	734807	7474388	70
	Current survey	HDA09	737517	7478460	7
	Current survey	YAQ12	738027	7479127	20
	Current survey	YAQ16	734166	7478025	30
	Current survey	YBI09	739242	7479676	150
	Current survey	YBI10	735461	7477797	75
	Current survey	YBI12	735518	7475188	1000
	Current survey	YBI15	736687	7477149	570
	Current survey	YBI17	734832	7475182	5
	Current survey	YEX04	732943	7473923	80
	Current survey	YEX08	732686	7474553	3
	Biota (2004b)	YEX09	732057	7475377	0.1%
	Biota (2004a)	HDA08	734807	7474388	0.1%
	Biota (2004a)	HDA12	735047	7474228	0.1%
	Biota (2009a)	YBI12	735518	7475188	0.1%
	Biota (2009a)	YBI15	736687	7477149	0.1%
	Biota (2004a)	HDA13	736755	7477227	0.1%
	Biota (2009a)	YBI25	741294	7481523	0.1%
**Cenchrus ciliaris*	Biota (2002)	H050	739564	7480735	5%
	Biota (2002)	H051	738944	7481012	70%
	Biota (2004a)	HDA07	733320	7472930	0.1%
	Biota (2004a)	HDA08	734807	7474388	1
	Biota (2004a)	HDA09	737517	7478460	60%
	Biota (2004a)	HDA12	735047	7474228	0.1%
	Biota (2004a)	HDA13	736755	7477227	2
	Biota (2004a)	HDA14	737468	7478207	1%

Species	Source	Site	Easting (mE)	Northing (mN)	Number of Individuals/ % Cover Estimation
**Cenchrus ciliaris* (cont')	Biota (2004b)	YEX02	733504	7474254	80%
	Biota (2004b)	YEX03	732917	7473766	0.1%
	Biota (2004b)	YEX04	732943	7473923	0.1%
	Biota (2004b)	YEX08	732686	7474553	35%
	Biota (2004b)	YEX09	732084	7475352	0.1%
	Biota (2009a)	YBI-RBME	741635	7482360	10%
	Biota (2009a)	YBI-RBMF	740486	7483133	70%
	Biota (2009a)	YBI-RPHA	735388	7478389	25%
	Biota (2009a)	YBI-RPHB	735704	7478491	40%
	Biota (2009a)	YBI01	739465	7482118	0.1%
	Biota (2009a)	YBI02	739211	7482114	60%
	Biota (2009a)	YBI03	740075	7481817	90%
	Biota (2009a)	YBI04	739343	7480406	45%
	Biota (2009a)	YBI06	738312	7480809	0.10%
	Biota (2009a)	YBI08	739883	7480259	35%
	Biota (2009a)	YBI09	739242	7479676	1.5%
	Biota (2009a)	YBI10	735461	7477797	1%
	Biota (2009a)	YBI11	736437	7477279	2.5%
	Biota (2009a)	YBI12	735518	7475188	0.1%
	Biota (2009a)	YBI13	736342	7477013	6%
	Biota (2009a)	YBI15	736687	7477149	0.1%
	Biota (2009a)	YBI17	734832	7475182	4%
	Biota (2009a)	YBI19	732824	7472236	0.5%
	Biota (2009a)	YBI20	734268	7472275	0.1%
	Biota (2009a)	YBI22	734904	7472469	0.1%
	Biota (2009a)	YBI23	731950	7471111	0.1%
	Biota (2009a)	YBI26	740825	7483118	4%
	Biota (2009a)	YBI30S	737297	7478783	0.1%
	Biota (2009a)	YBI35S	736781	7475190	0.1%
	Biota (2009a)	YBI35S	736781	7475190	0.1%
	Biota (2013b)	Opportunistic Record	735372	7479070	200
	Biota (2013b)	Opportunistic Record	735480	7478209	> 1000
	Biota (2013b)	Opportunistic Record	735588	7477615	> 100
	Biota (2013b)	Opportunistic Record	740100	7483033	50
	Biota (2013b)	Opportunistic Record	740417	7482977	1000
	Biota (2013b)	YAQ-CSRA	732770	7473142	8%
	Biota (2013b)	YAQ-CSRC	739681	7483146	20%
	Biota (2013b)	YAQ-CSRD	739685	7483923	30%
	Biota (2013b)	YAQ12	738027	7479127	60%
	Biota (2013b)	YAQ16	734166	7478025	13%
	Biota (2013b)	YAQ21	737304	7479144	12%
	Biota (2013b)	YAQ30	740844	7485826	13%
	Biots (2013b)	Opportunistic Record	738772	7479247	100
	Biots (2013b)	Opportunistic Record	739338	7482094	> 1000
	Biots (2013b)	YAQ29	739045	7482529	0.1%
	Current survey	BIL-RCFB	731555	7473010	1
	Current survey	BIL-RSPA	743101	7483664	0.1%
	Current survey	BIL-RSWA	742364	7482528	0.1%
	Current survey	BIL02	738304	7482643	9%
	Current survey	BIL05	741600	7485494	0.1%
	Current survey	BIL07	742381	7483792	150
	Current survey	BIL09	742897	7484264	400
	Current survey	BIL10	741890	7484313	100
	Current survey	BIL12	738244	7482579	14%
	Current survey	BIL13	736238	7479815	2
	Current survey	BIL14	737046	7480911	50
	Current survey	BIL16	737466	7476191	15%

Species	Source	Site	Easting (mE)	Northing (mN)	Number of Individuals/ % Cover Estimation
	Current survey	BIL18	735048	7476958	70
	Current survey	BIL21	734428	7471153	5%
	Current survey	BIL23	730055	7471353	50%
Cenchrus ciliaris (cont')	Current survey	BIL24	731105	7472466	15%
	Current survey	BIL25	731255	7471567	0.1%
	Current survey	BIL30	740462	7486024	17
	Current survey	BIL31	740648	7479936	2%
	Current survey	BIL32	738634	7481425	5%
	Current survey	BIL35	731333	7474127	900
	Current survey	BIL36	730717	7474212	3%
	Current survey	BIL46	737268	7480980	0.1%
	Current survey	H050	739564	7480732	9%
	Current survey	HDA08	734807	7474388	1%
	Current survey	HDA09	737517	7478460	35%
	Current survey	Opportunistic Record	741182	7485804	5
	Current survey	Opportunistic Record	741181	7485956	2000
	Current survey	Opportunistic Record	741263	7483791	2000
	Current survey	Opportunistic Record	741872	7483822	50
	Current survey	Opportunistic Record	741545	7482779	100
	Current survey	Opportunistic Record	742367	7483683	100
	Current survey	Opportunistic Record	739743	7484980	5000
	Current survey	Opportunistic Record	738696	7482802	200
	Current survey	Opportunistic Record	738364	7482621	300
	Current survey	Opportunistic Record	738298	7481550	200
	Current survey	Opportunistic Record	736304	7479418	100
	Current survey	Opportunistic Record	731051	7471628	100
	Current survey	Opportunistic Record	735087	7476683	50
	Current survey	Opportunistic Record	741173	7486595	20
	Current survey	Opportunistic Record	741273	7486826	25
	Current survey	Opportunistic Record	741404	7486803	25
	Current survey	Opportunistic Record	741078	7484143	1000
	Current survey	Opportunistic Record	741203	7483816	100
	Current survey	Opportunistic Record	741356	7483756	50
	Current survey	Opportunistic Record	741496	7483774	50
	Current survey	Opportunistic Record	741831	7483822	300
	Current survey	Opportunistic Record	741482	7482732	1000
	Current survey	Opportunistic Record	742128	7483266	50
	Current survey	Opportunistic Record	742366	7483584	1000
	Current survey	Opportunistic Record	741590	7482510	1000
	Current survey	Opportunistic Record	739753	7485070	5000
	Current survey	Opportunistic Record	739649	7484814	5000
	Current survey	Opportunistic Record	738549	7482580	50
	Current survey	Opportunistic Record	738261	7482607	5000
	Current survey	Opportunistic Record	738195	7482631	1000
	Current survey	Opportunistic Record	730968	7471551	5000
	Current survey	Opportunistic Record	730555	7471314	5000
	Current survey	Opportunistic Record	729585	7471233	1000
	Current survey	Opportunistic Record	729748	7471700	500
	Current survey	Opportunistic Record	730676	7472521	1000
	Current survey	Opportunistic Record	730895	7472560	500
	Current survey	Opportunistic Record	729924	7472803	100
	Current survey	Opportunistic Record	729654	7472905	100
	Current survey	Opportunistic Record	738407	7477134	50
	Current survey	Opportunistic Record	737408	7476202	25
	Current survey	Opportunistic Record	732468	7470596	25
	Current survey	Opportunistic Record	738293	7482427	200
	Current survey	Opportunistic Record	738276	7482515	500

Species	Source	Site	Easting (mE)	Northing (mN)	Number of Individuals/ % Cover Estimation
	Current survey	Opportunistic Record	738051	7480388	5000
	Current survey	Opportunistic Record	734380	7471195	700
	Current survey	Opportunistic Record	742972	7484327	200
	Current survey	YAQ12	738027	7479127	60%
	Current survey	YAQ16	734166	7478025	0.5%
	Current survey	YAQ30	740844	7485826	15%
**Cenchrus ciliaris* (cont')	Current survey	YBI06	738312	7480809	100
	Current survey	YBI07	740286	7479541	1
	Current survey	YBI08	739883	7480259	15%
	Current survey	YBI09	739242	7479676	200
	Current survey	YBI10	735461	7477797	25%
	Current survey	YBI11	736437	7477279	2%
	Current survey	YBI12	735518	7475188	0.5%
	Current survey	YBI15	736687	7477149	2%
	Current survey	YBI17	734832	7475182	8%
	Current survey	YBI20	734268	7472275	1%
	Current survey	YEX02	733504	7474254	87%
	Current survey	YEX08	732686	7474553	60%
	Current survey	YEX38	733626	7474399	45%
	GHD (2009)	Opportunistic Record	735795	7477062	Not recorded
	GHD (2009)	Opportunistic Record	732757	7473359	Not recorded
	GHD (2009)	Opportunistic Record	734931	7477581	Not recorded
	GHD (2009)	Opportunistic Record	734710	7477708	Not recorded
	GHD (2009)	Opportunistic Record	732917	7473452	Not recorded
	GHD (2009)	Opportunistic Record	735018	7477694	Not recorded
	GHD (2009)	Opportunistic Record	734933	7477865	Not recorded
	GHD (2009)	Opportunistic Record	735297	7477149	Not recorded
	GHD (2009)	Opportunistic Record	733037	7473508	Not recorded
	GHD (2009)	Opportunistic Record	732935	7473569	Not recorded
	GHD (2009)	Opportunistic Record	735461	7477178	Not recorded
	GHD (2009)	Opportunistic Record	735568	7476914	Not recorded
	GHD (2009)	Opportunistic Record	735882	7477511	Not recorded
	GHD (2009)	Opportunistic Record	732820	7473407	Not recorded
	GHD (2009)	Opportunistic Record	732809	7473440	Not recorded
	GHD (2009)	Opportunistic Record	733110	7473862	Not recorded
*Cenchrus setiger	Current survey	BIL02	738304	7482643	5%
	Current survey	BIL07	742381	7483792	20
	Current survey	BIL10	741890	7484313	10
	Current survey	BIL12	738244	7482579	4%
	Current survey	BIL30	740462	7486024	3
	Current survey	BIL31	740648	7479936	0.1%
	Current survey	BIL32	738634	7481425	1%
	Current survey	BIL46	737268	7480980	0.1%
	Current survey	Opportunistic Record	741181	7485956	1000
	Current survey	Opportunistic Record	739743	7484980	5000
	Current survey	Opportunistic Record	738696	7482802	50
	Current survey	Opportunistic Record	738364	7482621	100
	Current survey	Opportunistic Record	741203	7483816	100
	Current survey	Opportunistic Record	742383	7483629	1
	Current survey	Opportunistic Record	739753	7485070	5000
	Current survey	Opportunistic Record	739649	7484814	5000
	Current survey	Opportunistic Record	738549	7482580	50
	Current survey	Opportunistic Record	738261	7482607	5000
	Current survey	Opportunistic Record	738195	7482631	500
	Current survey	Opportunistic Record	738293	7482427	300
	Current survey	Opportunistic Record	742972	7484327	200
	Current survey	H050	739564	7480732	0.1%

Species	Source	Site	Easting (mE)	Northing (mN)	Number of Individuals/ % Cover Estimation
	Current survey	HDA08	734807	7474388	1%
	Current survey	HDA09	737517	7478460	60%
	Current survey	YAQ12	738027	7479127	15%
	Current survey	YAQ16	734166	7478025	0.1%
	Current survey	YAQ30	740844	7485826	5%
	Current survey	YBI06	738312	7480809	100
	Current survey	YBI08	739883	7480259	10%
	Current survey	YBI09	739242	7479676	10
	Current survey	YBI10	735461	7477797	3%
**Cenchrus setiger* (cont')	Current survey	YBI12	735518	7475188	0.5%
	Current survey	YBI15	736687	7477149	3%
	Current survey	YBI17	734832	7475182	0.1%
	Current survey	YEX38	733626	7474399	0.1%
	Biota (2009a)	YBI17	734832	7475182	0.1%
	Biota (2009a)	YBI-RPHA	735388	7478389	25%
	Biota (2009a)	YBI-RPHB	735388	7478389	35%
	Biota (2013b)	YAQ-CG	735588	7477615	> 20
	Biota (2009a)	YBI-RPHB	735704	7478491	35%
	Biota (2009a)	YBI15	736687	7477149	0.1%
	Biota (2004a)	HDA09	737517	7478460	35%
	Biota (2013b)	YAQ12	738027	7479127	15%
	Biota (2002)	H051	738944	7481012	0.1%
	Biota (2009a)	YBI02	739211	7482114	15%
	Biota (2009a)	YBI09	739242	7479676	0.1%
	Biota (2009a)	YBI04	739343	7480406	45%
	Biota (2002)	H050	739564	7480735	0.1%
	Biota (2013b)	YAQ-CSRC	739681	7483146	1%
	Biota (2013b)	YAQ-CSRD	739685	7483923	5%
	Biota (2009a)	YBI08	739883	7480259	1.5%
	Biota (2009a)	YBI03	740075	7481817	5%
	Biota (2009a)	YBI-RBMF	740486	7483133	Not recorded
	Biota (2013b)	YAQ30	740844	7485826	0.5%
	Biota (2009a)	YBI26	740825	7483118	0.1%
**Cucumis melo* subsp. *agrestis*	Biota (2009a)	YBI01	739465	7482118	0.1%
	Biota (2013b)	Opportunistic Record	739805	7483801	1
	Biota (2013b)	Opportunistic Record	739895	7483710	2
**Datura leichhardtii*	Biota (2004a)	HDA13	736755	7477227	0.1%
	Biota (2004a)	HDA09	737517	7478460	0.1%
**Flaveria trinervia*	Current survey	YAQ12	738027	7479127	1
	Current survey	YBIR17	734832	7475182	5
	Current survey	YEX38	733626	7474399	2
	Biota (2009a)	YBI30S	737297	7478783	0.1%
	Biota (2004a)	HDA09	737517	7478460	0.1%
**Malvastrum americanum*	Current survey	BIL16	737466	7476191	70
	Current survey	BIL23	730055	7471353	6
	Current survey	BIL24	731105	7472466	200
	Current survey	BIL32	738634	7481425	6
	Current survey	BIL35	731333	7474127	5
	Current survey	Opportunistic Record	738298	7481550	10
	Current survey	BIL-RSPA	730066	7472398	0.1%
	Current survey	H050	739564	7480732	0.1%
	Current survey	HDA08	734807	7474388	0.1%
	Current survey	HDA09	737517	7478460	10
	Current survey	YAQ12	738027	7479127	20
	Current survey	YAQ16	734166	7478025	20

Species	Source	Site	Easting (mE)	Northing (mN)	Number of Individuals/ % Cover Estimation
	Current survey	YBI12	735518	7475188	600
	Current survey	YBI15	736687	7477149	535
	Current survey	YBI17	734832	7475182	300
	Current survey	YEX02	733504	7474254	4
	Current survey	YEX04	732943	7473923	8
	Current survey	YEX08	732686	7474553	100
	Current survey	YEX38	733626	7474399	23
	Biota (2009a)	YBI23	731950	7471111	0.1%
	Biota (2004b)	YEX08	732686	7474553	0.1%
	Biota (2004b)	YEX04	732943	7473923	0.1%
	Biota (2004b)	YEX02	733504	7474254	1%
	Biota (2004b)	YAQ16	734166	7478025	3%
**Malvastrum americanum* (cont')	Biota (2004a)	HDA08	734807	7474388	0.1%
	Biota (2009a)	YBI17	734832	7475182	0.1%
	Biota (2009a)	YBI10	735461	7477797	0.1%
	Biota (2009a)	YBI12	735518	7475188	2.5%
	Biota (2009a)	YBI-RPHB	735704	7478491	0.1%
	Biota (2009a)	YBI13	736342	7477013	0.1%
	Biota (2009a)	YBI15	736687	7477149	1%
	Biota (2004a)	HDA13	736755	7477227	0.1%
	Biota (2004a)	HDA14	737468	7478207	0.1%
	Biota (2004a)	HDA09	737517	7478460	0.1%
	Biota (2013b)	YAQ12	738027	7479127	10%
	Biota (2009a)	YBI02	739211	7482114	0.1%
	Biota (2009a)	YBI09	739242	7479676	0.1%
	Biota (2009a)	YBI04	739343	7480406	0.1%
	Biota (2009a)	YBI14	735845	7475759	1
	Biota (2009a)	YBI08	739883	7480259	0.1%
	Biota (2009a)	YBI03	740075	7481817	0.1%
	GHD (2009)	Opportunistic Record	735297	7477149	Not recorded
	GHD (2009)	Opportunistic Record	732957	7473427	Not recorded
	GHD (2009)	Opportunistic Record	735461	7477178	Not recorded
**Setaria verticillata*	Current survey	BIL09	742897	7484264	6
	Current survey	BIL11	737797	7481466	7
	Current survey	BIL16	737466	7476191	0.1%
	Current survey	BIL24	731105	7472466	2
	Current survey	BIL32	738634	7481425	0.1%
	Current survey	BIL35	731333	7474127	0
	Current survey	Opportunistic Record	729654	7472905	1
	Current survey	Opportunistic Record	738478	7482520	15
	Current survey	H050	739564	7480732	0.1%
	Current survey	HDA08	734807	7474388	5
	Current survey	YAQ12	738027	7479127	1
	Current survey	YAQ16	734166	7478025	0.1%
	Current survey	YBI09	739242	7479676	2
	Current survey	YBI10	735461	7477797	15
	Current survey	YBI15	736687	7477149	1
	Current survey	YEX08	732686	7474553	6
	Biota (2009a)	YBI23	731950	7471111	0.1%
	Biota (2004b)	YEX07	732315	7474436	0.1%
	Biota (2009a)	YBI20	734268	7472275	0.1%
	Biota (2009a)	YBI-RRWB	735420	7478487	0.1%
	Biota (2009a)	YBI10	735461	7477797	0.1%
	Biota (2009a)	YBI-RPHB	735704	7478491	0.1%
	Biota (2009a)	YBI15	736687	7477149	0.1%
	Biota (2004a)	HDA13	736755	7477227	0.1%
	Biota (2009a)	YBI34S	737033	7476575	0.1%

Species	Source	Site	Easting (mE)	Northing (mN)	Number of Individuals/ % Cover Estimation
	Biota (2009a)	YBI30S	737297	7478783	0.1%
	Biota (2004a)	HDA09	737517	7478460	0.1%
	Biota (2013b)	YAQ12	738027	7479127	18
	Biota (2002)	H051	738944	7481012	0.1%
	Biota (2002)	H050	739564	7480735	0.1%
	Biota (2009a)	YBI04	739343	7480406	0.1%
	Biota (2009a)	YBI01	739465	7482118	0.1%
**Sigesbeckia orientalis*	Current survey	YBIR12	735518	7475188	0.1%
	Biota (2004a)	HDA09	737517	7478460	0.1%
**Sisymbrium orientale*	Biota (2009a)	YBI30S	737297	7478783	0.1%
**Solanum nigrum*	Biota (2009a)	YBI30S	737297	7478783	0.1%
**Sonchus oleraceus*	Biota (2004a)	HDA09	737517	7478460	0.1%
	Biota (2013b)	YAQ12	738027	7479127	0.1%
**Tribulus terrestris*	Current survey	BIL07	742381	7483792	0.1%
	Current survey	BIL23	730055	7471353	0.1%
	Current survey	BIL24	731105	7472466	0.1%
	Current survey	BIL36	730717	7474212	0.1%
	Current survey	Opportunistic Record	741181	7485956	Not recorded
	Current survey	Opportunistic Record	738437	7480658	Not recorded
	Current survey	YBI10	735461	7477797	0.1%
	Current survey	YBI11	736437	7477279	0.1%
	Current survey	YBI15	736687	7477149	0.1%
**Typha orientalis*	GHD (2009)	Opportunistic Record	732986	7473442	Not recorded
	GHD (2009)	Opportunistic Record	735882	7477511	Not recorded
	GHD (2009)	Opportunistic Record	732809	7473440	Not recorded
**Vachellia farnesiana*	Current survey	HDA09	737517	7478460	4
	Current survey	YAQ12	738027	7479127	1
	Current survey	YBI12	735518	7475188	1
	Biota (2009a)	YBI12	735518	7475188	1
	Biota (2004a)	HDA09	737517	7478460	0.1%
	Biota (2013b)	YAQ12	738027	7479127	1%
	Biota (2013b)	Opportunistic Record	740443	7482961	1

Appendix 6

Raw Quadrat and Relevé Data

Yandi Billiards Level 2				Site	BIL01
Described by	SVSW		Date	10-Mar-14	Type Quadrat 50 x 50 m
MGA Zone	50	742398 mE		7482129 mN	
Habitat	Top of hill (plateau) gently sloping to the west.				
Soil	2.5YR 3/3 dark reddish brown sandy clay loam.				
Rock Type	Ironstone gravel, pebbles and cobbles over bedrock (90% cover).				
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia arida* shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.				
Veg Condition	Excellent.				
Fire Age	No sign of recent fire.				
Notes	One juvenile *Corymbia hamersleyana* outside of quadrat.				

Species	Cover (%)	Height	Specimen
Acacia arida	14	190 cm	
Eriachne pulchella	0.1	10 cm	
Eucalyptus leucophloia subsp. *leucophloia*	1	580 cm	
Fimbristylis dichotoma	0.1	15 cm	BIL01-02
Ptilotus calostachyus	0.1	70 cm	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	40 cm	BIL01-03
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	28	30 cm	BIL01-01

Yandi Billiards Level 2				Site	BIL02
Described by	SVSW	Date	12-Mar-14	Type	Quadrat 20 x 125 m
MGA Zone	50	738242 mE	7482663 mN		

Habitat: Creek bed (20 m wide) flowing east into major creek (Weeli Wolli).

Soil: 2.5YR 3/4 dark reddish brown sandy loam (skeletal).

Rock Type: Riverstone mix of cobbles (25%), pebbles (40%), gravel (30%) - ironstone, basalt, chert, mudstone, sandstone.

Vegetation: *Eucalyptus victrix, Corymbia hamersleyana* open woodland over *Acacia tumida* var. *pilbarensis*, *A. pyrifolia* var. *pyrifolia* tall open scrub over *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186) low shrubland over **Cenchrus ciliaris*, **C. setiger*, *Cymbopogon procerus*, *Themeda triandra* open tussock grassland.

Veg Condition: Good (**Cenchrus* spp.).

Fire Age: No sign of recent fire.

Notes: Elevation: 473 m.

Species	Cover (%)	Height	Specimen	Notes
Abutilon otocarpum	0.1	40 cm	BIL02-10	
Acacia pyrifolia var. *pyrifolia*	15	320 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	280 cm	BIL02-02	
Acacia tumida var. *pilbarensis*	22	330 cm		
Amaranthus undulatus	0.1	60 cm	BIL02-08	
Androcalva luteiflora	0.1	160 cm		
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	50 cm		
Aristida inaequiglumis	0.1	80 cm	BIL02-03	
Boerhavia coccinea	0.1	10 cm		
Cenchrus ciliaris	9	60 cm		
Cenchrus setiger	5	60 cm		
Cleome viscosa	0.1	40 cm		
Corchorus crozophorifolius	0.1	85 cm		
Corymbia hamersleyana	2	1600 cm		
Crotalaria medicaginea var. *neglecta*	0.1	45 cm		
Cucumis variabilis	0.1	60 cm	BIL02-05	
Cymbopogon procerus	4	180 cm		
Enneapogon lindleyanus	0.1	45 cm		
Enneapogon polyphyllus	0.1	35 cm		
Enneapogon robustissimus	0.1	80 cm	BIL02-12	
Eriachne pulchella	0.1	10 cm		
Eriachne tenuiculmis	0.1	70 cm		
Eucalyptus victrix	8	1600 cm		
Euphorbia australis var. *subtomentosa*	0.1	10 cm	BIL02-13	
Euphorbia coghlanii	0.1	30 cm	BIL02-11	
Evolvulus alsinoides var. *decumbens*	0.1	30 cm		
Gomphrena cunninghamii	0.1	25 cm		
Goodenia stobbsiana	0.1	25 cm		
Gossypium australe	0.1	110 cm		
Gossypium robinsonii	0.1	400 cm		
Grevillea wickhamii	0.1	410 cm	Sterile.	
Hybanthus aurantiacus	0.1	50 cm		
Jasminum didymum subsp. *lineare*	0.1	60 cm		
Paraneurachne muelleri	0.1	50 cm		
Petalostylis cassioides	0.1	120 cm	BIL02-09	
Polycarpaea longiflora	0.1	20 cm		
Ptilotus astrolasius	0.1	30 cm		
Ptilotus calostachyus	0.1	100 cm		
Salsola australis	0.1	20 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	80 cm	BIL02-06	Ferruginous form.
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	18	40 cm	BIL02-01	R. Butcher confirmed.
Themeda triandra	0.1	50 cm	BIL02-07	

Species	Cover (%)	Height	Specimen	Notes
Themeda triandra	2	110 cm		
Triodia pungens	0.1	45 cm	BIL02-04	
Triodia wiseana	0.1	35 cm		
Waltheria indica	0.1	70 cm		

Yandi Billiards Level 2 Site BIL03
Described by PLSV Date 18-Mar-14 Type Quadrat 42.5 x 60 m
MGA Zone 50 739032 mE 7477714 mN
Habitat Narrow crest on top of a hill sloping in all directions.
Soil 2.5YR 3/3 dark reddish brown sandy clay loam (skeletal).
Rock Type Ironstone cobbles (10%), pebbles (80%) and gravel (18%).
Vegetation *Senna artemisioides* subsp. *oligophylla*, *Ptilotus rotundifolius* scattered low shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *T. wiseana* open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia bivenosa	0.1	180 cm		
Acacia inaequilatera	0.1	80 cm		
Amphipogon sericeus	0.1	25 cm	BIL03-05	
Bulbostylis barbata	0.1	8 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	40 cm		
Eriachne pulchella	0.1	10 cm		
Fimbristylis dichotoma	0.1	15 cm		
Fimbristylis simulans	0.1	15 cm		
Goodenia stobbsiana	0.1	10 cm		
Grevillea wickhamii	0.1	35 cm		Sterile.
Mollugo molluginea	0.1	10 cm		
Polycarpaea holtzei	0.1	1 cm		
Ptilotus astrolasius	0.1	40 cm		
Ptilotus calostachyus	0.1	70 cm		
Ptilotus rotundifolius	0.5	90 cm		
Schizachyrium fragile	0.1	10 cm	BIL03-01	
Senna artemisioides subsp. *oligophylla*	1	80 cm	BIL03-04	
Senna artemisioides subsp. *oligophylla*	0.1	40 cm	BIL03-02	
Senna glutinosa subsp. *glutinosa*	0.1	150 cm		
Senna glutinosa subsp. *glutinosa* x subsp. *pruinosa*	0.1	120 cm		
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	90 cm		
Senna notabilis	0.1	1 cm		
Sida echinocarpa	0.1	50 cm	BIL03-03	
Tribulus suberosus	0.1	90 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	7	30 cm		
Triodia wiseana	6	35 cm		

Yandi Billiards Level 2 Site BIL04

Described by PLSV Date 10-Mar-14 Type Quadrat 50 x 50 m

MGA Zone 50 741466 mE 7481941 mN

Habitat Large hill / crest of range.

Soil Mostly absent.

Rock Type BIF, conglomerate of cobbles (10%), pebbles (80%), and gravel (10%), with outcropping.

Vegetation *Corymbia hamersleyana* scattered low trees over *Acacia arida* open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.

Veg Condition Excellent.

Fire Age Very long unburnt.

Species	Cover (%)	Height	Specimen	Notes
Acacia arida	4	170 cm	BIL04-01	
Acacia citrinoviridis	0.1	260 cm		
Acacia coriacea subsp. *pendens*	0.1	90 cm	BIL04-03	
Acacia pachyacra	0.1	110 cm		
Acacia synchronicia	0.1	220 cm		
Aristida holathera var. *holathera*	0.1	50 cm		
Corymbia hamersleyana	1	450 cm		
Cymbopogon obtectus	0.1	110 cm	BIL04-05	
Eriachne mucronata (arid form) (MET 12 736)	0.1	60 cm	BIL04-04	
Eriachne pulchella	0.1	20 cm		
Fimbristylis dichotoma	0.1	15 cm		
Goodenia stobbsiana	0.1	40 cm		
Petalostylis labicheoides	0.1	220 cm		
Ptilotus calostachyus	0.1	80 cm		
Schizachyrium fragile	0.1	30 cm	BIL04-06	
Senna glutinosa subsp. *glutinosa* x *S. stricta*	0.1	80 cm	BIL04-07	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	100 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	210 cm		
Solanum lasiophyllum	0.1	50 cm		
Solanum phlomoides	0.1	45 cm	BIL04-02	
Tribulus sp.	0.1	8 cm		Juvenile; sterile
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	13	45 cm		
Triodia wiseana	0.1	80 cm		

Yandi Billiards Level 2 Site BIL05
Described by SVSW Date 09-Mar-04 Type Quadrat 40 x 60 m
MGA Zone 50 741606 mE 7485529 mN
Habitat Northwest facing upper slope of hill.
Soil 2.5YR 2.5/4 dark reddish brown sandy loam.
Rock Type Ironstone shale cobbles, pebbles and gravel overlying bedrock (90% cover).
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) closed hummock grassland.
Veg Condition Very Good (**Cenchrus ciliaris*).
Fire Age No sign of recent fire.
Notes Site set up as 40 x 60 m due to old track at crest not allowing for 50 x 50 m.

Species	Cover (%)	Height	Specimen	Notes
Acacia bivenosa	0.1	220 cm		
Acacia pruinocarpa	0.1	150 cm		
Aristida holathera var. *holathera*	0.1	25 cm		
Cenchrus ciliaris	0.1	50 cm		
Digitaria brownii	0.1	60 cm	BIL05-05	
Eriachne mucronata (typical form)	0.1	40 cm		
Eriachne pulchella	0.1	10 cm		
Eucalyptus leucophloia subsp. *leucophloia*	6	400 cm		
Euphorbia boophthona	0.1	10 cm		
Fimbristylis dichotoma	0.1	30 cm	BIL05-02	
Fimbristylis simulans	0.1	10 cm		
Grevillea wickhamii	0.1	160 cm		Sterile.
Paraneurachne muelleri	0.1	40 cm		
Paspalidium clementii	0.1	10 cm	BIL05-06	
Salsola australis	0.1	20 cm		
Senna artemisioides subsp. *oligophylla*	0.1	70 cm	BIL05-04	
Senna glutinosa subsp. *glutinosa*	0.1	120 cm		
Senna glutinosa subsp. *pruinosa*	0.1	70 cm		
Solanum lasiophyllum	0.1	30 cm		
Triodia epactia	0.1	45 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	2	60 cm	BIL05-03	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	76	45 cm	BIL05-01	

Yandi Billiards Level 2				Site	BIL06
Described by	SVSW		Date	10-Mar-14	Type Quadrat 50 x 50 m
MGA Zone	50	741977 mE		7482836 mN	
Habitat	Gentle mid-slope of low range with north aspect.				
Soil	2.5YR 3/3 dark reddish brown sandy loam (skeletal).				
Rock Type	Ironstone cobbles (70%), pebbles (20%) and gravel (5%) overlying bedrock.				
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Acacia arida* tall shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland.				
Veg Condition	Excellent.				
Fire Age	No sign of recent fire.				
Notes	Surrounding slopes have been burnt recently.				

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	35 cm		
Acacia arida	29	270 cm	BIL06-03	
Eriachne lanata	0.1	40 cm	BIL06-02	
Eucalyptus leucophloia subsp. *leucophloia*	3	650 cm		
Fimbristylis simulans	0.1	15 cm		
Goodenia stobbsiana	0.1	20 cm		
Grevillea wickhamii	0.1	220 cm		Sterile.
Ptilotus astrolasius	0.1	25 cm		
Ptilotus calostachyus	0.1	30 cm		
Triodia pungens	0.1	30 cm	BIL06-01	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	45	40 cm		

Yandi Billiards Level 2				Site	BIL07
Described by	PLSV	Date	19-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	742387 mE	7483825 mN		

Habitat: Flat plain directly northwest of range.

Soil: Dark reddish brown fine sandy loam.

Rock Type: Discontinuous ironstone scree of cobbles (5%), pebbles (10%) and gravel (40%).

Vegetation: *Corymbia hamersleyana* scattered low trees over *Acacia pruinocarpa*, (*A. citrinoviridis, Atalaya hemiglauca*) tall open shrubland over *Scaevola spinescens, Corchorus sidoides* subsp. *sidoides*, *Ptilotus obovatus* low open shrubland over *Triodia pungens* open hummock grassland with **Cenchrus ciliaris, *C. setiger* very open tussock grassland.

Veg Condition: Good (**Cenchrus ciliaris*).

Fire Age: Very long unburnt.

Notes: Elevation: 463 m.

Species	Cover (%)	Height	Specimen	Notes
Abutilon sp. Pilbara (W.R. Barker 2025)	0.1	50 cm		
Acacia citrinoviridis	1	250 cm		
Acacia pruinocarpa	4	450 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	140 cm		
Acacia tenuissima	0.1	170 cm		
Aristida contorta	0.1	15 cm		
Atalaya hemiglauca	1	300 cm		
Boerhavia coccinea	0.1	30 cm	BIL07-11	
Boerhavia coccinea	0.1	30 cm		
Bulbostylis barbata	0.1	6 cm		
Cenchrus ciliaris	2	50 cm		N=150.
Cenchrus setiger	0.5	80 cm		N=20.
Chrysopogon fallax	0.1	90 cm		
Cleome viscosa	0.1	50 cm		
Corchorus sidoides subsp. *sidoides*	1	40 cm	BIL07-04	
Corchorus tridens	0.1	10 cm		
Corymbia hamersleyana	1	550 cm		
Crotalaria medicaginea var. *neglecta*	0.1	25 cm		
Dactyloctenium radulans	0.1	15 cm		
Digitaria ctenantha	0.1	40 cm		
Dysphania sp.	0.1	3 cm		Sterile.
Enneapogon caerulescens	0.1	25 cm		
Enneapogon polyphyllus	0.1	20 cm		
Eragrostis eriopoda	0.1	40 cm		
Eremophila longifolia	0.1	140 cm		
Eriachne pulchella	0.1	15 cm		
Euphorbia australis var. *subtomentosa*	0.1	5 cm	BIL07-02	
Euphorbia trigonosperma	0.1	15 cm	BIL07-06	
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Goodenia prostrata	0.1	3 cm		
Gossypium australe	0.1	160 cm		
Heliotropium inexplicitum	0.1	15 cm	BIL07-10	
Hibiscus sturtii var. *platychlamys*	0.1	45 cm		
Indigofera colutea	0.1	10 cm		
Indigofera linifolia	0.1	25 cm		
Melhania oblongifolia	0.1	30 cm		
Paspalidium clementii	0.1	10 cm	BIL07-07	
Perotis rara	0.1	20 cm		
Portulaca oleracea/intraterranea	0.1	7 cm	BIL07-03	
Ptilotus obovatus var. *obovatus*	0.5	60 cm		
Rhynchosia minima	0.1	30 cm		
Salsola australis	0.1	15 cm		
Scaevola spinescens	1	90 cm		Broad form.
Senna artemisioides subsp. *helmsii*	0.1	40 cm		
Senna artemisioides subsp. *oligophylla*	0.5	140 cm	BIL07-13	
Senna glutinosa subsp. *glutinosa*	0.1	150 cm		

Species	Cover (%)	Height	Specimen	Notes
Senna notabilis	0.1	10 cm		
Sida fibulifera	0.1	30 cm	BIL07-08	
Sida arsiniata	0.1	40 cm	BIL07-05	
Sida echinocarpa	0.1	50 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	25 cm		
Solanum lasiophyllum	0.1	45 cm		
Sporobolus australasicus	0.1	15 cm		
Swainsona maccullochiana	0.1	20 cm	BIL07-12	
Tragus australianus	0.1	20 cm		
Tribulus astrocarpus	0.1	10 cm		
Tribulus terrestris	0.1	15 cm	BIL07-09	
Triodia pungens	11	50 cm	BIL07-01	
Waltheria indica	0.1	10 cm		

Yandi Billiards Level 2 Site BIL08

Described by PLCA Date 10-Mar-14 Type Quadrat 50 x 50 m

MGA Zone 50 743243 mE 7484047 mN

Habitat Gently sloping plain to the north of range.

Soil Dark reddish brown sandy loam.

Rock Type BIF, ironstone cobbles (10%), pebbles (80%) and gravel (10%).

Vegetation *Grevillea wickhamii* subsp. *hispidula*, *Acacia pruinocarpa*, *A. ancistrocarpa* tall open shrubland over *Bonamia erecta, Senna artemisioides* subsp. *oligophylla*, *Corchorus tectus* low open shrubland over *Triodia basedowii* open hummock grassland.

Veg Condition Excellent.

Fire Age Very long unburnt.

Notes Elevation: 478 m.
Scattered *Eucalyptus leucophloia* and *Corymbia hamersleyana* in the surrounding area.

Species	Cover (%)	Height	Specimen
Acacia adoxa var. *adoxa*	0.1	40 cm	
Acacia ancistrocarpa	1	200 cm	BIL08-08
Acacia dictyophleba	0.1	160 cm	
Acacia pachyacra	0.1	40 cm	
Acacia pruinocarpa	1	210 cm	
Aristida holathera var. *holathera*	0.1	30 cm	
Aristida inaequiglumis	0.1	80 cm	BIL08-09
Bonamia erecta	2	70 cm	
Cleome viscosa	0.1	40 cm	
Corchorus tectus	0.5	40 cm	BIL08-06
Cymbopogon obtectus	0.1	90 cm	BIL08-03
Dampiera candicans	0.1	35 cm	
Dicrastylis cordifolia	0.1	50 cm	
Dodonaea coriacea	0.1	20 cm	
Eragrostis eriopoda	0.1	30 cm	
Goodenia microptera	0.1	40 cm	
Gossypium australe	0.1	140 cm	
Grevillea wickhamii subsp. *hispidula*	2	420 cm	BIL08-07
Hakea chordophylla	0.1	30 cm	
Heliotropium pachyphyllum	0.1	25 cm	BIL08-02
Hybanthus aurantiacus	0.1	45 cm	
Indigofera monophylla	0.1	35 cm	
Paraneurachne muelleri	0.1	40 cm	
Ptilotus obovatus var. *obovatus*	0.1	40 cm	
Senna artemisioides subsp. *helmsii*	0.1	100 cm	
Senna artemisioides subsp. *oligophylla*	0.5	90 cm	BIL08-04, -10
Senna glutinosa subsp. *pruinosa*	0.1	210 cm	
Senna glutinosa subsp. *x luerssenii*	0.1	150 cm	
Senna notabilis	0.1	3 cm	
Sida arenicola	0.1	110 cm	
Sida cardiophylla	0.1	80 cm	BIL08-05
Sida echinocarpa	0.1	70 cm	
Solanum lasiophyllum	0.1	110 cm	
Tribulus macrocarpus	0.1	20 cm	
Triodia basedowii	13	45 cm	BIL08-01

Yandi Billiards Level 2				Site	BIL09
Described by	PLCA	Date	10-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	742906 mE	7484298 mN		
Habitat	Floodplain.				
Soil	Dark red brown sandy loam.				
Rock Type	Ironstone cobbles (10%), pebbles (20%), and gravel (40%).				
Vegetation	*Corymbia hamersleyana* scattered low trees over *Acacia sclerosperma* subsp. *sclerosperma*, *A. pruinocarpa*, *A. pyrifolia* var. *pyrifolia* tall open shrubland over *Triodia pungens* open hummock grassland with **Cenchrus ciliaris* very open tussock grassland.				
Veg Condition	Good (**Cenchrus ciliaris, *Setaria verticillata*).				
Fire Age	No sign of recent fire.				
Notes	Elevation: 461 m.				

Species	Cover (%)	Height	Specimen	Notes
Abutilon leucopetalum	0.1	40 cm	BIL09-04	
Abutilon otocarpum	0.1	50 cm		
Acacia citrinoviridis	0.1	250 cm		
Acacia pruinocarpa	1	420 cm		
Acacia pyrifolia var. *pyrifolia*	1	400 cm		
Acacia sclerosperma subsp. *sclerosperma*	3	300 cm		
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	50 cm		
Atalaya hemiglauca	0.1	250 cm		
Boerhavia coccinea	0.1	10 cm		
Cenchrus ciliaris	4	60 cm		N=400.
Chrysopogon fallax	0.1	150 cm		
Cleome viscosa	0.1	60 cm		
Corchorus sidoides subsp. *sidoides*	0.1	40 cm		
Corymbia hamersleyana	2	750 cm		
Cucumis variabilis	0.1	40 cm		
Duperreya commixta	0.1	100 cm		
Enneapogon caerulescens	0.1	30 cm	BIL09-10	
Eragrostis eriopoda	0.1	40 cm		
Eremophila longifolia	0.1	200 cm		
Euphorbia australis var. *subtomentosa*	0.1	10 cm	BIL09-06	
Euphorbia trigonosperma	0.1	40 cm	BIL09-03	
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Heliotropium inexplicitum	0.1	10 cm	BIL09-09	
Hibiscus sturtii var. *platychlamys*	0.1	60 cm		
Indigofera colutea	0.1	20 cm		
Mollugo molluginea	0.1	20 cm		
Paraneurachne muelleri	0.1	70 cm		
Portulaca oleracea/intraterranea	0.1	8 cm	BIL09-11	
Rhynchosia minima	0.1	80 cm		
Senna artemisioides subsp. *helmsii*	0.1	120 cm		
Senna artemisioides subsp. *oligophylla*	0.1	120 cm	BIL09-05	
Setaria verticillata	0.1	60 cm		N=6.
Sida arsiniata	0.1	20 cm	BIL09-14; -15	
Sida echinocarpa	0.1	60 cm	BIL09-07	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	10 cm	BIL09-13	
Solanum lasiophyllum	0.1	30 cm		
Tephrosia supina	0.1	20 cm	BIL09-12	R. Butcher confirmed.
Trianthema pilosa	0.1	5 cm		
Tribulus astrocarpus	0.1	10 cm		
Tribulus macrocarpus	0.1	20 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	5 cm		
Triodia basedowii	0.1	30 cm		
Triodia pungens	15	40 cm	BIL09-01	

Yandi Billiards Level 2			Site	BIL10	
Described by	SVSW	Date	09-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	741889 mE	7484348 mN		
Habitat	Flat plain.				
Soil	2.5YR 2.5/4 dark reddish brown sandy clay.				
Rock Type	Nil.				
Vegetation	*Acacia pruinocarpa, Atalaya hemiglauca, Acacia inaequilatera, Acacia sclerosperma* subsp. *sclerosperma* tall open shrubland over *Triodia epactia* hummock grassland with **Cenchrus ciliaris, *C. setiger* very open tussock grassland.				
Veg Condition	Good (**Cenchrus* spp.).				
Fire Age	No sign of recent fire.				
Notes	Elevation: 467 m.				

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	100 cm	BIL10-06	M Trudgen confirmed.
Acacia inaequilatera	1	310 cm		
Acacia pruinocarpa	3	310 cm		
Acacia sclerosperma subsp. *sclerosperma*	1	220 cm		
Atalaya hemiglauca	2	240 cm		
Boerhavia coccinea	0.1	10 cm	BIL10-02	
Bothriochloa ewartiana	0.1	70 cm		
Cenchrus ciliaris	5	45 cm		N=100.
Cenchrus setiger	1	45 cm		N=10.
Chrysopogon fallax	0.1	120 cm		
Cleome viscosa	0.1	30 cm		
Corchorus sidoides subsp. *sidoides*	0.1	40 cm	BIL10-05	
Crotalaria medicaginea var. *neglecta*	0.1	15 cm		
Duperreya commixta	0.1	450 cm		
Eragrostis eriopoda	0.1	40 cm		
Eragrostis tenellula	0.1	15 cm		
Euphorbia biconvexa	0.1	10 cm	BIL10-10	
Glycine canescens	0.1	10 cm	BIL10-03	
Goodenia microptera	0.1	20 cm		
Gossypium australe	0.1	120 cm		
Hakea lorea subsp. *lorea*	0.1	580 cm		
Hibiscus sturtii var. *platychlamys*	0.1	20 cm	BIL10-07	
Hybanthus aurantiacus	0.1	10 cm		
Indigofera colutea	0.1	25 cm	BIL10-01	
Indigofera linifolia	0.1	20 cm		
Iseilema membranaceum	0.1	25 cm	BIL10-09	
Perotis rara	0.1	10 cm		
Polymeria ambigua	0.1	10 cm	BIL10-08	
Ptilotus obovatus var. *obovatus*	0.1	45 cm		
Rhagodia eremaea	0.1	100 cm		
Rhynchosia minima	0.1	60 cm		
Senna artemisioides subsp. *helmsii*	0.1	40 cm		
Senna artemisioides subsp. *oligophylla*	0.1	100 cm	BIL10-04	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	60 cm	BIL10-13	
Senna glutinosa subsp. *glutinosa*	0.1	220 cm		
Sida echinocarpa	0.1	70 cm		
Solanum lasiophyllum	0.1	100 cm		
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.1	25 cm		
Tephrosia supina	0.1	30 cm	BIL10-12	R. Butcher confirmed.
Tribulus macrocarpus	0.1	20 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	100 cm		
Triodia epactia	65	60 cm		

Yandi Billiards Level 2 Site BIL11
Described by PLCA Date 11-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 737787 mE 7481504 mN
Habitat Drainage plain.
Soil Dark red brown fine sandy loam with patches of sandy clay loam in low areas.
Rock Type Not recorded. 1% pebbles, 40% gravel.
Vegetation *Corymbia hamersleyana, Eucalyptus gamophylla* low open woodland over *Gossypium robinsonii, Acacia adsurgens, A. citrinoviridis* tall open shrubland over *Acacia ancistrocarpa, A. dictyophleba, A. tenuissima, Petalostylis cassioides* open shrubland over *Bonamia erecta* low open shrubland over *Triodia basedowii, T. pungens* very open hummock grassland over *Aristida holathera* var. *holathera*, *Paraneurachne muelleri* very open tussock grassland.
Veg Condition Very Good (**Setaria verticillata*, scats).
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon otocarpum	0.1	40 cm		
Acacia adoxa var. *adoxa*	0.1	80 cm		
Acacia adsurgens	1	210 cm		
Acacia ancistrocarpa	5	170 cm		
Acacia citrinoviridis	1	210 cm		
Acacia dictyophleba	2	170 cm		
Acacia elachantha	0.1	250 cm	BIL11-13	
Acacia inaequilatera	0.1	270 cm		
Acacia pruinocarpa	0.1	230 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	160 cm		
Acacia tenuissima	1	140 cm		
Acacia tumida var. *pilbarensis*	0.1	210 cm		
Aristida holathera var. *holathera*	1	40 cm		
Boerhavia coccinea	0.1	30 cm		
Bonamia erecta	2	70 cm		
Chrysopogon fallax	0.1	110 cm		
Cleome viscosa	0.1	60 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	60 cm		
Corchorus tectus	0.1	40 cm	BIL11-02	M Trudgen confirmed.
Corchorus tridens	0.1	20 cm		
Corymbia hamersleyana	2	850 cm		
Cucumis variabilis	0.1	110 cm		
Dicrastylis cordifolia	0.1	60 cm		
Digitaria brownii	0.1	100 cm		
Duperreya commixta	0.1	150 cm		
Dysphania sp.	0.1	5 cm		Sterile.
Enneapogon lindleyanus	0.1	60 cm	BIL11-10	
Enneapogon polyphyllus	0.1	40 cm	BIL11-12	
Eragrostis eriopoda	0.1	40 cm	BIL11-03	
Eremophila forrestii subsp. *forrestii*	0.1	100 cm		
Eremophila longifolia	0.1	170 cm		
Eriachne mucronata (typical form)	0.1	40 cm		
Eucalyptus gamophylla	2	400 cm		
Eulalia sp. (Three Rivers Station, B.Forsyth AQ6789133)	0.1	60 cm	BIL11-11	
Euphorbia australis var. *hispidula*	0.1	20 cm	BIL11-06	
Euphorbia biconvexa/coghlanii/trigonosperma	0.1	40 cm		Sterile.
Evolvulus alsinoides var. *villosicalyx*	0.1	30 cm		
Gomphrena cunninghamii	0.1	20 cm		
Gossypium robinsonii	1	320 cm		
Hibiscus burtonii	0.1	60 cm	BIL11-04	
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		
Indigofera georgei	0.1	60 cm		
Indigofera monophylla	0.1	60 cm	BIL11-08	
Iseilema membranaceum	0.1	25 cm	BIL11-09	

Species	Cover (%)	Height	Specimen	Notes
Paraneurachne muelleri	1	40 cm		
Paspalidium rarum	0.1	25 cm		
Petalostylis cassioides	7	160 cm	BIL12-17=	
Ptilotus astrolasius	0.1	40 cm		
Ptilotus obovatus var. *obovatus*	0.1	60 cm		
Rhyncharrhena linearis	0.1	80 cm		
Rhynchosia minima	0.1	40 cm		
Scaevola parvifolia subsp. *pilbarae*	0.1	50 cm		
Senna artemisioides subsp. *oligophylla*	0.1	100 cm		
Senna artemisioides subsp. *oligophylla*	0.1	60 cm	BIL11-07	
Senna notabilis	0.1	20 cm		
Setaria verticillata	0.1	90 cm		N=7.
Sida cardiophylla	0.1	80 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	30 cm		
Solanum phlomoides	0.1	40 cm		
Themeda triandra	0.1	100 cm		
Tribulopis angustifolia	0.1	30 cm	BIL11-05	
Tribulus macrocarpus	0.1	20 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	120 cm		
Triodia basedowii	7	40 cm		
Triodia pungens	1	40 cm	BIL11-01	

Yandi Billiards Level 2				Site	BIL12
Described by	PLCA	Date	11-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	738219 mE	7482604 mN		
Habitat	Broad drainage plain/valley.				
Soil	Dark reddish brown fine sandy loam.				
Rock Type	Scattered ironstone pebbles (3%) and gravel (2%).				
Vegetation	*Corymbia hamersleyana* scattered low trees over *Acacia pyrifolia* var. *pyrifolia* (*A. tumida* var. *pilbarensis*, *Gossypium robinsonii, Petalostylis cassioides*) tall shrubland over *Triodia pungens* very open hummock grassland with **Cenchrus ciliaris, *C. setiger* open tussock grassland.				
Veg Condition	Good (**Cenchrus* spp., cattle scats).				
Fire Age	Very long unburnt.				
Notes	**Cenchrus* spp. extends throughout this vegetation unit.				

Species	Cover	Height	Specimen	Notes
Abutilon otocarpum	0.1	40 cm		
Acacia maitlandii	0.1	50 cm		
Acacia pyrifolia var. *pyrifolia*	7	220 cm		
Acacia spondylophylla	0.1	40 cm		
Acacia tumida var. *pilbarensis*	2	220 cm		
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	45 cm		
Atalaya hemiglauca	0.1	140 cm		
Boerhavia coccinea	0.1	40 cm		
Bonamia erecta	0.1	40 cm		
Cenchrus ciliaris	14	80 cm		
Cenchrus setiger	4	90 cm		
Cleome viscosa	0.1	50 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	70 cm		
Corchorus tectus	0.1	40 cm	BIL12-12	M Trudgen confirmed.
Corchorus tridens	0.1	25 cm	BIL12-03	
Corymbia hamersleyana	1.5	700 cm		
Crotalaria medicaginea var. *neglecta*	0.1	45 cm		
Cucumis variabilis	0.1	90 cm		
Eragrostis eriopoda	0.1	40 cm	BIL12-20	
Euphorbia australis var. *subtomentosa*	0.1	15 cm	BIL12-22	
Euphorbia trigonosperma	0.1	60 cm	BIL12-18	
Evolvulus alsinoides var. *decumbens*	0.1	20 cm	BIL12-21	
Evolvulus alsinoides var. *villosicalyx*	0.1	25 cm		
Gomphrena cunninghamii	0.1	15 cm		
Goodenia microptera	0.1	40 cm		
Gossypium australe	0.1	80 cm		
Gossypium robinsonii	2	210 cm		
Grevillea wickhamii subsp. *hispidula*	1	230 cm	BIL12-09	
Heliotropium cunninghamii	0.1	25 cm	BIL12-11	
Hibiscus sturtii var. *campylochlamys*	0.1	35 cm	BIL12-19	
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		
Hybanthus aurantiacus	0.1	45 cm		
Indigofera georgei	0.1	60 cm	BIL12-23	
Indigofera linifolia	0.1	30 cm		
Melhania oblongifolia	0.1	50 cm	BIL12-06	
Mollugo molluginea	0.1	20 cm		
Paraneurachne muelleri	0.1	40 cm		
Paspalidium rarum	0.1	30 cm	BIL12-15	
Perotis rara	0.1	10 cm		
Petalostylis cassioides	2	220 cm	BIL12-17	
Polycarpaea corymbosa var. *corymbosa*	0.1	25 cm	BIL12-04	
Polymeria ambigua	0.1	20 cm	BIL12-14	
Portulaca intraterranea	0.1	15 cm	BIL12-13	Seeds different. ID to be confirmed.
Ptilotus astrolasius	0.1	50 cm		

Species	Cover	Height	Specimen	Notes
Ptilotus nobilis subsp. *nobilis*	0.1	40 cm		
Salsola australis	0.1	30 cm		
Senna artemisioides subsp. *helmsii*	0.1	50 cm		
Senna artemisioides subsp. *oligophylla*	0.1	80 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	70 cm	BIL12-08	
Senna notabilis	0.1	20 cm		
Sida fibulifera	0.1	30 cm	BIL12-10	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	130 cm		
Sida sp. verrucose glands (F.H. Mollemans	0.1	35 cm	BIL12-01	
2423)				
Solanum lasiophyllum	0.1	40 cm		
Solanum phlomoides	0.1	50 cm		
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.1	60 cm		
Trianthema pilosa	0.1	25 cm		
Tribulus macrocarpus	0.1	25 cm		
Triodia pungens	2	40 cm	BIL12-02	
Triraphis mollis	0.1	30 cm	BIL12-05	
Waltheria indica	0.1	60 cm		
Yakirra australiensis var. *australiensis*	0.1	25 cm	BIL12-16	

Yandi Billiards Level 2				Site	BIL13
Described by	SVSW		Date 12-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	736228 mE	7479850 mN		

Habitat: Colluvial plain between two low lying undulating hill ranges.

Soil: 5YR 3/3 dark reddish brown sandy loam.

Rock Type: Ironstone cobbles (20%), pebbles (30%), and gravel (20%).

Vegetation: *Corymbia hamersleyana* scattered low trees over *Acacia citrinoviridis*, *A. inaequilatera* scattered tall shrubs over *Indigofera monophylla, Ptilotus astrolasius*, *Senna artemisioides* subsp. *oligophylla* low open shrubland over *Triodia basedowii* open hummock grassland.

Veg Condition: Very Good (**Cenchrus ciliaris*).

Fire Age: No sign of recent fire.

Notes: Elevation: 500 m.
Greater plain dissected by minor drainages/flowlines of *Acacia tumida*, *A. citrinoviridis, Gossypium robinsonii, Eucalyptus gamophylla*.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	45 cm		
Acacia bivenosa (wispy/weeping form)	0.1	180 cm		
Acacia citrinoviridis	1	460 cm		
Acacia inaequilatera	0.5	240 cm		
Acacia tumida var. *pilbarensis*	0.1	220 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Boerhavia coccinea	0.1	5 cm		
Cenchrus ciliaris	0.1	60 cm		N=2.
Cleome viscosa	0.1	15 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	25 cm	BIL13-04	M Trudgen confirmed.
Corymbia hamersleyana	1	460 cm		
Cymbopogon obtectus	0.1	100 cm		
Dodonaea coriacea	0.1	80 cm		
Eragrostis eriopoda	0.1	40 cm		
Eriachne pulchella	0.1	20 cm		
Euphorbia australis var. *hispidula*	0.1	12 cm	BIL13-08	
Goodenia stobbsiana	0.1	20 cm		
Grevillea wickhamii	0.1	220 cm		Sterile.
Hakea chordophylla	0.1	410 cm		
Hybanthus aurantiacus	0.1	15 cm		
Indigofera monophylla	0.1	15 cm		
Indigofera monophylla	1	70 cm	BIL13-01	
Jasminum didymum subsp. *lineare*	0.1	200 cm		
Mollugo molluginea	0.1	15 cm		
Paraneurachne muelleri	0.1	80 cm		
Polymeria ambigua	0.1	25 cm	BIL13-07	
Ptilotus astrolasius	0.5	35 cm		
Ptilotus calostachyus	0.1	45 cm		
Ptilotus clementii	0.1	10 cm	BIL13-09	
Ptilotus nobilis subsp. *nobilis*	0.1	15 cm		
Senna artemisioides subsp. *oligophylla*	0.5	90 cm	BIL13-03	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	30 cm	BIL13-06	
Sida arenicola	0.1	20 cm	BIL13-11	
Sida cardiophylla	0.1	45 cm	BIL13-10	
Solanum lasiophyllum	0.1	10 cm		
Triodia basedowii	22	40 cm	BIL13-02	
Triodia pungens	0.1	70 cm	BIL13-05	

Yandi Billiards Level 2 Site BIL14
Described by PLCA Date 12-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 737046 mE 7480946 mN
Habitat Broad plain with some drainage.
Soil Dark reddish brown fine sandy loam.
Rock Type Scattered ironstone boulders, cobbles, pebbles, and gravel with ?basalt outcropping mid-quadrat.
Vegetation *Corymbia hamersleyana* low open woodland over *Acacia tumida* var. *pilbarensis, Petalostylis cassioides, Senna artemisioides* subsp. *oligophylla* x subsp. *helmsii* open shrubland over *Triodia basedowii, T. pungens* very open hummock grassland.
Veg Condition Very Good (**Cenchrus* spp. and evidence of cattle).
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	60 cm		
Acacia adsurgens	0.1	90 cm		
Acacia ancistrocarpa	0.1	50 cm		
Acacia bivenosa (wispy/weeping form)	0.1	200 cm		
Acacia citrinoviridis	0.1	150 cm		
Acacia dictyophleba	0.1	80 cm		
Acacia elachantha	0.1	190 cm		
Acacia inaequilatera	0.1	230 cm		
Acacia pachyacra	0.1	170 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	40 cm		
Acacia tenuissima	0.1	140 cm		
Acacia tumida var. *pilbarensis*	3	190 cm		
Aristida holathera var. *holathera*	0.1	50 cm		
Aristida hygrometrica	0.1	20 cm	BIL14-09	
Aristida inaequiglumis	1	110 cm	BIL14-13	
Boerhavia coccinea	0.1	10 cm		
Bonamia erecta	0.1	40 cm		
Cenchrus ciliaris	0.1	40 cm		N=50.
Cleome viscosa	0.1	60 cm		
Corchorus tectus	1	50 cm	BIL14-03	
Corchorus tridens	0.1	5 cm	BIL14-12	
Corymbia hamersleyana	4	700 cm		
Crotalaria medicaginea var. *neglecta*	0.1	50 cm		
Dicrastylis cordifolia	0.1	40 cm		
Eragrostis eriopoda	0.1	40 cm		
Eriachne aristidea	0.1	50 cm		
Euphorbia australis var. *subtomentosa*	0.1	20 cm	BIL14-14	
Euphorbia biconvexa	0.1	10 cm	BIL14-08	
Euphorbia tannensis subsp. *eremophila*	0.1	20 cm	BIL14-10	
Evolvulus alsinoides var. *villosicalyx*	0.1	25 cm		
Gomphrena affinis subsp. *pilbarensis*	0.1	30 cm	BIL14-18	
Goodenia microptera	0.1	25 cm		
Gossypium australe	0.1	60 cm		
Gossypium robinsonii	0.1	140 cm		
Grevillea wickhamii	0.1	80 cm		Sterile.
Hakea chordophylla	0.1	140 cm		
Hakea lorea subsp. *lorea*	0.1	140 cm		
Hibiscus sturtii var. *platychlamys*	0.1	60 cm		
Hybanthus aurantiacus	0.1	60 cm		
Indigofera monophylla	0.1	40 cm	BIL14-06	
Melhania oblongifolia	0.1	20 cm		
Paraneurachne muelleri	0.1	40 cm		
Paspalidium rarum	0.1	10 cm	BIL14-15	
Petalostylis cassioides	2	160 cm		
Polymeria ambigua	0.1	5 cm	BIL14-04	
Portulaca oleracea/intraterranea	0.1	5 cm	BIL14-17	
Ptilotus astrolasius	0.1	40 cm		

Ptilotus nobilis subsp. *nobilis*	0.1	40 cm		
Ptilotus obovatus var. *obovatus*	0.1	30 cm		
Rhagodia eremaea	0.1	110 cm		
Rhynchosia minima	0.1	120 cm		
Salsola australis	0.1	30 cm		
Scaevola parvifolia subsp. *pilbarae*	0.1	35 cm		
Senna artemisioides subsp. *oligophylla*	0.1	50 cm	BIL14-02	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	1	120 cm	BIL14-16	
Senna notabilis	0.1	20 cm		
Sida cardiophylla	0.1	70 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	30 cm	BIL14-07	Intermediate form.
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	30 cm	BIL14-11	Ferruginous form.
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	20 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	20 cm		
Themeda triandra	0.1	90 cm		
Trianthema pilosa	0.1	10 cm		
Tribulopis angustifolia	0.1	30 cm		
Triodia basedowii	7	40 cm		
Triodia pungens	2	30 cm	BIL14-01	
Waltheria indica	0.1	20 cm		
Yakirra australiensis var. *australiensis*	0.1	10 cm	BIL14-05	

Yandi Billiards Level 2				Site	BIL15
Described by	PLSV	Date	18-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	737714 mE	7476807 mN		
Habitat	Hill slope up to crest in a broader area of ranges to the east of major drainage.				
Soil	Dark reddish brown sandy loam.				
Rock Type	BIF, ironstone cobbles (20%), pebbles (60%) and gravel (20%).				
Vegetation	*Acacia inaequilatera* scattered tall shrubs over *Indigofera monophylla*, *Ptilotus astrolasius, P. rotundifolius* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), (*T. wiseana*) open hummock grassland.				
Veg Condition	Excellent.				
Fire Age	Burnt 3-5 years ago.				
Notes	Elevation: 526 m.				

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	30 cm		
Acacia inaequilatera	1	300 cm		
Acacia pruinocarpa	0.1	50 cm		
Amphipogon sericeus	0.1	30 cm	BIL15-05	
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	15 cm		
Cleome viscosa	0.1	5 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	50 cm	BIL15-02	M Trudgen confirmed.
Dampiera candicans	0.1	40 cm		
Dodonaea coriacea	0.1	30 cm		
Eriachne pulchella	0.1	10 cm		
Evolvulus alsinoides	0.1	20 cm		
Fimbristylis dichotoma	0.1	20 cm		
Fimbristylis simulans	0.1	15 cm		
Goodenia microptera	0.1	20 cm		
Goodenia stobbsiana	0.1	35 cm		
Grevillea wickhamii	0.1	70 cm		Sterile.
Hakea chordophylla	0.1	190 cm		
Heliotropium pachyphyllum	0.1	20 cm	BIL15-03	
Heliotropium tenuifolium	0.1	25 cm	BIL15-04	
Indigofera monophylla	2	40 cm	BIL15-01	
Isotropis atropurpurea	0.1	30 cm		
Mollugo molluginea	0.1	25 cm		
Paraneurachne muelleri	0.1	40 cm		
Ptilotus astrolasius	0.5	30 cm		
Ptilotus calostachyus	0.1	50 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	10 cm		
Ptilotus rotundifolius	0.5	50 cm		
Senna artemisioides subsp. *helmsii*	0.1	45 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	15 cm		
Senna glutinosa subsp. *glutinosa*	0.1	160 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	40 cm		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	35 cm		
Solanum lasiophyllum	0.1	40 cm		
Solanum phlomoides	0.1	50 cm		
Tephrosia supina	0.1	20 cm	BIL15-06	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	12	30 cm		
Triodia wiseana	0.5	30 cm		

Yandi Billiards Level 2 Site BIL16
Described by CEFCASW Date 18-Mar-14 Type Quadrat 25 x 100 m
MGA Zone 50 737409 mE 7476202 mN
Habitat Minor flow lines and banks of meandering incised drainage line (approx. 2.5 m wide).
Soil Dark reddish brown sandy loam.
Rock Type Bank - ironstone cobbles (10%), pebbles (15%), and gravel (15%); Bed - riverstone mix (100%).
Vegetation *Eucalyptus gamophylla, Corymbia hamersleyana* low open woodland over *Acacia tumida* var. *pilbarensis*, *A. pyrifolia* var. *pyrifolia*, *Grevillea wickhamii* subsp. *hispidula*, *Gossypium robinsonii* tall shrubland over *Triodia pungens* open hummock grassland over **Cenchrus ciliaris*, *Themeda triandra*, *Paraneurachne muelleri, Bothriochloa ewartiana* open tussock grassland.
Veg Condition Good (**Cenchrus ciliaris, *Setaria verticillata, *Bidens bipinnata, *Malvastrum americanum*).
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon amplum	0.1	150 cm	BIL16-39	
Abutilon macrum	0.1	10 cm	BIL16-09	
Abutilon otocarpum	0.1	70 cm		
Acacia adoxa var. *adoxa*	0.1	50 cm		
Acacia ancistrocarpa	0.1	300 cm		
Acacia bivenosa	0.1	200 cm		
Acacia dictyophleba	0.1	320 cm		
Acacia pyrifolia var. *pyrifolia*	3	350 cm		
Acacia spondylophylla	0.1	120 cm	BIL16-40	
Acacia tenuissima	0.1	150 cm	BIL16-38	
Acacia tumida var. *pilbarensis*	11	250 cm	BIL16-02	
Alternanthera nana	0.1	10 cm	BIL16-12	
Androcalva luteiflora	0.1	210 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Aristida pruinosa	1	150 cm	BIL16-26	
Bidens bipinnata	0.1	20 cm	N=1000.	
Boerhavia coccinea	0.1	10 cm	BIL16-07	
Bonamia erecta	0.1	20 cm		
Bothriochloa ewartiana	1	60 cm		
Bulbostylis barbata	0.1	10 cm	BIL16-20	
Cenchrus ciliaris	15	60 cm		
Cleome viscosa	0.1	60 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	40 cm	BIL16-17	M Trudgen confirmed.
Corchorus tridens	0.1	10 cm		
Corymbia hamersleyana	1	420 cm		
Crotalaria medicaginea var. *neglecta*	0.1	40 cm	BIL16-06	
Cucumis variabilis	0.1	120 cm		
Cymbopogon ambiguus	0.1	80 cm		
Cymbopogon obtectus	0.1	80 cm		
Digitaria brownii	0.1	70 cm	BIL16-04	
Digitaria ctenantha	0.1	60 cm	BIL16-08	
Duperreya commixta	0.1	400 cm		
Dysphania melanocarpa forma *melanocarpa*	0.1	20 cm	BIL16-32	
Enneapogon caerulescens	0.1	15 cm	BIL16-16	
Enneapogon lindleyanus	0.1	60 cm	BIL16-35	
Enneapogon polyphyllus	0.1	30 cm		
Eragrostis cumingii	0.1	20 cm		
Eriachne mucronata (typical form)	0.1	60 cm	BIL16-25	
Eucalyptus gamophylla	2	300 cm		
Euphorbia australis var. *subtomentosa*	0.1	30 cm	BIL16-22	
Euphorbia biconvexa	0.1	30 cm	BIL16-42	
Evolvulus alsinoides var. *decumbens*	0.1	20 cm		

Species	Cover (%)	Height	Specimen	Notes
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Gomphrena cunninghamii	0.1	20 cm	BIL16-36	
Goodenia muelleriana	0.1	60 cm	BIL16-14	
Goodenia stobbsiana	0.1	40 cm		
Gossypium australe	0.1	160 cm		
Gossypium robinsonii	2	480 cm		
Grevillea wickhamii subsp. *hispidula*	3	480 cm	BIL16-01	
Hibiscus sturtii var. *platychlamys*	0.1	30 cm		
Hybanthus aurantiacus	0.1	40 cm		
Hybanthus aurantiacus	0.1	20 cm	BIL16-18	
Indigofera colutea	0.1	40 cm	BIL16-27	
Indigofera georgei	0.1	40 cm	BIL16-41	
Iseilema membranaceum	0.1	15 cm	BIL16-23	
Isotropis atropurpurea	0.1	30 cm	BIL16-33	
Jasminum didymum subsp. *lineare*	0.1	210 cm		
Malvastrum americanum	0.1	30 cm		N=70.
Melhania oblongifolia	0.1	35 cm		
Mollugo molluginea	0.1	20 cm		
Notoleptopus decaisnei var. *decaisnei*	0.1	20 cm	BIL16-19	
Paraneurachne muelleri	2	60 cm		
Paspalidium rarum	0.1	10 cm	BIL16-13	
Perotis rara	0.1	10 cm		
Petalostylis cassioides	0.1	220 cm		
Pluchea dunlopii	0.1	60 cm	BIL16-30	
Polycarpaea corymbosa var. *corymbosa*	0.1	10 cm		
Polycarpaea longiflora	0.1	20 cm		
Polymeria ambigua	0.1	10 cm	BIL16-15	
Pterocaulon sphacelatum	0.1	20 cm	BIL16-44	
Pterocaulon sphacelatum	0.1	50 cm	BIL16-24	
Ptilotus calostachyus	0.1	40 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	40 cm		
Rhynchosia minima	0.1	130 cm		
Salsola australis	0.1	15 cm		
Santalum lanceolatum	0.1	160 cm	BIL16-43	
Schizachyrium fragile	0.1	20 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	80 cm	BIL16-10	
Senna artemisioides subsp. *x artemisioides*	0.1	210 cm	BIL16-28	
Senna glutinosa subsp. *glutinosa*	0.1	220 cm	BIL16-37	M Trudgen confirmed.
Senna notabilis	0.1	10 cm		
Setaria surgens	0.1	20 cm	BIL16-21	
Setaria verticillata	0.1	80 cm		
Sida cardiophylla	0.1	50 cm	BIL16-34	
Sida echinocarpa	0.1	110 cm		
Sida sp. spiciform panicles (E. Leyland s.n.	0.1	150 cm		
14/8/90)				
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	30 cm	BIL16-03, -05	
Solanum cleistogamum	0.1	20 cm	BIL16-31	
Solanum lasiophyllum	0.1	40 cm		
Sporobolus australasicus	0.1	10 cm		
Themeda triandra	10	80 cm		
Trianthema pilosa	0.1	5 cm	BIL16-29	
Tribulus macrocarpus	0.1	10 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	40 cm		
Triodia basedowii	0.1	50 cm		
Triodia pungens	9	60 cm	BIL16-11	
Triodia wiseana	0.1	30 cm		
Waltheria indica	0.1	60 cm		

Yandi Billiards Level 2			Site	BIL18	
Described by	CASV	Date	16-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	735027 mE	7476987 mN		

Habitat: Drainage plain.

Soil: 2.5YR 3/3 dark reddish brown sandy loam.

Rock Type: Scattered ironstone pebbles (2%) and gravel (5%).

Vegetation: *Eucalyptus gamophylla* low open mallee woodland over *Acacia pachyacra*, *A. inaequilatera* tall open shrubland over *Acacia ancistrocarpa* open shrubland over *Triodia basedowii* hummock grassland.

Veg Condition: Very Good (**Cenchrus ciliaris*).

Fire Age: No sign of recent fire.

Notes: Elevation: 489 m.
Corymbia hamersleyana outside of quadrat.

Species	Cover (%)	Height	Specimen	Notes
Abutilon amplum	0.1	140 cm	BIL18-04	
Abutilon otocarpum	0.1	20 cm		
Acacia adoxa var. *adoxa*	0.1	40 cm		
Acacia ancistrocarpa	2	160 cm		
Acacia bivenosa	0.1	140 cm		
Acacia coriacea subsp. *pendens*	0.1	160 cm		
Acacia dictyophleba	0.1	160 cm		
Acacia inaequilatera	1	420 cm		
Acacia pachyacra	2	450 cm	BIL18-08	
Acacia pruinocarpa	0.1	210 cm		
Acacia tumida var. *pilbarensis*	0.1	180 cm		
Alternanthera nana	0.1	40 cm	BIL18-20	
Aristida holathera var. *holathera*	0.1	40 cm		
Boerhavia coccinea	0.1	30 cm		
Bulbostylis barbata	0.1	20 cm		
Cenchrus ciliaris	0.1	60 cm		N=70.
Cleome viscosa	0.1	100 cm		
Corchorus sidoides subsp. *sidoides*	0.1	30 cm	BIL18-21	
Corchorus tridens	0.1	10 cm	BIL18-05	
Crotalaria medicaginea var. *neglecta*	0.1	30 cm		
Cymbopogon ambiguus	0.1	110 cm	BIL18-13	
Cymbopogon obtectus	0.1	110 cm		
Dicrastylis cordifolia	0.1	60 cm		
Digitaria brownii	0.1	90 cm	BIL18-17	
Digitaria ctenantha	0.1	35 cm		
Duperreya commixta	0.1	200 cm		
Eragrostis eriopoda	0.1	45 cm		
Eucalyptus gamophylla	4	550 cm		
Euphorbia australis var. *hispidula*	0.1	30 cm	BIL18-14	
Euphorbia australis var. *subtomentosa*	0.1	10 cm	BIL18-22	
Euphorbia biconvexa	0.1	10 cm	BIL18-07	
Evolvulus alsinoides var. *decumbens*	0.1	15 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	10 cm		
Goodenia muelleriana	0.1	30 cm	BIL18-10	
Gossypium australe	0.1	120 cm		
Gossypium australe	0.1	50 cm	BIL18-12	
Hakea lorea subsp. *lorea*	0.1	450 cm	BIL18-11	
Hibiscus burtonii	0.1	40 cm		
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		
Hybanthus aurantiacus	0.1	60 cm		
Indigofera monophylla	0.1	50 cm		
Mollugo molluginea	0.1	15 cm		
Paraneurachne muelleri	0.1	80 cm		
Paspalidium rarum	0.1	10 cm	BIL18-18	
Perotis rara	0.1	15 cm		
Phyllanthus erwinii	0.1	30 cm	BIL18-09	
Polycarpaea corymbosa var. *corymbosa*	0.1	20 cm		

Species	Cover (%)	Height	Specimen	Notes
Ptilotus astrolasius	0.1	60 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	30 cm		
Rhynchosia minima	0.1	120 cm		
Scaevola parvifolia subsp. *pilbarae*	0.1	30 cm	BIL18-24	
Senna artemisioides subsp. *oligophylla*	0.1	60 cm	BIL18-23	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	60 cm	BIL18-02	
Senna notabilis	0.1	10 cm		
Sida cardiophylla	0.1	60 cm	BIL18-19	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	30 cm	BIL18-03	
Solanum lasiophyllum	0.1	30 cm		
Sporobolus australasicus	0.1	10 cm		
Tephrosia supina	0.1	10 cm	BIL18-16	R. Butcher confirmed.
Themeda triandra	0.1	120 cm		
Tribulopis angustifolia	0.1	5 cm	BIL18-06	
Triodia basedowii	45	40 cm	BIL18-01	
Yakirra australiensis var. *australiensis*	0.1	10 cm	BIL18-15	

Yandi Billiards Level 2 Site BIL19
Described by PLSW Date 15-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 734006 mE 7476232 mN
Habitat Hilltop/slope to the west of a major valley.
Soil Dark reddish brown sandy clay loam.
Rock Type BIF, ironstone angular continuous cobbles (50%) and pebbles (50%).
Vegetation *Hakea chordophylla* scattered tall shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia hilliana	0.1	50 cm		
Acacia pruinocarpa	0.1	220 cm		
Amphipogon sericeus	0.1	35 cm	BIL19-01	
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	10 cm		
Calytrix carinata	0.1	60 cm		
Fimbristylis simulans	0.1	25 cm		
Goodenia stobbsiana	0.1	35 cm		
Grevillea wickhamii	0.1	160 cm		Sterile.
Hakea chordophylla	1	350 cm		
Ptilotus calostachyus	0.1	45 cm		
Ptilotus rotundifolius	0.1	60 cm		
Senna glutinosa subsp. *pruinosa*	0.1	130 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	140 cm		
Solanum lasiophyllum	0.1	50 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	12	35 cm		

Yandi Billiards Level 2				Site	BIL20
Described by	CASW	Date	17-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	733162 mE	7470987 mN		

Habitat: Gentle NW sloping hill slope at top of low undulating hills.

Soil: Dark reddish brown sandy clay loam.

Rock Type: BIF, shale, ironstone boulders (1%), cobbles (40%), pebbles (30%) and gravel (20%).

Vegetation: *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Hakea chordophylla* scattered tall shrubs over *Acacia hilliana* scattered low shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland with *Amphipogon sericeus* scattered grasses.

Veg Condition: Excellent.

Fire Age: No sign of recent fire.

Species	Cover	Height	Specimen	Notes
Abutilon lepidum	0.1	20 cm	BIL20-07	
Acacia ancistrocarpa	0.1	220 cm	BIL20-04	
Acacia bivenosa	0.1	15 cm		
Acacia hilliana	0.5	60 cm		
Acacia pruinocarpa	0.1	240 cm		
Amphipogon sericeus	1	30 cm		
Aristida holathera var. *holathera*	0.1	45 cm	BIL20-08	
Bonamia erecta	0.1	20 cm	BIL20-10	
Eremophila fraseri subsp. *fraseri*	0.1	70 cm	BIL20-09	
Eremophila latrobei subsp. *latrobei*	0.1	60 cm	BIL20-03	
Eriachne mucronata (typical form)	0.1	30 cm		
Eriachne pulchella	0.1	8 cm		
Eucalyptus leucophloia subsp. *leucophloia*	0.5	450 cm		
Fimbristylis dichotoma	0.1	20 cm		
Fimbristylis simulans	0.1	10 cm		
Goodenia stobbsiana	0.1	10 cm		
Hakea chordophylla	0.5	300 cm		
Heliotropium glabellum	0.1	20 cm	BIL20-05	ID to be confirmed
Hibiscus coatesii	0.1	25 cm	BIL37-01=	
Hybanthus aurantiacus	0.1	30 cm		
Keraudrenia nephrosperma	0.1	30 cm	BIL37-05=	
Polygala glaucifolia	0.1	5 cm	BIL20-01	
Ptilotus calostachyus	0.1	100 cm		
Ptilotus rotundifolius	0.1	30 cm		
Ptilotus rotundifolius	0.1	40 cm		
Rhagodia eremaea	0.1	70 cm		
Schizachyrium fragile	0.1	15 cm		
Senna glutinosa subsp. *glutinosa*	0.1	100 cm		
Senna glutinosa subsp. *pruinosa*	0.1	160 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	110 cm		
Senna sericea	0.1	110 cm	BIL20-02	
Sida echinocarpa	0.1	50 cm	BIL20-06	
Solanum lasiophyllum	0.1	30 cm		
Tribulus suberosus	0.1	100 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	20	40 cm		
Triodia wiseana	0.1	40 cm		

Yandi Billiards Level 2			Site	BIL21	
Described by	PLSV	Date	17-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	734397 mE	7471165 mN		

Habitat: Broad floodplain with minor flow channels in broader area.

Soil: Dark reddish brown sandy loam.

Rock Type: Discontinuous ironstone pebbles (25%) and gravel (25%).

Vegetation: *Corymbia hamersleyana* scattered low trees over *Acacia ancistrocarpa, A. citrinoviridis, A. inaequilatera* tall open shrubland over *Acacia pyrifolia* var. *pyrifolia* scattered shrubs over *Senna artemisioides* subsp. *helmsii, S. artemisioides* subsp. *oligophylla* low open shrubland over *Triodia pungens, T. basedowii* open hummock grassland with **Cenchrus ciliaris, Themeda triandra* very open tussock grassland.

Veg Condition: Good (**Cenchrus ciliaris*).

Fire Age: No sign of recent fire.

Notes: Elevation: 529 m.

Species	Cover (%)	Height	Specimen
Abutilon otocarpum	0.1	40 cm	
Acacia ancistrocarpa	1	220 cm	
Acacia aptaneura	0.1	250 cm	BIL21-12
Acacia bivenosa	0.1	180 cm	
Acacia citrinoviridis	1	240 cm	
Acacia inaequilatera	0.5	200 cm	
Acacia pyrifolia var. *pyrifolia*	0.5	120 cm	
Acacia tumida var. *pilbarensis*	0.1	170 cm	
Aristida contorta	0.1	25 cm	
Aristida holathera var. *holathera*	0.1	35 cm	
Aristida inaequiglumis	0.1	110 cm	BIL21-10
Boerhavia coccinea	0.1	30 cm	
Bonamia erecta	0.1	50 cm	
Bulbostylis barbata	0.1	10 cm	
Cenchrus ciliaris	5	50 cm	
Cleome viscosa	0.1	35 cm	
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	40 cm	
Corchorus tectus	0.1	35 cm	BIL21-08
Corymbia hamersleyana	2	700 cm	
Crotalaria medicaginea var. *neglecta*	0.1	40 cm	
Cucumis variabilis	0.1	300 cm	
Dactyloctenium radulans	0.1	20 cm	
Digitaria ctenantha	0.1	40 cm	
Enneapogon polyphyllus	0.1	30 cm	
Eragrostis eriopoda	0.1	35 cm	
Eremophila longifolia	0.1	120 cm	
Eriachne mucronata (typical form)	0.1	25 cm	
Eriachne pulchella	0.1	20 cm	
Euphorbia biconvexa	0.1	40 cm	BIL21-02
Evolvulus alsinoides var. *decumbens*	0.1	30 cm	
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm	
Glycine canescens	0.1	50 cm	
Goodenia microptera	0.1	30 cm	
Gossypium australe	0.1	20 cm	
Gossypium australe	0.1	120 cm	
Gossypium robinsonii	0.1	100 cm	
Grevillea wickhamii	0.1	180 cm	
Hakea chordophylla	0.1	150 cm	
Heliotropium cunninghamii	0.1	30 cm	BIL21-03
Hibiscus sturtii var. *platychlamys*	0.1	60 cm	
Hybanthus aurantiacus	0.1	40 cm	
Indigofera monophylla	0.1	50 cm	BIL21-05
Indigofera monophylla	0.1	40 cm	BIL21-04
Ipomoea muelleri	0.1	40 cm	
Isotropis atropurpurea	0.1	40 cm	
Melhania oblongifolia	0.1	25 cm	

Species	Cover (%)	Height	Specimen
Mollugo molluginea	0.1	15 cm	
Paraneurachne muelleri	0.1	45 cm	
Perotis rara	0.1	10 cm	
Pluchea ferdinandi-muelleri	0.1	45 cm	
Polycarpaea corymbosa var. *corymbosa*	0.1	15 cm	
Polymeria ambigua	0.1	15 cm	BIL21-06
Ptilotus astrolasius	0.1	35 cm	
Ptilotus nobilis subsp. *nobilis*	0.1	5 cm	
Ptilotus obovatus var. *obovatus*	0.1	45 cm	
Santalum lanceolatum	0.1	170 cm	
Senna artemisioides subsp. *helmsii*	2	90 cm	
Senna artemisioides subsp. *oligophylla*	0.5	80 cm	BIL21-07
Senna glutinosa subsp. *x luerssenii*	0.1	170 cm	BIL21-09
Sida fibulifera	0.1	25 cm	BIL21-11
Sida echinocarpa	0.1	100 cm	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	70 cm	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	30 cm	
Solanum lasiophyllum	0.1	45 cm	
Synaptantha tillaeacea var. *tillaeacea*	0.1	7 cm	BIL21-14
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.1	45 cm	
Themeda triandra	1	80 cm	
Trianthema pilosa	0.1	25 cm	
Tribulus macrocarpus	0.1	15 cm	
Trichodesma zeylanicum var. *zeylanicum*	0.1	20 cm	
Triodia basedowii	2	40 cm	
Triodia pungens	14	50 cm	BIL21-01
Waltheria indica	0.1	50 cm	

Yandi Billiards Level 2 Site BIL22

Described by CEFCASW Date 18-Mar-14 Type Quadrat 50 x 50 m

MGA Zone 50 742126 mE 7485367 mN

Habitat Colluvial plain to the east of a range of hills.

Soil Dark reddish brown loamy sand.

Rock Type Nil.

Vegetation *Eucalyptus gamophylla* low open mallee woodland over *Acacia inaequilatera, A. pruinocarpa* tall open shrubland *Triodia schinzii*, (*T. pungens*) hummock grassland.

Veg Condition Excellent.

Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen
Abutilon otocarpum	0.1	10 cm	
Acacia bivenosa	0.1	400 cm	
Acacia dictyophleba	0.1	120 cm	
Acacia inaequilatera	4	400 cm	
Acacia pachyacra	0.1	40 cm	BIL22-09
Acacia pruinocarpa	1	500 cm	
Acacia trudgeniana	0.1	150 cm	BIL22-08
Aristida hygrometrica	0.1	30 cm	BIL22-16
Chrysopogon fallax	0.1	40 cm	
Corchorus tectus	0.1	30 cm	BIL22-02
Cucumis variabilis	0.1	5 cm	
Cullen martinii	0.1	20 cm	BIL22-14
Dicrastylis cordifolia	0.1	70 cm	
Eragrostis eriopoda	0.1	35 cm	
Eucalyptus gamophylla	2.5	300 cm	
Hibiscus leptocladus	0.1	40 cm	BIL22-11
Isotropis atropurpurea	0.1	55 cm	BIL22-12
Rhynchosia minima	0.1	250 cm	
Santalum lanceolatum	0.1	130 cm	BIL22-15
Scaevola parvifolia subsp. *pilbarae*	0.1	25 cm	BIL22-13
Senna artemisioides subsp. *helmsii*	0.1	110 cm	
Senna artemisioides subsp. *oligophylla*	0.1	100 cm	BIL22-07
Senna notabilis	0.1	5 cm	
Sida cardiophylla	0.1	50 cm	BIL22-04
Sida cardiophylla	0.1	10 cm	BIL22-06
Trianthema pilosa	0.1	20 cm	BIL22-10
Tribulopis angustifolia	0.1	5 cm	BIL22-05
Trichodesma zeylanicum var. *zeylanicum*	0.1	8 cm	
Triodia pungens	0.5	70 cm	BIL22-03
Triodia schinzii	31	140 cm	BIL22-01

Yandi Billiards Level 2 Site BIL23
Described by PLSW Date 13-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 730034 mE 7471381 mN
Habitat Banks/floodplain of creek line (tributary to Weeli Wolli Creek).
Soil Red brown clayey sand.
Rock Type Not recorded. Cobbles (20%), pebbles (20%), and gravel (50%).
Vegetation *Acacia pruinocarpa, Eremophila longifolia, Acacia pyrifolia* var. *pyrifolia*, *A. tumida* var. *pilbarensis* tall open shrubland over *Triodia wiseana* scattered hummock grasses with **Cenchrus ciliaris* tussock grassland.
Veg Condition Poor (**Cenchrus ciliaris*, **Malvastrum americanum*).
Fire Age Not recorded.

Species	Cover	Height	Specimen	Notes
Abutilon fraseri	0.1	40 cm	BIL23-13	
Abutilon macrum	0.1	60 cm		
Abutilon otocarpum	0.1	40 cm		
Acacia bivenosa	0.1	300 cm		
Acacia citrinoviridis	0.1	250 cm		
Acacia maitlandii	0.1	170 cm		
Acacia pruinocarpa	3	400 cm		
Acacia pyrifolia var. *pyrifolia*	1.5	230 cm		
Acacia tumida var. *pilbarensis*	1	250 cm		
Alternanthera nana	0.1	-	BIL23-09	
Amaranthus undulatus	0.1	60 cm	BIL23-04	
Aristida holathera var. *holathera*	0.1	30 cm		
Atalaya hemiglauca	0.1	380 cm		
Boerhavia burbidgeana	0.1	30 cm	BIL23-01	
Boerhavia coccinea	0.1	30 cm		
Cenchrus ciliaris	50	100 cm		
Chrysopogon fallax	0.1	120 cm		
Cleome viscosa	0.1	30 cm		
Corymbia hamersleyana	0.1	140 cm		
Enneapogon polyphyllus	0.1	25 cm		
Enneapogon robustissimus	0.1	60 cm		
Enneapogon robustissimus	0.1	60 cm	BIL23-12	
Eragrostis eriopoda	0.1	50 cm		
Eremophila fraseri subsp. *fraseri*	0.1	120 cm		
Eremophila longifolia	2.5	300 cm		
Eriachne mucronata (typical form)	0.1	50 cm		
Eriachne tenuiculmis	0.1	45 cm	BIL23-02	
Evolvulus alsinoides var. *decumbens*	0.1	20 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	30 cm		
Gossypium australe	0.1	140 cm		
Gossypium robinsonii	0.1	90 cm		
Heliotropium tenuifolium	0.1	40 cm	BIL23-14	
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		
Indigofera colutea	0.1	25 cm		
Indigofera linifolia	0.1	20 cm		
Indigofera linnaei	0.1	20 cm	BIL-CF142=	
Malvastrum americanum	0.1	40 cm		N=6.
Melhania oblongifolia	0.1	40 cm		
Mollugo molluginea	0.1	20 cm		
Paraneurachne muelleri	0.1	40 cm		
Phyllanthus maderaspatensis	0.1	25 cm		
Polycarpaea corymbosa var. *corymbosa*	0.1	15 cm		
Polymeria ambigua	0.1	25 cm	BIL23-03	
Rhagodia eremaea	0.1	40 cm		
Rhynchosia minima	0.1	30 cm		
Salsola australis	0.1	70 cm		
Senna artemisioides subsp. *helmsii*	0.1	30 cm		
Senna artemisioides subsp. *oligophylla*	0.1	40 cm	BIL23-15	
Senna notabilis	0.1	30 cm		

Species	Cover	Height	Specimen	Notes
Sida fibulifera	0.1	40 cm	BIL23-06	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	40 cm	BIL23-10	
Solanum lasiophyllum	0.1	110 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	40 cm	BIL23-05	R. Butcher confirmed
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	30 cm	BIL23-11	R. Butcher confirmed.
Themeda triandra	0.1	100 cm		
Tribulus terrestris	0.1	25 cm	BIL23-08	
Triodia wiseana	0.5	60 cm		
Zaleya galericulata subsp. *galericulata*	0.1	30 cm	BIL23-07	

Yandi Billiards Level 2 Site BIL24
Described by CEFCASW Date 19-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 731092 mE 7472495 mN
Habitat Floodplain and bed of creek line (indistinct channel).
Soil Dark reddish brown sandy loam.
Rock Type Not recorded. 2% gravel.
Vegetation *Eucalyptus victrix* scattered low trees over *Acacia citrinoviridis* (*A. pruinocarpa*) tall open scrub over **Cenchrus ciliaris* open tussock grassland over *Boerhavia burbidgeana* very open herbland.
Veg Condition Good (**Cenchrus ciliaris, *Setaria verticillata, *Aerva javanica*, cattle
Fire Age Not recorded.
Notes East corner is not staked.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	60 cm	BIL24-01	
Abutilon lepidum	0.1	15 cm	BIL24-18	M Trudgen confirmed.
Abutilon otocarpum	0.1	60 cm		
Acacia bivenosa	0.1	300 cm		
Acacia citrinoviridis	40	450 cm		
Acacia pruinocarpa	1	300 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	60 cm		
Acrachne racemosa	0.1	45 cm	BIL24-08	
Aerva javanica	0.1	60 cm		N=10.
Amaranthus undulatus	0.1	30 cm	BIL24-07	
Boerhavia burbidgeana	2	10 cm	BIL24-06	
Boerhavia coccinea	0.1	10 cm	BIL24-02	
Cenchrus ciliaris	15	70 cm		
Chrysopogon fallax	0.1	110 cm		
Cleome viscosa	0.1	20 cm		
Clerodendrum floribundum var. *angustifolium*	0.1	25 cm	BIL24-23	
Corchorus crozophorifolius	0.1	70 cm		
Corchorus tridens	0.1	15 cm	BIL24-04	
Crotalaria medicaginea var. *neglecta*	0.1	40 cm		
Cymbopogon ambiguus	0.1	120 cm	BIL24-13	
Duperreya commixta	0.1	300 cm		
Dysphania melanocarpa forma *melanocarpa*	0.1	10 cm	BIL24-12	
Enchylaena tomentosa var. *tomentosa*	0.1	20 cm	BIL24-20	
Enneapogon lindleyanus	0.1	70 cm	BIL24-03	
Enneapogon polyphyllus	0.1	30 cm		
Enneapogon robustissimus	0.1	110 cm	BIL24-25	
Eriachne mucronata (typical form)	0.1	40 cm	BIL24-14	
Eucalyptus victrix	0.5	450 cm		
Euphorbia australis var. *subtomentosa*	0.1	5 cm	BIL24-30	
Euphorbia coghlanii	0.1	40 cm	BIL24-11	
Evolvulus alsinoides var. *villosicalyx*	0.1	25 cm		
Glycine canescens	0.1	30 cm	BIL24-05	
Gomphrena cunninghamii	0.1	35 cm	BIL24-27	
Gossypium australe	0.1	110 cm		
Heliotropium cunninghamii	0.1	60 cm	BIL24-28	
Hibiscus sturtii var. *platychlamys*	0.1	30 cm	BIL24-15	
Hibiscus sturtii var. *platychlamys*	0.1	30 cm		
Indigofera colutea	0.1	15 cm	BIL24-17	
Malvastrum americanum	0.1	30 cm		N=200.
Melhania oblongifolia	0.1	60 cm		
Notoleptopus decaisnei var. *decaisnei*	0.1	40 cm	BIL24-10	
Perotis rara	0.1	10 cm		
Phyllanthus maderaspatensis	0.1	60 cm	BIL24-19	
Polycarpaea longiflora	0.1	40 cm		
Ptilotus auriculifolius	0.1	30 cm	BIL24-26	
Ptilotus nobilis subsp. *nobilis*	0.1	10 cm		

Species	Cover (%)	Height	Specimen	Notes
Ptilotus obovatus var. *obovatus*	0.1	60 cm		
Rhynchosia minima	0.1	10 cm		
Senna artemisioides subsp. *helmsii*	0.1	130 cm		
Senna artemisioides subsp. *oligophylla*	0.1	120 cm	BIL24-24	
Senna glutinosa subsp. *x luerssenii*	0.1	150 cm		
Setaria verticillata	0.1	25 cm		N=2.
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	30 cm	BIL24-22	
Solanum lasiophyllum	0.1	10 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	40 cm	BIL24-16	R. Butcher confirmed.
Themeda triandra	0.1	100 cm		
Tribulus terrestris	0.1	10 cm	BIL24-29	
Trichodesma zeylanicum var. *zeylanicum*	0.1	50 cm		
Triodia pungens	0.1	30 cm	BIL24-21	
Triodia wiseana	0.1	25 cm	BIL24-09	Recollect PH2

Yandi Billiards Level 2				Site	BIL25
Described by	CASV		Date 13-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	731238 mE	7471596 mN		
Habitat	Plain.				
Soil	Dark reddish brown sandy loam.				
Rock Type	Scattered ironstone cobbles (1%), pebbles (1%) and gravel (2%).				
Vegetation	*Acacia citrinoviridis* scattered tall shrubs over *Eremophila fraseri* subsp. *fraseri* tall shrubland over *Senna artemisioides* subsp. *helmsii* open shrubland over *Eragrostis eriopoda* very open tussock grassland.				
Veg Condition	Good (**Cenchrus ciliaris*, cattle evidence).				
Fire Age	No sign of recent fire.				
Notes	*Corymbia hamersleyana* and *Acacia pruinocarpa* mature individuals outside of quadrat.				

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	80 cm	BIL25-13	M Trudgen confirmed.
Abutilon macrum	0.1	80 cm	BIL25-06	
Abutilon otocarpum	0.1	20 cm		
Acacia citrinoviridis	1	600 cm	BIL25-21	
Acacia coriacea subsp. *pendens*	0.1	600 cm	BIL25-16	
Anthobolus leptomerioides	0.1	130 cm	BIL25-20	
Aristida contorta	0.1	20 cm		
Aristida holathera var. *holathera*	0.1	30 cm		
Boerhavia coccinea	0.1	10 cm		
Capparis lasiantha	0.1	120 cm		
Cenchrus ciliaris	0.1	40 cm		
Chrysopogon fallax	0.1	160 cm		
Cleome viscosa	0.1	60 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	30 cm	BIL25-23	M Trudgen confirmed.
Crotalaria medicaginea var. *neglecta*	0.1	40 cm		
Cymbopogon procerus	0.1	110 cm		
Enchylaena tomentosa var. *tomentosa*	0.1	100 cm		
Enneapogon polyphyllus	0.1	30 cm	BIL25-10	
Eragrostis eriopoda	7	40 cm		
Eremophila forrestii subsp. *forrestii*	0.1	70 cm	BIL25-03	
Eremophila fraseri subsp. *fraseri*	20	200 cm	BIL25-01	
Euphorbia biconvexa	0.1	30 cm	BIL25-12	
Evolvulus alsinoides var. *villosicalyx*	0.1	15 cm		
Goodenia microptera	0.1	35 cm		
Gossypium australe	0.1	70 cm		
Hakea lorea subsp. *lorea*	0.1	400 cm		
Heliotropium cunninghamii	0.1	30 cm	BIL25-18	
Hibiscus burtonii	0.1	30 cm		
Hibiscus sturtii	0.1	50 cm		Recollect PH2.
Indigofera colutea	0.1	10 cm		
Indigofera linifolia	0.1	20 cm	BIL25-19	
Melhania oblongifolia	0.1	40 cm		
Paraneurachne muelleri	0.1	40 cm		
Ptilotus obovatus var. *obovatus*	0.1	70 cm		
Rhagodia eremaea	0.1	100 cm		
Salsola australis	0.1	15 cm		
Sclerolaena cornishiana	0.1	10 cm	BIL25-04	
Senna artemisioides subsp. *helmsii*	2	120 cm	BIL25-02	
Senna artemisioides subsp. *oligophylla*	0.1	70 cm	BIL25-14	M Trudgen confirmed.
Senna artemisioides subsp. *oligophylla* (thinly sericeous form MET 15,035) *x* subsp. *helmsii*	0.1	80 cm	BIL25-09	
Sida echinocarpa	0.1	60 cm		

Species	Cover (%)	Height	Specimen	Notes
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	10 cm	BIL25-05; -22	
Solanum lasiophyllum	0.1	60 cm		
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	25 cm	BIL25-08	R. Butcher confirmed.
Tribulus macrocarpus	0.1	10 cm		
Triodia basedowii	0.1	20 cm	BIL25-11	
Triodia wiseana	0.1	60 cm	BIL25-17	

Yandi Billiards Level 2 Site BIL26

Described by PLSW Date 14-Mar-14 Type Quadrat 50 x 50 m

MGA Zone 50 730959 mE 7473498 mN

Habitat Low hilltop in broad area of low undulating hills.

Soil Dark reddish brown fine sandy clay loam.

Rock Type Basalt, BIF boulders (10%), cobbles (40%), pebbles (40%), and gravel (10%).

Vegetation *Acacia inaequilatera* tall open shrubland over *Acacia adoxa, A. hilliana*, *Ptilotus rotundifolius* low open shrubland over *Triodia wiseana* (*T.* sp. Shovelanna Hill (S. van Leeuwen 3835)) open hummock grassland.

Veg Condition Excellent.

Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.5	50 cm		
Acacia hilliana	0.5	60 cm		
Acacia inaequilatera	2	430 cm		
Amphipogon sericeus	0.1	35 cm	BIL26-05	
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	25 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	80 cm	BIL26-02	M Trudgen confirmed.
Eriachne mucronata (typical form)	0.1	40 cm		
Fimbristylis simulans	0.1	25 cm		
Goodenia stobbsiana	0.1	25 cm		
Grevillea wickhamii	0.1	180 cm		Sterile
Indigofera monophylla	0.1	30 cm		
Polygala glaucifolia	0.1	2 cm	BIL26-03	
Ptilotus calostachyus	0.1	75 cm		
Ptilotus rotundifolius	0.5	70 cm		
Senna artemisioides subsp. *oligophylla*	0.1	40 cm	BIL26-01	
Senna glutinosa subsp. *glutinosa*	0.1	140 cm		
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	170 cm	BIL26-04	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	190 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	175 cm		
Sida echinocarpa	0.1	40 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	1	30 cm		
Triodia wiseana	27	40 cm		

Yandi Billiards Level 2			Site	BIL27	
Described by	PLSW	Date	14-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	729978 mE	7473313 mN		

Habitat: South-southeast facing ridge/slope (40% incline) amongst broader area of undulating medium hills.

Soil: Dark reddish brown sandy clay loam (skeletal).

Rock Type: Basalt outcropping (10% large boulders, 30% boulders, 30% cobbles, 20% pebbles, and 10% gravel).

Vegetation: *Acacia inaequilatera* scattered tall shrubs over *Indigofera rugosa* low open shrubland over *Triodia wiseana* open hummock grassland.

Veg Condition: Excellent.

Fire Age: No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia inaequilatera	1	250 cm		
Acacia maitlandii	0.1	40 cm		
Acacia pruinocarpa	0.1	240 cm		
Atalaya hemiglauca	0.1	140 cm		
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	30 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	50 cm	BIL27-04	M Trudgen confirmed.
Cymbopogon ambiguus	0.1	80 cm		
Enneapogon aff. *caerulescens*	0.1	45 cm	BIL27-02	ID to be confirmed
Enneapogon caerulescens	0.1	25 cm		
Enneapogon polyphyllus	0.1	25 cm		
Eriachne mucronata (typical form)	0.1	40 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Gomphrena cunninghamii	0.1	20 cm		
Goodenia muelleriana	0.1	25 cm		
Gossypium australe	0.1	195 cm		
Grevillea wickhamii	0.1	110 cm		Sterile.
Hybanthus aurantiacus	0.1	40 cm		
Indigofera rugosa	3.5	50 cm		
Mollugo molluginea	0.1	15 cm		
Paraneurachne muelleri	0.1	40 cm		
Polymeria ambigua	0.1	30 cm	BIL27-01	
Ptilotus astrolasius	0.1	45 cm		
Ptilotus obovatus var. *obovatus*	0.1	45 cm		
Rhynchosia minima	0.1	50 cm		
Senna artemisioides subsp. *oligophylla*	0.1	60 cm	BIL27-05	
Senna glutinosa subsp. *glutinosa*	0.1	20 cm		
Solanum phlomoides	0.1	60 cm		
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.1	45 cm	BIL27-03	R. Butcher confirmed.
Themeda triandra	0.1	80 cm		
Triodia wiseana	25	40 cm		

Yandi Billiards Level 2 Site BIL28
Described by SVSW Date 11-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 738952 mE 7483700 mN
Habitat Crest of low undulating hill range gently sloping to SE and NW from crest.
Soil 2.5YR 3/4 dark reddish brown clay loam.
Rock Type Ironstone shale cobbles (70%), pebbles (20%), and gravel (5%).
Vegetation *Acacia inaequilatera, A. pruinocarpa, Grevillea wickhamii* scattered tall shrubs over *Acacia hilliana*, *Ptilotus rotundifolius* scattered low shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.
Notes Elevation: 497 m.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	65 cm	BIL28-08	
Acacia hilliana	1	50 cm	BIL28-06	
Acacia inaequilatera	0.5	250 cm		
Acacia pruinocarpa	0.5	240 cm		
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	5 cm	BIL28-09	
Fimbristylis dichotoma	0.1	20 cm	BIL28-05	
Fimbristylis simulans	0.1	20 cm		
Goodenia stobbsiana	0.1	15 cm		
Goodenia triodiophila	0.1	40 cm	BIL28-04	
Grevillea wickhamii	0.5	370 cm		Sterile.
Hakea lorea subsp. *lorea*	0.1	80 cm		
Ptilotus astrolasius	0.1	40 cm		
Ptilotus calostachyus	0.1	60 cm		
Ptilotus rotundifolius	0.5	90 cm		
Schizachyrium fragile	0.1	10 cm	BIL28-10	
Senna artemisioides subsp. *oligophylla*	0.1	70 cm	BIL28-02	
Senna glutinosa subsp. *glutinosa x* subsp. *x luerssenii*	0.1	210 cm	BIL28-03	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	120 cm		
Solanum lasiophyllum	0.1	20 cm	BIL28-07	
Trachymene oleracea subsp. *oleracea*	0.1	10 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	35	40 cm	BIL28-01	

Yandi Billiards Level 2				Site	BIL29
Described by	SVSW		Date	12-Mar-14	Type Quadrat 50 x 50 m
MGA Zone	50	735596 mE		7479180 mN	
Habitat	Gentle south-southeast facing transitional slope of low undulating hills. False crest/plateau situated above quadrat.				
Soil	2.5 YR 3/4 dark reddish brown sandy loam (skeletal).				
Rock Type	Ironstone boulders (2%), cobbles (35%), pebbles (35%), and gravel (20%).				
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Acacia hilliana* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.				
Veg Condition	Excellent.				
Fire Age	No sign of recent fire.				
Notes	Elevation: 522 m.				

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	25 cm		
Acacia bivenosa (wispy/weeping form)	0.1	40 cm		
Acacia hilliana	2	50 cm	BIL29-07	
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	5 cm	BIL29-04	
Bulbostylis barbata	0.1	15 cm		
Calytrix carinata	0.1	70 cm	BIL29-06	
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	50 cm	BIL29-05	M Trudgen confirmed.
Cymbopogon obtectus	0.1	80 cm		
Dampiera candicans	0.1	60 cm		
Eriachne pulchella	0.1	10 cm		
Eucalyptus leucophloia subsp. *leucophloia*	4	740 cm		
Euphorbia australis var. *hispidula*	0.1	10 cm	BIL29-09	
Fimbristylis dichotoma	0.1	20 cm		
Fimbristylis simulans	0.1	15 cm		
Goodenia stobbsiana	0.1	20 cm		
Grevillea wickhamii	0.1	220 cm		
Hakea chordophylla	0.1	240 cm		
Mollugo molluginea	0.1	15 cm		
Mollugo molluginea	0.1	15 cm		
Ptilotus astrolasius	0.1	30 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	5 cm		
Ptilotus rotundifolius	0.1	90 cm		
Schizachyrium fragile	0.1	20 cm		
Senna glutinosa subsp. *glutinosa x* subsp. *x luerssenii*	0.1	180 cm	BIL29-03	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	70 cm		
Solanum phlomoides	0.1	25 cm	BIL29-01	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	26	35 cm	BIL29-02	
Triodia wiseana	0.1	20 cm	BIL29-08	

Yandi Billiards Level 2 Site BIL30
Described by PLCA Date 09-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 740449 mE 7486054 mN
Habitat Major drainage line running north to south.
Soil Dark reddish brown sandy clay loam..
Rock Type Not recorded. Cobbles (20%), pebbles (40%), and gravel (40%).
Vegetation *Acacia citrinoviridis, Eucalyptus victrix* low open woodland over *Acacia pyrifolia* var. *pyrifolia, Indigofera monophylla, Corchorus crozophorifolius* open shrubland over *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186) low open shrubland.
Veg Condition Very Good (**Cenchrus ciliaris*, evidence of cattle).
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	150 cm	BIL30-06	M Trudgen confirmed.
Acacia citrinoviridis	7	600 cm		
Acacia coriacea subsp. *pendens*	0.1	150 cm		
Acacia pyrifolia var. *pyrifolia*	1.5	170 cm		
Aerva javanica	0.1	40 cm		n=3
Amaranthus undulatus	0.1	15 cm	BIL30-07	
Aristida inaequiglumis	0.1	40 cm	BIL30-08	
Atalaya hemiglauca	0.1	400 cm		
Boerhavia burbidgeana	0.1	10 cm	BIL30-09	
Boerhavia coccinea	0.1	25 cm		
Cenchrus ciliaris	0.1	40 cm		n=17
Cenchrus setiger	0.1	40 cm		n=3
Cleome viscosa	0.1	20 cm		
Corchorus crozophorifolius	1	150 cm		
Crotalaria medicaginea var. *neglecta*	0.1	20 cm		
Cucumis variabilis	0.1	180 cm		
Digitaria brownii	0.1	40 cm	BIL30-03	
Enneapogon lindleyanus	0.1	60 cm	BIL30-05	
Enneapogon lindleyanus	0.1	30 cm		
Enneapogon polyphyllus	0.1	40 cm		
Eriachne mucronata (typical form)	0.1	40 cm		
Eriachne pulchella	0.1	15 cm		
Eucalyptus victrix	2	800 cm		
Eulalia aurea	0.1	120 cm		
Gomphrena cunninghamii	0.1	5 cm		
Heliotropium cunninghamii	0.1	4 cm	BIL30-04	
Indigofera monophylla	2	150 cm	BIL30-02	M Trudgen confirmed;
Phyllanthus maderaspatensis	0.1	20 cm		
Polycarpaea longiflora	0.1	15 cm		
Ptilotus obovatus var. *obovatus*	0.1	60 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	2	70 cm	BIL30-01	R. Butcher confirmed.
Waltheria indica	0.1	10 cm		

Yandi Billiards Level 2 Site BIL31
Described by CEFCASW Date 18-Mar-14 Type Quadrat 25 x 100 m
MGA Zone 50 740600 mE 7479953 mN
Habitat Meandering creek bed and associated banks running east to west (10m wide).
Soil Dark reddish brown sandy clay loam.
Rock Type Riverstone mix (ironstone, basalt, quartz, sandstone, mudstone) of cobbles (3%), pebbles (60%) and gravel (15%).
Vegetation *Corymbia hamersleyana* low open woodland over *Acacia tumida* var. *pilbarensis, Grevillea wickhamii, Gossypium robinsonii* tall open shrubland over *Androcalva luteiflora* open shrubland over *Triodia pungens* hummock grassland with **Cenchrus ciliaris*, *Themeda triandra* very open tussock grassland.
Veg Condition Very Good (**Cenchrus* spp.).
Fire Age No sign of recent fire.
Notes Few standing dead trees that could be *Eucalyptus victrix*.

Species	Cover (%)	Height	Specimen	Notes
Acacia pyrifolia var. *pyrifolia*	0.1	120 cm		
Acacia tumida var. *pilbarensis*	3	450 cm		
Androcalva luteiflora	2	120 cm		
Aristida holathera var. *holathera*	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Atalaya hemiglauca	0.1	60 cm		
Boerhavia coccinea	0.1	20 cm	BIL31-03	
Bonamia erecta	0.1	30 cm		
Bothriochloa ewartiana	0.1	70 cm		
Cenchrus ciliaris	2	40 cm		
Cenchrus setiger	0.1	60 cm		
Chrysopogon fallax	0.1	110 cm		
Cleome viscosa	0.1	20 cm		
Clerodendrum floribundum var. *angustifolium*	0.1	200 cm	BIL31-05	
Corchorus crozophorifolius	0.1	20 cm	BIL31-12	
Corchorus sidoides subsp. *sidoides*	0.1	50 cm	BIL31-06	
Corchorus tectus	0.1	50 cm	BIL31-13	M Trudgen confirmed.
Corymbia hamersleyana	4	850 cm		
Crotalaria medicaginea var. *neglecta*	0.1	50 cm		
Cucumis variabilis	0.1	40 cm		
Cymbopogon obtectus	0.1	80 cm		
Cymbopogon procerus	0.1	100 cm		
Dicrastylis cordifolia	0.1	20 cm		
Digitaria ctenantha	0.1	50 cm		
Enneapogon polyphyllus	0.1	40 cm		
Eragrostis eriopoda	0.1	40 cm		
Eremophila longifolia	0.1	120 cm		
Euphorbia australis var. *subtomentosa*	0.1	5 cm	BIL31-11	
Euphorbia trigonosperma	0.1	35 cm	BIL31-02	
Evolvulus alsinoides var. *villosicalyx*	0.1	25 cm		
Gomphrena cunninghamii	0.1	10 cm		
Goodenia stobbsiana	0.1	30 cm		
Gossypium robinsonii	1	600 cm		
Grevillea wickhamii subsp. *hispidula*	1	480 cm	BIL31-09	
Hybanthus aurantiacus	0.1	30 cm		
Indigofera georgei	0.1	60 cm		
Ipomoea polymorpha	0.1	30 cm	BIL31-07	
Paraneurachne muelleri	0.1	30 cm		
Paspalidium clementii	0.1	20 cm	BIL31-10	
Perotis rara	0.1	10 cm		
Petalostylis cassioides	0.1	200 cm	BIL31-08	
Polymeria ambigua	0.1	20 cm		
Rhagodia eremaea	0.1	50 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	100 cm		

Species	Cover (%)	Height	Specimen	Notes
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	1	70 cm	BIL31-14	
Setaria dielsii	0.1	60 cm		
Solanum lasiophyllum	0.1	20 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	60 cm	BIL31-04	R. Butcher confirmed.
Themeda triandra	1	70 cm		
Trianthema pilosa	0.1	15 cm		
Tribulopis angustifolia	0.1	20 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	60 cm		
Triodia pungens	38	50 cm	BIL31-01	
Waltheria indica	0.1	60 cm		

Yandi Billiards Level 2 Site BIL32
Described by CEFCASW Date 19-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 738627 mE 7481457 mN
Habitat Colluvial floodplain on the northwest side of Weeli Wolli Creek, with very slight southerly aspect.
Soil Dark reddish brown sandy loam.
Rock Type Ironstone gravel (1%).
Vegetation *Acacia aptaneura, A. pruinocarpa* low woodland over **Cenchrus ciliaris, *C. setiger* very open tussock grassland and *Cleome viscosa* scattered herbs.
Veg Condition Poor (**Malvastrum americanum, *Bidens bipinnata, *Setaria verticillata, *Cenchrus* spp., evidence of cattle).
Fire Age Very long unburnt.
Notes Moderate to high level of cattle tracks and scats.

Species	Cover (%)	Height	Specimen	Notes
Abutilon cryptopetalum	0.1	60 cm	BIL32-30	
Abutilon lepidum	0.1	40 cm	BIL32-20	M Trudgen confirmed.
Abutilon lepidum	0.1	20 cm	BIL32-08	M Trudgen confirmed.
Abutilon otocarpum	0.1	10 cm		
Abutilon otocarpum	0.1	30 cm	BIL32-07	
Acacia aptaneura	25	680 cm	BIL32-01	
Acacia pruinocarpa	3	620 cm		
Aristida holathera var. *holathera*	0.1	20 cm		
Bidens bipinnata	0.1	20 cm		N=5.
Boerhavia coccinea	0.1	10 cm	BIL32-05	
Bulbostylis barbata	0.1	10 cm	BIL32-17	
Cenchrus ciliaris	5	50 cm		
Cenchrus setiger	1	50 cm		
Chrysopogon fallax	0.1	70 cm		
Cleome viscosa	0.5	40 cm		
Corchorus sidoides subsp. *sidoides*	0.1	10 cm		
Corchorus tridens	0.1	15 cm	BIL32-18	
Cyperus iria	0.1	25 cm	BIL32-34	
Dactyloctenium radulans	0.1	5 cm		
Digitaria ctenantha	0.1	30 cm		
Dipteracanthus australasicus subsp. *australasicus*	0.1	30 cm	BIL32-33	
Duperreya commixta	0.1	50 cm		
Dysphania kalpari	0.1	20 cm	BIL32-09	
Dysphania melanocarpa forma *melanocarpa*	0.1	20 cm		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	15 cm		
Enchylaena tomentosa var. *tomentosa*	0.1	100 cm	BIL32-38	
Enneapogon polyphyllus	0.1	50 cm		
Eragrostis cumingii	0.1	10 cm		
Eremophila forrestii x latrobei	0.1	40 cm	BIL32-15	
Eremophila lanceolata	0.1	40 cm	BIL32-31	
Euphorbia australis var. *subtomentosa*	0.1	5 cm	BIL32-04	
Euphorbia biconvexa	0.1	10 cm	BIL32-19	
Evolvulus alsinoides var. *decumbens*	0.1	15 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	10 cm		
Gomphrena cunninghamii	0.1	20 cm		
Goodenia microptera	0.1	15 cm	BIL32-28	
Goodenia prostrata	0.1	10 cm	BIL32-06	
Gossypium australe	0.1	100 cm		
Heliotropium inexplicitum	0.1	10 cm	BIL32-13	
Hibiscus burtonii	0.1	100 cm	BIL32-27	
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		

Species	Cover (%)	Height	Specimen	Notes
Indigofera colutea	0.1	10 cm		
Indigofera linnaei	0.1	5 cm	BIL32-12	
Ipomoea muelleri	0.1	15 cm	BIL32-10	
Iseilema membranaceum	0.1	10 cm	BIL32-24	
Malvastrum americanum	0.1	15 cm		N=6.
Melhania oblongifolia	0.1	30 cm		
Nicotiana simulans	0.1	20 cm	BIL32-35	
Paspalidium clementii	0.1	30 cm	BIL32-21	
Perotis rara	0.1	10 cm		
Polycarpaea corymbosa var. *corymbosa*	0.1	10 cm		
Polycarpaea longiflora	0.1	10 cm		
Portulaca oleracea/intraterranea	0.1	5 cm	BIL32-03	Recollect PH2.
Pterocaulon sphacelatum	0.1	20 cm	BIL32-22	
Ptilotus gaudichaudii subsp. *gaudichaudii*	0.1	20 cm	BIL32-25	
Ptilotus helipteroides	0.1	10 cm	BIL32-32	
Ptilotus nobilis subsp. *nobilis*	0.1	15 cm		
Rhynchosia minima	0.1	30 cm		
Salsola australis	0.1	20 cm		
Sclerolaena cornishiana	0.1	30 cm	BIL32-11	
Senna artemisioides subsp. *helmsii*	0.1	60 cm		
Senna notabilis	0.1	20 cm		
Setaria verticillata	0.1	25 cm	BIL32-29	
Sida fibulifera	0.1	15 cm		
Sida ectogama	0.1	40 cm		
Sida platycalyx	0.1	10 cm	BIL32-16	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	10 cm	BIL32-23	
Solanum lasiophyllum	0.1	15 cm		
Sporobolus australasicus	0.1	10 cm		
Tragus australianus	0.1	15 cm		
Trianthema pilosa	0.1	10 cm	BIL32-37	
Trianthema pilosa	0.1	10 cm	BIL32-36	
Tribulus astrocarpus	0.1	2 cm		
Tribulus macrocarpus	0.1	2 cm		
Triodia basedowii	0.1	40 cm	BIL32-26	
Triodia pungens	0.1	50 cm	BIL32-14	
Triodia wiseana	0.1	50 cm	BIL32-02	
Waltheria indica	0.1	40 cm		

Yandi Billiards Level 2			Site	BIL33	
Described by	CEFCASW	Date	17-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	735578 mE	7474708 mN		
Habitat	Plain with low hills to the east and south.				
Soil	Dark reddish brown sandy loam.				
Rock Type	Ironstone cobbles (1%), pebbles (10%), and gravel (2%).				
Vegetation	*Eucalyptus gamophylla* low open mallee woodland over *Acacia pruinocarpa, A. bivenosa* tall open shrubland over *Petalostylis cassioides* open shrubland over *Triodia basedowii* open hummock grassland.				
Veg Condition	Excellent.				
Fire Age	No sign of recent fire.				
Notes	Elevation: 503 m.				

Species	Cover (%)	Height	Specimen	Notes
Acacia ancistrocarpa	0.1	220 cm		
Acacia aptaneura	0.1	150 cm	BIL33-06	
Acacia aptaneura x ayersiana	0.1	190 cm	BIL33-15	
Acacia bivenosa	1	300 cm		
Acacia dictyophleba	0.1	190 cm		
Acacia inaequilatera	0.1	300 cm		
Acacia pruinocarpa	1	400 cm		
Anthobolus leptomerioides	0.1	140 cm		
Aristida contorta	0.1	20 cm		
Aristida holathera var. *holathera*	0.1	50 cm		
Boerhavia coccinea	0.1	5 cm	BIL33-16	
Corchorus sidoides subsp. *sidoides*	0.1	40 cm		
Corymbia hamersleyana	0.1	500 cm		
Cymbopogon ambiguus	0.1	100 cm	BIL33-10	
Cymbopogon obtectus	0.1	90 cm		
Digitaria brownii	0.1	130 cm	BIL33-09	
Dodonaea coriacea	0.1	30 cm	BIL33-13	
Duperreya commixta	0.1	70 cm		
Enneapogon polyphyllus	0.1	30 cm		
Eragrostis eriopoda	0.1	40 cm		
Eremophila forrestii subsp. *forrestii*	0.1	100 cm	BIL33-05	
Eremophila longifolia	0.1	40 cm		
Eucalyptus gamophylla	3	450 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	5 cm		
Goodenia microptera	0.1	35 cm		
Hakea lorea subsp. *lorea*	0.1	400 cm		
Hibiscus burtonii	0.1	15 cm	BIL33-11	
Hibiscus sturtii var. *platychlamys*	0.1	25 cm	BIL33-12	
Paraneurachne muelleri	0.1	60 cm		
Petalostylis cassioides	4	100 cm		
Ptilotus calostachyus	0.1	25 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	5 cm		
Ptilotus obovatus var. *obovatus*	0.1	20 cm		
Rhyncharrhena linearis	0.1	5 cm		
Scaevola parvifolia subsp. *pilbarae*	0.1	25 cm		
Senna artemisioides subsp. *helmsii*	0.1	50 cm		
Senna artemisioides subsp. *oligophylla*	0.1	100 cm	BIL33-04	
Senna glutinosa subsp. *glutinosa*	0.1	90 cm	BIL33-02	M Trudgen confirmed.
Senna glutinosa subsp. *x luerssenii*	0.1	120 cm		
Sida cardiophylla	0.1	70 cm	BIL33-07	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	35 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	15 cm	BIL33-08	
Solanum lasiophyllum	0.1	20 cm	BIL33-03	
Triodia basedowii	25	45 cm	BIL33-01	

Yandi Billiards Level 2 Site BIL34

Described by CASV Date 14-Mar-14 Type Quadrat 50 x 50 m

MGA Zone 50 733151 mE 7474714 mN

Habitat Hill crest amongst low rolling hills.

Soil Dark reddish brown sandy clay loam (skeletal).

Rock Type Ironstone cobbles (10%), pebbles (70%), and gravel (10%); with some outcropping.

Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Grevillea wickhamii, Acacia inaequilatera, Hakea lorea* subsp. *lorea* scattered tall shrubs over *Acacia hilliana* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.

Veg Condition Excellent.

Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	60 cm		
Acacia hilliana	2	60 cm		
Acacia inaequilatera	0.5	400 cm		
Acacia pruinocarpa	0.1	180 cm		
Amphipogon sericeus	0.1	10 cm	BIL34-07	
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	30 cm		
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	1 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	60 cm	BIL34-11	M Trudgen confirmed.
Eriachne mucronata (typical form)	0.1	30 cm	BIL34-03	
Eriachne pulchella	0.1	10 cm		
Eucalyptus leucophloia subsp. *leucophloia*	1	600 cm		
Fimbristylis simulans	0.1	10 cm		
Goodenia stobbsiana	0.1	10 cm		
Goodenia triodiophila	0.1	30 cm	BIL34-06	
Grevillea wickhamii	1	220 cm		Sterile.
Hakea lorea subsp. *lorea*	0.5	410 cm	BIL34-01	
Paraneurachne muelleri	0.1	30 cm		
Ptilotus calostachyus	0.1	40 cm		
Ptilotus rotundifolius	0.1	50 cm		
Scaevola spinescens	0.1	60 cm		
Senna artemisioides subsp. *oligophylla*	0.1	30 cm	BIL34-09	
Senna glutinosa subsp. *glutinosa*	0.1	120 cm		
Senna glutinosa subsp. *pruinosa*	0.1	110 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	160 cm	BIL34-08	
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	30 cm	BIL34-04	Ferruginous form.
Solanum lasiophyllum	0.1	40 cm		
Tribulus suberosus	0.1	40 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	20	50 cm	BIL34-02	

Yandi Billiards Level 2 Site BIL35
Described by CASV Date 14-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 731319 mE 7474160 mN
Habitat Drainage line at junction of two minor drainage channels.
Soil Dark reddish brown sandy loam.
Rock Type Ironstone cobbles (30%), pebbles (5%), and gravel (10%).
Vegetation *Corymbia hamersleyana* low open woodland over *Acacia pyrifolia* var. *pyrifolia, A. tumida* var. *pilbarensis*, *Grevillea wickhamii* subsp. *hispidula* tall shrubland over *Acacia adoxa* var. *adoxa* scattered low shrubs over *Triodia pungens, T. wiseana* very open hummock grassland with *Themeda triandra*, **Cenchrus ciliaris, Eulalia aurea* open tussock grassland.
Veg Condition Good (**Cenchrus ciliaris*).
Fire Age No sign of recent fire.
Notes Elevation: 521 m.

Species	Cover	Height	Specimen	Notes
Abutilon lepidum	0.1	60 cm	BIL35-23	M Trudgen confirmed.
Abutilon otocarpum	0.1	80 cm		
Acacia adoxa var. *adoxa*	1	50 cm		
Acacia adsurgens	0.1	150 cm	BIL35-18	
Acacia ancistrocarpa	0.1	140 cm		
Acacia dictyophleba	0.1	140 cm		
Acacia pyrifolia var. *pyrifolia*	6	300 cm	BIL35-01	
Acacia tenuissima	0.1	150 cm		
Acacia tumida var. *pilbarensis*	5	450 cm		
Alysicarpus muelleri	0.1	120 cm	BIL35-22	
Amaranthus undulatus	0.1	60 cm	BIL35-20	
Aristida holathera var. *holathera*	0.1	40 cm		
Boerhavia coccinea	0.1	10 cm	BIL35-05	
Boerhavia coccinea	0.1	15 cm		
Bonamia erecta	0.1	30 cm		
Cenchrus ciliaris	9	60 cm		N=900.
Cleome viscosa	0.1	50 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	70 cm	BIL35-19	M Trudgen confirmed.
Corchorus tridens	0.1	20 cm	BIL35-10	
Corymbia hamersleyana	7	1000 cm		
Crotalaria medicaginea var. *neglecta*	0.1	80 cm	BIL35-11	
Cucumis variabilis	0.1	40 cm		
Cymbopogon procerus	0.1	120 cm		
Digitaria brownii	0.1	30 cm	BIL35-30	
Eragrostis cumingii	0.1	20 cm		
Eremophila longifolia	0.1	110 cm		
Eriachne aristidea	0.1	30 cm		
Eriachne mucronata (typical form)	0.1	40 cm	BIL35-24	
Eriachne mucronata (typical form)	0.1	20 cm	BIL35-29	
Eulalia aurea	2	60 cm		
Euphorbia australis var. *erythrantha*	0.1	20 cm	BIL35-12	ID to be confirmed
Euphorbia biconvexa/coghlanii/trigonosperma	0.1	20 cm	BIL35-04	Sterile.
Evolvulus alsinoides var. *decumbens*	0.1	20 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	30 cm		
Gossypium australe	0.1	60 cm	BIL35-02	
Gossypium australe	0.1	80 cm	BIL35-31	
Grevillea wickhamii subsp. *hispidula*	1	400 cm	BIL35-27	
Hakea chordophylla	0.1	150 cm		
Hibiscus sturtii var. *platychlamys*	0.1	30 cm	BIL35-26	
Hybanthus aurantiacus	0.1	40 cm		
Indigofera colutea	0.1	25 cm		
Indigofera monophylla	0.1	40 cm	BIL35-28	
Ipomoea muelleri	0.1	10 cm		

Species	Cover	Height	Specimen	Notes
Malvastrum americanum	0.1	100 cm		N=5.
Melhania oblongifolia	0.1	45 cm		
Mollugo molluginea	0.1	15 cm		
Paraneurachne muelleri	0.1	80 cm		
Paspalidium clementii	0.1	10 cm	BIL35-21	
Perotis rara	0.1	10 cm		
Polycarpaea longiflora	0.1	25 cm		
Polymeria ambigua	0.1	10 cm	BIL35-09	
Ptilotus astrolasius	0.1	30 cm		
Ptilotus obovatus var. *obovatus*	0.1	20 cm		
Rhynchosia minima	0.1	70 cm		
Salsola australis	0.1	60 cm		
Santalum lanceolatum	0.1	170 cm	BIL35-15	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	100 cm	BIL35-14	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	60 cm	BIL35-17	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	180 cm	BIL35-25	
Senna notabilis	0.1	25 cm		
Setaria verticillata	0.1	110 cm		N=10.
Sida echinocarpa	0.1	120 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	80 cm	BIL35-08	Ferruginous form.
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	25 cm	BIL35-07	
Stemodia grossa	0.1	110 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	60 cm	BIL35-03	R. Butcher confirmed.
Themeda triandra	12	70 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	80 cm		
Triodia basedowii	0.1	40 cm	BIL35-16	
Triodia pungens	2	40 cm	BIL35-13	
Triodia wiseana	1	40 cm		
Waltheria indica	0.1	70 cm		

Yandi Billiards Level 2				Site	BIL36
Described by	PLSW	Date	14-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	730684 mE	7474207 mN		
Habitat	Plain to the east northeast of low undulating hills.				
Soil	Dark reddish brown fine sandy loam.				
Rock Type	Ironstone and basalt cobbles (2%), pebbles (10%), and gravel (10%).				
Vegetation	*Acacia pruinocarpa, Hakea lorea* subsp. *lorea* scattered tall open shrubland over *Acacia bivenosa, Eremophila forrestii* subsp. *forrestii* low open shrubland over *Senna artemisioides* subsp. *helmsii, S. artemisioides* subsp. *oligophylla* low open shrubland over *Triodia pungens* open hummock grassland and **Cenchrus ciliaris, Eragrostis desertorum* very open tussock grassland.				
Veg Condition	Good (**Cenchrus ciliaris*).				
Fire Age	No sign of recent fire.				
Notes	Elevation: 522 m.				

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	40 cm		
Abutilon lepidum	0.1	40 cm	BIL36-16	M Trudgen confirmed.
Abutilon otocarpum	0.1	40 cm		
Acacia bivenosa	1	100 cm		
Acacia dictyophleba	0.1	170 cm		
Acacia pachyacra	0.1	150 cm		
Acacia pruinocarpa	1	400 cm		
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	30 cm		
Boerhavia burbidgeana	0.1	5 cm	BIL36-08	
Boerhavia coccinea	0.1	20 cm		
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	5 cm		
Cenchrus ciliaris	3	45 cm		
Chrysopogon fallax	0.1	100 cm		
Cleome viscosa	0.1	20 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	40 cm		
Crotalaria medicaginea var. *neglecta*	0.1	15 cm		
Cucumis variabilis	0.1	200 cm		
Cymbopogon ambiguus	0.1	110 cm		
Cymbopogon obtectus	0.1	70 cm		
Digitaria ctenantha	0.1	30 cm		
Enneapogon caerulescens	0.1	20 cm	BIL36-15	
Enneapogon lindleyanus	0.1	20 cm	BIL36-11	
Enneapogon polyphyllus	0.1	80 cm	BIL36-13	
Enneapogon robustissimus	0.1	80 cm		
Eragrostis desertorum	1	40 cm	BIL36-10	
Eragrostis eriopoda	0.1	20 cm		
Eremophila forrestii subsp. *forrestii*	0.5	180 cm		
Eremophila fraseri subsp. *fraseri*	0.1	90 cm		
Eremophila longifolia	0.1	170 cm		
Eriachne mucronata (typical form)	0.1	30 cm		
Euphorbia australis var. *australis*	0.1	10 cm	BIL36-18	ID to be confirmed
Euphorbia biconvexa	0.1	30 cm	BIL36-05	
Euphorbia tannensis subsp. *eremophila*	0.1	40 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	30 cm		
Goodenia microptera	0.1	15 cm		
Gossypium australe	0.1	40 cm		
Gossypium australe	0.1	70 cm	BIL36-17	
Hakea lorea subsp. *lorea*	1	500 cm		
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		
Indigofera colutea	0.1	10 cm		
Indigofera rugosa	0.1	130 cm		
Melhania oblongifolia	0.1	50 cm		

Species	Cover (%)	Height	Specimen	Notes
Mollugo molluginea	0.1	30 cm		
Notoleptopus decaisnei var. *decaisnei*	0.1	25 cm		
Paraneurachne muelleri	0.1	50 cm		
Perotis rara	0.1	30 cm		
Polycarpaea longiflora	0.1	20 cm		
Polymeria ambigua	0.1	20 cm		
Pterocaulon sphacelatum	0.1	40 cm	BIL36-14	
Rhynchosia minima	0.1	40 cm		
Salsola australis	0.1	20 cm		
Salsola australis	0.1	20 cm		
Sclerolaena cornishiana	0.1	40 cm	BIL36-07	
Senna artemisioides subsp. *helmsii*	2	80 cm		
Senna artemisioides subsp. *oligophylla*	1	70 cm	BIL36-02	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	35 cm		
Sida fibulifera	0.1	30 cm	BIL36-03	
Sida echinocarpa	0.1	60 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	80 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	35 cm		
Solanum lasiophyllum	0.1	50 cm		
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.1	50 cm		
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	30 cm	BIL36-12	R. Butcher confirmed.
Themeda triandra	0.1	60 cm		
Tragus australianus	0.1	20 cm		
Tribulus terrestris	0.1	20 cm	BIL36-04	
Triodia pungens	16	45 cm	BIL36-01	
Triodia wiseana	0.1	60 cm		
Triraphis mollis	0.1	30 cm	BIL36-09	

Yandi Billiards Level 2 Site BIL37
Described by CASW Date 17-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 732870 mE 7470854 mN
Habitat Gentle north-facing hill slope at crest of low hill amongst undulating hill range.
Soil Dark reddish brown sandy clay loam (skeletal).
Rock Type BIF, shale, ironstone cobbles (20%), pebbles (60%), and gravel (10%).
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia hilliana* scattered low shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia ancistrocarpa x *arida*	0.1	25 cm	BIL37-04	
Acacia hilliana	0.5	40 cm		
Acacia pruinocarpa	0.1	110 cm		
Amphipogon sericeus	0.1	20 cm		
Calytrix carinata	0.1	60 cm		
Cymbopogon ambiguus	0.1	70 cm		
Eremophila latrobei subsp. *latrobei*	0.1	50 cm	BIL37-02	
Eriachne mucronata (typical form)	0.1	30 cm		
Eriachne pulchella	0.1	10 cm		
Eucalyptus leucophloia subsp. *leucophloia*	0.5	480 cm		
Fimbristylis simulans	0.1	15 cm	BIL37-03	
Goodenia stobbsiana	0.1	15 cm		
Grevillea wickhamii	0.1	210 cm		Sterile.
Hakea lorea subsp. *lorea*	0.1	200 cm		
Hibiscus coatesii	0.1	30 cm	BIL37-01	
Hybanthus aurantiacus	0.1	20 cm		
Keraudrenia nephrosperma	0.1	60 cm	BIL37-05	
Ptilotus calostachyus	0.1	40 cm		
Ptilotus rotundifolius	0.1	55 cm		
Senna glutinosa subsp. *glutinosa*	0.1	60 cm		
Senna glutinosa subsp. *glutinosa x* subsp. *x luerssenii*	0.1	180 cm		
Senna glutinosa subsp. *pruinosa*	0.1	160 cm		
Solanum lasiophyllum	0.1	60 cm		
Themeda triandra	0.1	60 cm		
Tribulus suberosus	0.1	90 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	22	45 cm		
Triodia wiseana	0.1	50 cm		

Yandi Billiards Level 2 Site BIL38
Described by CEFCASW Date 14-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 732161 mE 7472949 mN
Habitat Colluvial plain extending close to the foot of a mesa.
Soil 2.5YR 3/3 dark reddish brown sandy loam.
Rock Type Ironstone cobbles (70%), pebbles (10%), and gravel (5%).
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia bivenosa* tall shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *T. wiseana* open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	80 cm		
Acacia ancistrocarpa	0.1	250 cm		
Acacia bivenosa	25	250 cm		
Acacia dictyophleba	0.1	250 cm		
Acacia hilliana	0.1	90 cm		
Acacia inaequilatera	0.1	130 cm		
Acacia pruinocarpa	0.1	320 cm		
Acacia synchronicia	0.1	200 cm	BIL38-14	
Aristida contorta	0.1	25 cm		
Bonamia erecta	0.1	35 cm		
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	5 cm	BIL38-12	
Brachyachne prostrata	0.1	5 cm	BIL38-20	
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	30 cm	BIL38-15	
Cymbopogon obtectus	0.1	80 cm		
Duperreya commixta	0.1	300 cm		
Enneapogon polyphyllus	0.1	30 cm	BIL38-10	
Eremophila fraseri subsp. *fraseri*	0.1	100 cm		
Eriachne mucronata (typical form)	0.1	45 cm	BIL38-18	
Eriachne pulchella	0.1	5 cm		
Eucalyptus leucophloia subsp. *leucophloia*	1	500 cm		
Goodenia microptera	0.1	20 cm		
Goodenia muelleriana	0.1	10 cm	BIL38-03	
Goodenia stobbsiana	0.1	5 cm		
Hakea chordophylla	0.1	70 cm		
Hibiscus coatesii	0.1	20 cm	BIL38-16	
Hibiscus leptocladus	0.1	20 cm	BIL38-07	
Hybanthus aurantiacus	0.1	30 cm		
Isotropis atropurpurea	0.1	20 cm		
Maireana planifolia	0.1	70 cm	BIL38-19	
Paraneurachne muelleri	0.1	35 cm		
Ptilotus astrolasius	0.1	30 cm		
Ptilotus calostachyus	0.1	30 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	30 cm		
Sclerolaena cornishiana	0.1	7 cm	BIL38-13	
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	160 cm		
Senna glutinosa subsp. *pruinosa*	0.1	40 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	130 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	130 cm	BIL38-08	
Sida arenicola	0.1	35 cm	BIL38-09	
Sida echinocarpa	0.1	10 cm		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	25 cm	BIL38-11	Ferruginous form.
Solanum horridum	0.1	20 cm	BIL38-17	
Solanum lasiophyllum	0.1	60 cm		
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.1	35 cm	BIL38-06	R. Butcher confirmed.
Themeda triandra	0.1	70 cm		
Triodia pungens	0.1	45 cm	BIL38-04	

Species	Cover (%)	Height	Specimen	Notes
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	22	40 cm	BIL38-01	
Triodia wiseana	6	40 cm	BIL38-02	
Tylophora flexuosa	0.1	40 cm	BIL38-05	M Trudgen confirmed.

Yandi Billiards Level 2 Site BIL39

Described by CASV Date 13-Mar-14 Type Quadrat 50 x 50 m

MGA Zone 50 730658 mE 7471897 mN

Habitat Hill crest.

Soil Dark reddish brown sandy loam (skeletal).

Rock Type Ironstone (with outcropping) cobbles (75%), pebbles (10%), and gravel (5%).

Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland.

Veg Condition Excellent.

Fire Age No sign of recent fire.

Notes Elevation: 572 m.

Species	Cover (%)	Height	Specimen
Acacia adoxa var. *adoxa*	0.1	40 cm	
Acacia hilliana	0.1	60 cm	
Acacia pruinocarpa	0.1	350 cm	
Eucalyptus leucophloia subsp. *leucophloia*	1	450 cm	
Fimbristylis dichotoma	0.1	15 cm	BIL39-02
Fimbristylis simulans	0.1	15 cm	
Goodenia stobbsiana	0.1	30 cm	
Polygala glaucifolia	0.1	1 cm	BIL39-03
Ptilotus calostachyus	0.1	60 cm	
Ptilotus rotundifolius	0.1	70 cm	
Senna glutinosa subsp. *glutinosa*	0.1	170 cm	
Senna glutinosa subsp. *pruinosa*	0.1	40 cm	
Senna glutinosa subsp. *x luerssenii*	0.1	120 cm	BIL39-04
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	40	30 cm	BIL39-01
Triodia wiseana	0.1	30 cm	

Yandi Billiards Level 2 Site BIL40
Described by CASV Date 14-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 730090 mE 7473783 mN
Habitat Hillcrest and slope of a small hill facing southwest.
Soil 2.5YR 3/3 dark reddish brown sandy loam.
Rock Type Ironstone cobbles (80%), pebbles (10%), and gravel (5%).
Vegetation *Acacia inaequilatera* tall open shrubland over *Indigofera monophylla* low open shrubland over *Triodia wiseana* hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen
Acacia inaequilatera	4	350 cm	
Acacia pruinocarpa	0.1	250 cm	
Boerhavia burbidgeana	0.1	5 cm	BIL40-09
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	10 cm	BIL40-04
Cheilanthes contigua	0.1	10 cm	BIL40-01
Enchylaena tomentosa var. *tomentosa*	0.1	35 cm	BIL40-10
Enneapogon caerulescens	0.1	25 cm	
Enneapogon lindleyanus	0.1	35 cm	
Enneapogon polyphyllus	0.1	25 cm	
Euphorbia australis var. *subtomentosa*	0.1	10 cm	BIL40-11
Fimbristylis dichotoma	0.1	15 cm	BIL40-06
Gomphrena cunninghamii	0.1	10 cm	
Gossypium australe	0.1	80 cm	
Indigofera monophylla	2	50 cm	BIL40-05
Paspalidium clementii	0.1	10 cm	BIL40-12
Portulaca oleracea/intraterranea	0.1	7 cm	BIL40-08
Ptilotus astrolasius	0.1	40 cm	
Ptilotus nobilis subsp. *nobilis*	0.1	7 cm	
Salsola australis	0.1	20 cm	
Schizachyrium fragile	0.1	20 cm	
Senna artemisioides subsp. *oligophylla*	0.1	45 cm	BIL40-07
Senna glutinosa subsp. *glutinosa*	0.1	150 cm	
Senna glutinosa subsp. *pruinosa*	0.1	100 cm	
Sida echinocarpa	0.1	20 cm	BIL40-03
Sida echinocarpa	0.1	20 cm	
Solanum lasiophyllum	0.1	30 cm	
Tribulus suberosus	0.1	110 cm	
Triodia wiseana	50	45 cm	BIL40-02

Yandi Billiards Level 2 Site BIL41
Described by SVSW Date 11-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 739479 mE 7484604 mN
Habitat Colluvial plain.
Soil Dark reddish brown sandy loam.
Rock Type Ironstone pebbles (1%) and gravel (1%).
Vegetation *Acacia ancistrocarpa, A. inaequilatera*, *A. pruinocarpa, A. bivenosa* tall open shrubland over *Petalostylis cassioides* open shrubland over *Triodia basedowii* hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen
Acacia ancistrocarpa	3	260 cm	
Acacia bivenosa	0.5	400 cm	
Acacia citrinoviridis	0.1	150 cm	
Acacia inaequilatera	3	350 cm	
Acacia pachyacra	0.1	260 cm	
Acacia pruinocarpa	1	410 cm	
Aristida holathera var. *holathera*	0.1	45 cm	
Cleome viscosa	0.1	10 cm	
Corchorus tectus	0.1	15 cm	
Cucumis variabilis	0.1	20 cm	
Cymbopogon ambiguus	0.1	140 cm	BIL41-03
Cymbopogon obtectus	0.1	110 cm	
Dicrastylis cordifolia	0.1	45 cm	
Dodonaea coriacea	0.1	15 cm	
Eragrostis eriopoda	0.1	40 cm	
Euphorbia australis var. *subtomentosa*	0.1	10 cm	BIL41-06
Evolvulus alsinoides var. *villosicalyx*	0.1	10 cm	
Goodenia microptera	0.1	35 cm	
Gossypium australe	0.1	60 cm	
Grevillea wickhamii	0.1	60 cm	
Hakea lorea subsp. *lorea*	0.1	100 cm	
Hibiscus sturtii var. *platychlamys*	0.1	20 cm	
Hybanthus aurantiacus	0.1	70 cm	
Paspalidium clementii	0.1	20 cm	BIL41-04
Paspalidium rarum	0.1	15 cm	BIL41-07
Petalostylis cassioides	4	160 cm	YAQR23-12=
Ptilotus astrolasius	0.1	25 cm	
Senna artemisioides subsp. *helmsii*	0.1	580 cm	
Senna artemisioides subsp. *oligophylla* (thinly sericeous form MET 15,035)	0.1	110 cm	BIL41-09
Senna notabilis	0.1	15 cm	
Sida cardiophylla	0.1	15 cm	YAQR23-14=
Solanum phlomoides	0.1	10 cm	BIL41-05
Solanum phlomoides	0.1	12 cm	BIL41-02
Trianthema pilosa	0.1	5 cm	
Triodia basedowii	55	55 cm	BIL41-01
Triodia pungens	0.1	60 cm	BIL41-08
Yakirra australiensis var. *australiensis*	0.1	10 cm	

Yandi Billiards Level 2 Site BIL42

Described by CEFCASW Date 18-Mar-14 Type Quadrat 50 x 50 m

MGA Zone 50 741425 mE 7484638 mN

Habitat Colluvial plain at the base of low hills to the west.

Soil Dark reddish brown loamy sand.

Rock Type Nil.

Vegetation *Eucalyptus gamophylla* low open mallee woodland over *Triodia schinzii* hummock grassland.

Veg Condition Excellent.

Fire Age No sign of recent fire.

Notes Northwest corner is not staked.

Species	Cover (%)	Height	Specimen	Notes
Acacia dictyophleba	0.1	160 cm		
Acacia pachyacra	0.1	150 cm	BIL42-03	
Aristida holathera var. *holathera*	0.1	30 cm		
Bonamia erecta	0.1	35 cm		
Corchorus tectus	0.1	30 cm	BIL42-02	M Trudgen confirmed.
Dicrastylis cordifolia	0.1	30 cm		
Eragrostis eriopoda	0.1	30 cm		
Eucalyptus gamophylla	3	450 cm		
Hybanthus aurantiacus	0.1	70 cm		
Paraneurachne muelleri	0.1	35 cm		
Scaevola parvifolia subsp. *pilbarae*	0.1	30 cm	BIL42-01	
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	100 cm	BIL42-04	
Senna notabilis	0.1	5 cm		
Sida cardiophylla	0.1	40 cm	BIL22-04=	
Trianthema pilosa	0.1	10 cm	BIL22-10=	
Trichodesma zeylanicum var. *zeylanicum*	0.1	10 cm		
Triodia pungens	0.1	70 cm	BIL22-03=	
Triodia schinzii	35	50 cm	BIL22-01=	

Yandi Billiards Level 2 Site BIL43
Described by PLCA Date 09-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 739882 mE 7485505 mN
Habitat Rocky BIF hill crest in major valley, on the western side of major drainage.
Soil Dark reddish brown sandy loam.
Rock Type BIF cobbles (80%), pebbles (20%).
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Grevillea wickhamii* subsp. *hispidula* scattered tall shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.
Notes Elevation: 510 m.

Species	Cover (%)	Height	Specimen	Notes
Acacia bivenosa (wispy/weeping form)	0.1	280 cm		
Acacia pruinocarpa	0.1	210 cm		
Eriachne mucronata (typical form)	0.1	30 cm		
Eucalyptus leucophloia subsp. *leucophloia*	1	500 cm		
Fimbristylis dichotoma	0.1	30 cm		
Fimbristylis simulans	0.1	10 cm		
Grevillea wickhamii subsp. *hispidula*	1	370 cm	BIL43-06	
Polygala glaucifolia	0.1	2 cm	BIL43-04	
Ptilotus calostachyus	0.1	60 cm		
Ptilotus obovatus var. *obovatus*	0.1	130 cm		
Ptilotus rotundifolius	0.1	120 cm		
Senna artemisioides subsp. *helmsii*	0.1	60 cm		
Senna glutinosa subsp. *glutinosa*	0.1	170 cm		
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	100 cm	BIL43-03	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	50 cm		
Senna glutinosa subsp. *pruinosa x*	0.1	120 cm	BIL43-02	M Trudgen confirmed.
Tribulus suberosus	0.1	70 cm		
Triodia pungens	0.1	30 cm	BIL43-05	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	35	30 cm	BIL43-01	

Yandi Billiards Level 2				Site	BIL44
Described by	PLSW	Date	13-Mar-14	Type	Quadrat 50 x 50 m
MGA Zone	50	729704 mE	7472128 mN		
Habitat	Ridge/slope in broader area of continuous hills.				
Soil	Dark reddish brown sandy clay loam.				
Rock Type	BIF and angular basalt cobbles (50%), pebbles (30%), and gravel (20%).				
Vegetation	*Acacia inaequilatera* tall open shrubland over *Triodia wiseana* hummock grassland.				
Veg Condition	Excellent.				
Fire Age	No sign of recent fire.				
Notes	West corner not staked. No picture.				

Species	Cover (%)	Height	Specimen
Acacia adoxa var. *adoxa*	0.1	50 cm	
Acacia inaequilatera	2.5	430 cm	
Acacia pruinocarpa	0.1	60 cm	
Boerhavia gardneri	0.1	35 cm	BILPL-19=
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	25 cm	
Enneapogon lindleyanus	0.1	45 cm	BIL44-03
Eriachne mucronata (typical form)	0.1	40 cm	
Paraneurachne muelleri	0.1	40 cm	
Paspalidium clementii	0.1	20 cm	
Ptilotus clementii	0.1	20 cm	BIL44-04
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	40 cm	
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	170 cm	BIL44-01
Senna glutinosa subsp. *x luerssenii*	0.1	190 cm	
Solanum lasiophyllum	0.1	50 cm	
Triodia wiseana	37	50 cm	

Yandi Billiards Level 2 Site BIL45
Described by CEFCASW Date 19-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 738293 mE 7481699 mN
Habitat Broad plain.
Soil Dark reddish brown loamy sand.
Rock Type Not recorded. Cobbles (3%), pebbles (3%), and gravel (20%).
Vegetation *Petalostylis cassioides* open shrubland over *Triodia basedowii* very hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.
Notes *Eucalyptus gamophylla* and *Corymbia hamersleyana* scattered low open woodland mallees and trees in broader landscape.

Species	Cover (%)	Height	Specimen
Acacia adoxa var. *adoxa*	0.1	40 cm	
Acacia adsurgens	0.1	120 cm	BIL45-12
Acacia ancistrocarpa	0.1	110 cm	
Acacia dictyophleba	0.1	100 cm	
Acacia elachantha	0.1	170 cm	BIL45-10
Acacia inaequilatera	0.1	410 cm	
Acacia pachyacra	0.1	60 cm	BIL46-05=
Acacia pruinocarpa	1	150 cm	
Acacia tumida var. *pilbarensis*	0.1	160 cm	
Aristida holathera var. *holathera*	0.1	40 cm	
Aristida pruinosa	0.1	80 cm	BIL46-21=
Bonamia erecta	0.1	10 cm	
Cleome viscosa	0.1	80 cm	
Corchorus tectus	0.1	30 cm	
Eragrostis eriopoda	0.1	40 cm	
Euphorbia australis var. *hispidula*	0.1	10 cm	BIL45-11
Goodenia microptera	0.1	40 cm	BIL45-05
Gossypium australe	0.1	150 cm	
Hibiscus burtonii	0.1	80 cm	BIL45-04
Hibiscus sturtii var. *platychlamys*	0.1	40 cm	
Hybanthus aurantiacus	0.1	60 cm	
Indigofera monophylla	0.1	60 cm	BIL45-03
Paraneurachne muelleri	0.1	70 cm	
Petalostylis cassioides	2	180 cm	
Ptilotus astrolasius	0.1	30 cm	
Ptilotus calostachyus	0.1	60 cm	
Ptilotus nobilis subsp. *nobilis*	0.1	5 cm	
Scaevola parvifolia subsp. *pilbarae*	0.1	10 cm	
Senna artemisioides subsp. *helmsii*	0.1	10 cm	
Senna artemisioides subsp. *oligophylla*	0.1	40 cm	BIL45-08
Senna glutinosa subsp. *glutinosa*	0.1	150 cm	BIL45-06
Senna glutinosa subsp. *pruinosa*	0.1	160 cm	
Senna notabilis	0.1	10 cm	
Sida arenicola	0.1	140 cm	BIL45-07
Sida cardiophylla	0.1	40 cm	BIL46-22=
Sida echinocarpa	0.1	40 cm	BIL45-09
Solanum elatius	0.1	80 cm	BIL45-01
Solanum phlomoides	0.1	40 cm	BIL45-13
Triodia basedowii	13	40 cm	BIL46-26=

Yandi Billiards Level 2 Site BIL46
Described by CEFCASW Date 19-Mar-14 Type Quadrat 50 x 50 m
MGA Zone 50 737262 mE 7481015 mN
Habitat Plain/diffuse floodplain of tributary of Weeli Wolli Creek.
Soil Dark reddish brown loamy sand.
Rock Type Nil.
Vegetation *Acacia tumida* var. *pilbarensis*, (*A. pachyacra*) tall open shrubland over *Petalostylis cassioides, Senna artemisioides* subsp. *oligophylla* (thinly sericeous form MET 15,035), *Acacia ancistrocarpa* open shrubland over *Aristida holathera* var. *holathera*, *Paraneurachne muelleri* very open tussock grasses over *Bonamia erecta* very open herbland.
Veg Condition Very Good (various weeds, cow scats and grazing).
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	50 cm	BIL46-09	M Trudgen confirmed.
Abutilon otocarpum	0.1	60 cm		
Acacia adoxa var. *adoxa*	0.1	70 cm		
Acacia ancistrocarpa	0.5	150 cm		
Acacia bivenosa	0.1	120 cm		
Acacia dictyophleba	0.1	130 cm		
Acacia pachyacra	1	200 cm	BIL46-05	
Acacia pyrifolia var. *pyrifolia*	0.1	120 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	130 cm	BIL46-24	
Acacia tumida var. *pilbarensis*	9	220 cm	BIL46-01	
Alternanthera nana	0.1	30 cm	BIL46-27	
Amaranthus undulatus	0.1	90 cm	BIL46-23	
Aristida holathera var. *holathera*	1	60 cm		
Aristida pruinosa	0.1	100 cm	BIL46-21	
Boerhavia coccinea	0.1	10 cm	BIL46-02	
Bonamia erecta	6	25 cm		
Cenchrus ciliaris	0.1	100 cm		
Cenchrus setiger	0.1	70 cm		
Chrysopogon fallax	0.1	150 cm		
Cleome viscosa	0.1	70 cm		
Corchorus tectus	0.1	30 cm		
Corchorus tridens	0.1	15 cm	BIL46-12	Recollect PH2.
Crotalaria medicaginea var. *neglecta*	0.1	40 cm		
Enneapogon polyphyllus	0.1	30 cm		
Eragrostis cumingii	0.1	10 cm		
Eragrostis eriopoda	0.1	50 cm		
Eriachne aristidea	0.1	40 cm		
Euphorbia australis var. *subtomentosa*	0.1	15 cm	BIL46-17	
Euphorbia coghlanii	0.1	35 cm	BIL46-07	
Euphorbia tannensis subsp. *eremophila*	0.1	35 cm	BIL46-11	
Evolvulus alsinoides var. *villosicalyx*	0.1	10 cm		
Gomphrena cunninghamii	0.1	40 cm	BIL46-14	
Goodenia microptera	0.1	20 cm		
Gossypium australe	0.1	50 cm		
Gossypium robinsonii	0.1	230 cm		
Grevillea wickhamii	0.1	220 cm		Sterile.
Hakea lorea subsp. *lorea*	0.1	350 cm		
Hibiscus sturtii var. *platychlamys*	0.1	80 cm	BIL46-18	
Hybanthus aurantiacus	0.1	60 cm		
Indigofera georgei	0.1	50 cm		
Indigofera monophylla	0.1	60 cm	BIL46-13	
Melhania oblongifolia	0.1	50 cm		
Mollugo molluginea	0.1	20 cm		
Notoleptopus decaisnei var. *decaisnei*	0.1	40 cm	BIL46-20	
Paraneurachne muelleri	1	70 cm		
Paspalidium rarum	0.1	60 cm	BIL46-19	

Species	Cover (%)	Height	Specimen	Notes
Perotis rara	0.1	15 cm		
Petalostylis cassioides	3	160 cm	BIL46-08	
Polymeria ambigua	0.1	10 cm	BIL46-03	
Ptilotus astrolasius	0.1	40 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	20 cm		
Rhagodia eremaea	0.1	100 cm		
Rhynchosia minima	0.1	40 cm		
Salsola australis	0.1	60 cm		
Scaevola parvifolia subsp. *pilbarae*	0.1	40 cm		
Senna artemisioides subsp. *oligophylla*(thinly sericeous form MET 15,035)	1	110 cm	BIL46-04	
Senna notabilis	0.1	10 cm		
Sida cardiophylla	0.1	90 cm	BIL46-22	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	30 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	50 cm	BIL46-16	
Solanum elatius	0.1	100 cm	BIL46-25	
Solanum lasiophyllum	0.1	50 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	30 cm	BIL46-10	R. Butcher confirmed.
Themeda triandra	0.1	120 cm		
Trianthema pilosa	0.1	15 cm		
Tribulopis angustifolia	0.1	5 cm		
Tribulus macrocarpus	0.1	10 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	30 cm		
Triodia basedowii	0.1	40 cm	BIL46-26	
Triodia pungens	0.1	50 cm	BIL46-06	
Waltheria indica	0.1	120 cm		

Yandi Billiards Level 2 Site BIL-RCFA
Described by CEF Date 14-Mar-14 Type Relevé
MGA Zone 50 729587 mE 7473059 mN
Habitat Minor creek line in between two low rocky hills.
Soil Dark reddish brown skeletal.
Rock Type Not recorded.
Vegetation *Senna artemisioides* subsp. *oligophylla*, *Gossypium australe, Acacia pyrifolia* var. *pyrifolia* open shrubland over *Cymbopogon ambiguus, Enneapogon lindleyanus, Enneapogon lindleyanus, Themeda triandra* open tussock grassland.
Veg Condition Very Good (**Aerva javanica*).
Fire Age No sign of recent fire.
Notes Creekline is approximately 3-5 m wide.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	30 cm	BIL-RCFA08	M Trudgen confirmed.
Acacia inaequilatera	0.1	250 cm		
Acacia pyrifolia var. *pyrifolia*	1	150 cm	BIL-RCFA01	
Aerva javanica	0.1	110 cm		N=8.
Aristida holathera var. *holathera*	0.1	30 cm		
Atalaya hemiglauca	0.1	300 cm		
Boerhavia coccinea	0.1	20 cm	BIL-RCFA06	
Bulbostylis barbata	0.1	30 cm	BIL-RCFA09	
Cleome viscosa	0.1	40 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	40 cm	BIL-RCFA05	M Trudgen confirmed.
Crotalaria medicaginea var. *neglecta*	0.1	50 cm		
Cymbopogon ambiguus	15	120 cm		
Cyperus squarrosus	0.1	10 cm	BIL-RCFA10	
Enneapogon lindleyanus	10	60 cm	BIL-CF160=	
Enneapogon polyphyllus	0.1	40 cm		
Enneapogon robustissimus	0.1	120 cm		
Eriachne tenuiculmis	0.5	50 cm	BIL-CF161=	
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Gossypium australe	2	160 cm		
Heliotropium tenuifolium	0.1	30 cm	BIL-RCFA07	
Hibiscus sturtii var. *platychlamys*	0.1	30 cm	BIL-RCFA12	
Indigofera monophylla	0.1	40 cm	BIL-RCFA11	
Indigofera rugosa	0.1	100 cm	BIL-RCFA03	
Melhania oblongifolia	0.1	45 cm		
Polycarpaea longiflora	0.1	30 cm		
Rhynchosia minima	0.1	40 cm		
Senna artemisioides subsp. *oligophylla*	5	150 cm	BIL-RCFA04	
Solanum horridum	0.1	15 cm		
Stemodia grossa	0.1	10 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	50 cm	BIL-RCFA02	R. Butcher confirmed.
Themeda triandra	0.5	100 cm		
Triodia wiseana	3	60 cm		

Yandi Billiards Level 2 Site BIL-RCFB
Described by CEF Date 14-Mar-14 Type Relevé
MGA Zone 50 731517 mE 7473016 mN
Habitat Rocky ridgeline adjacent to a gully.
Soil Not recorded.
Rock Type Not recorded.
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia ferriticola* low open woodland over *Senna glutinosa* subsp. *glutinosa*, *Eremophila latrobei* subsp. *filiformis* open shrubland over *Themeda triandra, Eriachne mucronata* (typical form), *Cymbopogon ambiguus* open tussock grassland with *Triodia pungens* scattered hummock grasses.
Veg Condition Very Good (**Cenchrus ciliaris*).
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	30 cm	BIL-RCFB14	M Trudgen confirmed.
Aristida holathera var. *holathera*	0.1	30 cm		
Capparis spinosa var. *nummularia*	0.1	30 cm		
Cenchrus ciliaris	0.1	30 cm		N=1.
Clerodendrum floribundum var. *angustifolium*	0.1	10 cm		Juvenile.
Corymbia ferriticola	1	300 cm	BIL-RCFB01	
Cymbopogon ambiguus	1	70 cm	BIL-RCFB04	
Duperreya commixta	0.1	60 cm		
Enneapogon polyphyllus	0.1	35 cm		
Eremophila latrobei subsp. *filiformis*	1	150 cm	BIL-RCFB07	
Eremophila latrobei subsp. *latrobei*	0.1	160 cm	BIL-RCFB08	
Eriachne mucronata (typical form)	10	40 cm	BIL-RCFB02	
Eucalyptus leucophloia subsp. *leucophloia*	4	500 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Goodenia muelleriana	0.1	40 cm	BIL-RCFB15	
Hibiscus sp. Mt Robinson (G. Byrne 3537)	0.1	40 cm	BIL-RCFB13	ID to be confirmed
Maireana planifolia	0.1	40 cm	BIL-RCFB09	
Ptilotus obovatus var. *obovatus*	0.1	70 cm		
Rhagodia eremaea	0.1	70 cm		
Senna glutinosa subsp. *glutinosa*	2	150 cm	BIL-RCFB06	M Trudgen confirmed.
Sida sp. Excedentifolia (J.L. Egan 1925)	0.1	40 cm	BIL-RCFB03	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	50 cm	BIL-RCFB11	White form.
Solanum lasiophyllum	0.1	30 cm	BIL-RCFB12	
Themeda triandra	12	60 cm	BIL-RCFB10	
Tribulus suberosus	0.1	40 cm		
Triodia pungens	1	50 cm	BIL-RCFB05	

Yandi Billiards Level 2 Site BIL-RCFC
Described by CEF Date 16-Mar-14 Type Relevé
MGA Zone 50 738123 mE 7476805 mN
Habitat Minor creek line.
Soil Not recorded.
Rock Type Not recorded.
Vegetation *Corymbia hamersleyana* scattered low trees over *Acacia tumida* var. *pilbarensis, Gossypium robinsonii* tall open scrub over *Triodia pungens* open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.
Notes Site unburnt, most of the surrounding landscape has been burnt <3 years ago.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	20 cm	BIL-RCFC10	M Trudgen confirmed.
Acacia pyrifolia var. *pyrifolia*	0.1	160 cm	BIL-RCFC12	
Acacia tumida var. *pilbarensis*	50	250 cm	BIL-RCFC01	
Aristida holathera var. *holathera*	0.1	45 cm		
Bonamia erecta	0.1	40 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	50 cm	BIL-RCFC04	M Trudgen confirmed.
Corymbia hamersleyana	1	550 cm		
Cymbopogon obtectus	0.1	60 cm		
Cymbopogon procerus	0.1	110 cm	BIL-RCFC13	
Enneapogon robustissimus	0.1	100 cm		
Eriachne mucronata (typical form)	0.1	40 cm	BIL-RCFC11	
Eucalyptus gamophylla	0.1	300 cm		
Eulalia aurea	0.1	110 cm	BIL-RCFC14	
Euphorbia australis var. *subtomentosa*	0.1	15 cm	BIL-RCFC05	
Euphorbia biconvexa	0.1	35 cm	BIL-RCFC08	
Evolvulus alsinoides var. *villosicalyx*	0.1	15 cm		
Goodenia microptera	0.1	30 cm		
Goodenia muelleriana	0.1	30 cm		
Gossypium robinsonii	3	300 cm		
Hibiscus leptocladus	0.1	30 cm	BIL-RCFC09	
Hybanthus aurantiacus	0.1	40 cm		
Indigofera monophylla	0.1	40 cm	BIL-RCFC07	
Isotropis atropurpurea	0.1	30 cm	BIL-RCFC02	
Melhania oblongifolia	0.1	30 cm		
Paraneurachne muelleri	0.1	30 cm		
Polycarpaea holtzei	0.1	2 cm		
Polycarpaea longiflora	0.1	40 cm		
Senna artemisioides subsp. *oligophylla*	0.1	75 cm	BIL-RCFC15	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	50 cm	BIL-RCFC16	Ferruginous form.
Stemodia grossa	0.1	30 cm		
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.1	70 cm	BIL-RCFC06	R. Butcher confirmed.
Trichodesma zeylanicum var. *zeylanicum*	0.1	10 cm		
Triodia pungens	25	40 cm	BIL-RCFC03	

Yandi Billiards Level 2 Site BIL-RCFD
Described by CEF Date 17-Mar-14 Type Relevé
MGA Zone 50 732791 mE 7470844 mN
Habitat Exposed rocky ridgeline.
Soil Dark reddish brown skeletal.
Rock Type Not recorded.
Vegetation *Corymbia ferriticola, Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Triodia pungens* very open hummock grassland with *Eriachne mucronata* (typical form), *Cymbopogon ambiguus* very open tussock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.
Notes Ridgeline has not been burnt but the plain and surrounding low hills have a fire age of approximately 3 years.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	35 cm	BIL-RCFD20	M Trudgen confirmed.
Abutilon sp. Pilbara (W.R. Barker 2025)	0.1	35 cm	BIL-RCFD18	
Acacia spondylophylla	0.1	50 cm		
Amphipogon sericeus	0.1	30 cm	BIL-CF191=	
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	10 cm		
Corchorus crozophorifolius	0.1	30 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	30 cm	BIL-RCFD07	M Trudgen confirmed.
Corymbia ferriticola	2	300 cm	BIL-RCFD03	
Cymbopogon ambiguus	2	100 cm	BIL-RCFD01	
Dodonaea coriacea	0.1	20 cm		
Eremophila latrobei subsp. *latrobei*	0.1	40 cm	BIL-RCFD05	Glabrous leaved form
Eriachne mucronata (typical form)	3	30 cm	BIL-RCFD02	
Eriachne pulchella	0.1	30 cm		
Eucalyptus leucophloia subsp. *leucophloia*	1	450 cm		
Gompholobium oreophilum	0.1	15 cm	BIL-RCFD16	
Gomphrena cunninghamii	0.1	15 cm	BIL-RCFD06	
Goodenia microptera	0.1	60 cm		
Goodenia muelleriana	0.1	15 cm	BIL-RCFD13	
Goodenia stobbsiana	0.1	20 cm		
Grevillea wickhamii	0.1	120 cm		
Heliotropium inexplicitum	0.1	20 cm	BIL-RCFD12	
Hibiscus coatesii	0.1	40 cm	BIL-RCFD10	
Hibiscus sturtii var. *campylochlamys*	0.1	40 cm	BIL-RCFD17	
Keraudrenia velutina subsp. *elliptica*	0.1	30 cm	BIL-RCFD14	
Paraneurachne muelleri	0.1	60 cm		
Senna glutinosa subsp. *glutinosa*	0.1	30 cm	BIL-RCFD11	M Trudgen confirmed.
Senna glutinosa subsp. *x luerssenii*	0.1	120 cm	BIL-RCFD04	
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	50 cm	BIL-RCFD15	Ferruginous form.
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	30 cm		
Solanum horridum	0.1	30 cm	BIL-RCFD09	
Themeda triandra	0.1	45 cm	BIL-RCFD19	
Triodia pungens	4	40 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	0.1	35 cm		
Triodia wiseana	0.1	60 cm		

Yandi Billiards Level 2 Site BIL-RPCA
Described by PLCA Date 10-Mar-14 Type Relevé ~40 x 40 m
MGA Zone 50 743101 mE 7483664 mN
Habitat Lower hill slope.
Soil Dark reddish brown silty clay loam.
Rock Type BIF boulders (1%), cobbles (10%), pebbles (88%), and gravel (1%).
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.
Notes Elevation: 475 m.
Relevé in place of quadrat because upslope is burnt and not enough area for quadrat.

Species	Cover (%)	Height	Specimen	Notes
Acacia bivenosa (wispy/weeping form)	1	220 cm		
Acacia inaequilatera	0.1	100 cm		
Acacia pachyacra	0.1	170 cm	BIL-RPCA02	
Eucalyptus leucophloia subsp. *leucophloia*	1	700 cm		
Fimbristylis simulans	0.1	15 cm		
Goodenia stobbsiana	0.1	10 cm		
Grevillea wickhamii	0.1	250 cm		Sterile.
Hakea chordophylla	0.1	250 cm		
Ptilotus calostachyus	0.1	60 cm		
Senna glutinosa subsp. *glutinosa*	0.1	180 cm		
Senna glutinosa subsp. *glutinosa* x subsp. *pruinosa*	0.1	160 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	20	40 cm	BIL-RPCA01	

Yandi Billiards Level 2				Site	BIL-RSPA
Described by	PLSW	Date	13-Mar-14	Type	Relevé
MGA Zone	50	730066 mE	7472398 mN		

Habitat: Southeast facing moderate hill slope amongst broader undulating hills.

Soil: Dark reddish brown sandy clay loam.

Rock Type: Mix of ironstone and basalt boulders (1%), cobbles (3%), pebbles (40%), and gravel (20%).

Vegetation: *Acacia aptaneura*, (*A. pruinocarpa*) low woodland over *Senna artemisioides* subsp. *helmsii* scattered low shrubs over *Triodia pungens* open hummock grassland with *Digitaria ctenantha* scattered grasses.

Veg Condition: Good (**Bidens bipinnata, *Cenchrus ciliaris*).

Fire Age: No sign of recent fire.

Notes: Elevation: 550 m. Relevé size is approximately 50 x 50 m.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	25 cm	BIL-RSPA02	M Trudgen confirmed.
Abutilon macrum	0.1	30 cm	BIL-RSPA23	
Abutilon otocarpum	0.1	40 cm		
Acacia aptaneura	14	850 cm	BIL-RSPA08	
Acacia pruinocarpa	1	900 cm		
Amaranthus cuspidifolius	0.1	20 cm	BIL-RSPA04	
Aristida contorta	0.1	40 cm		
Aristida holathera var. *holathera*	0.1	30 cm		
Bidens bipinnata	0.1	10 cm		N=8,000.
Boerhavia coccinea	0.1	30 cm		
Bulbostylis barbata	0.1	5 cm		
Cenchrus ciliaris	0.1	40 cm		
Cheilanthes brownii	0.1	10 cm	BIL-RSPA20	ID to be confirmed.
Cheilanthes contigua	0.1	10 cm	BIL-RSPA07	
Cleome viscosa	0.1	35 cm		
Corchorus crozophorifolius	0.1	30 cm		
Digitaria ctenantha	2	25 cm		
Duperreya commixta	0.1	200 cm		
Dysphania melanocarpa forma *melanocarpa*	0.1	20 cm	BIL-RSPA05	
Enchylaena tomentosa var. *tomentosa*	0.1	60 cm	BIL-RSPA22	
Enneapogon lindleyanus	0.1	30 cm	Specimen lost.	
Enneapogon polyphyllus	0.1	20 cm		
Enneapogon robustissimus	0.1	50 cm	BIL-RSPA11	
Eremophila latrobei subsp. *latrobei*	0.1	250 cm	BIL-RSPA14; -19	
Eremophila longifolia	0.1	200 cm		
Eriachne mucronata (typical form)	0.1	45 cm		
Eriachne pulchella	0.1	15 cm		
Eucalyptus leucophloia subsp. *leucophloia*	0.1	600 cm		
Euphorbia coghlanii	0.1	20 cm	BIL-RSPA06	
Evolvulus alsinoides var. *decumbens*	0.1	15 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Fimbristylis dichotoma	0.1	20 cm		
Gomphrena cunninghamii	0.1	10 cm		
Goodenia muelleriana	0.1	40 cm		
Hakea lorea subsp. *lorea*	0.1	70 cm		
Hibiscus burtonii	0.1	30 cm		
Hibiscus coatesii	0.1	40 cm	BIL-RSPA17	
Hibiscus sturtii var. *campylochlamys*	0.1	40 cm	BIL-RSPA15	
Iseilema membranaceum	0.1	20 cm	BIL-RSPA09	
Jasminum didymum subsp. *lineare*	0.1	110 cm		
Maireana planifolia	0.1	100 cm	BIL-RSPA13	
Maireana planifolia x *villosa*	0.1	70 cm	BIL-RSPA18	

Species	Cover (%)	Height	Specimen	Notes
Malvastrum americanum	0.1	20 cm		
Melhania oblongifolia	0.1	40 cm		
Paspalidium clementii	0.1	20 cm		
Perotis rara	0.1	10 cm		
Portulaca oleracea/intraterranea	0.1	10 cm	BIL-RSPA03	
Ptilotus auriculifolius	0.1	20 cm		
Ptilotus obovatus var. *obovatus*	0.1	30 cm		
Rhagodia eremaea	0.1	30 cm		
Salsola australis	0.1	25 cm		
Santalum lanceolatum	0.1	200 cm		
Senna artemisioides subsp. *oligophylla*	0.1	25 cm		
Senna glutinosa subsp. *x luerssenii*	0.5	80 cm		
Senna notabilis	0.1	10 cm		
Sida fibulifera	0.1	40 cm	BIL-RSPA21	
Sida echinocarpa	0.1	45 cm	BIL-RSPA14	
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	30 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	20 cm		White form.
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	25 cm		
Solanum horridum	0.1	20 cm	BIL-RSPA10	
Solanum lasiophyllum	0.1	15 cm		
Sporobolus australasicus	0.1	10 cm		
Themeda triandra	0.1	80 cm		
Tribulus suberosus	0.1	160 cm		
Triodia pungens	2	12 cm	BIL-RSPA12	
Triodia schinzii	0.1	50 cm	BIL-RSPA01	
Triodia wiseana	0.1	40 cm		

Yandi Billiards Level 2				Site	BIL-RSWA
Described by	SVSW		Date	10-Mar-14	Type Relevé
MGA Zone	50	742413 mE		7482550 mN	
Habitat	Flat 70 m wide valley floor between mesa ranges.				
Soil	2.5YR 3/4 dark reddish brown sandy loam.				
Rock Type	Nil.				
Vegetation	*Gossypium robinsonii, Senna artemisioides* subsp. *oligophylla*, *Atalaya hemiglauca* tall shrubland over *Triodia epactia* very open hummock grassland over *Cleome viscosa* low open shrubland.				
Veg Condition	Very Good (**Cenchrus ciliaris*).				
Fire Age	Burnt 3-5 years ago.				
Notes	Valley would act as drainage during rainfall events. Surrounding veg. and valley slopes recently burnt (<2 years ago). Elevation: 842 m (SW), 849 m (NE).				

Species	Cover (%)	Height	Specimen	Notes
Acacia pyrifolia var. *pyrifolia*	0.1	100 cm		
Amaranthus undulatus	0.1	50 m	BIL-RSWA05	
Aristida holathera var. *holathera*	0.1	30 cm		
Atalaya hemiglauca	1	340 cm		
Boerhavia coccinea	0.1	10 cm		
Bulbostylis barbata	0.1	10 cm		
Cenchrus ciliaris	0.1	70 cm		
Cleome viscosa	10	100 cm		
Corchorus sidoides subsp. *sidoides*	0.1	60 cm		
Corchorus tectus	0.1	30 cm		
Corchorus tridens	0.1	20 cm	BIL-RSWA14	
Cucumis variabilis	0.1	100 cm		
Cymbopogon ambiguus	0.1	110 cm	BIL-RSWA09	
Cymbopogon procerus	0.1	120 cm		
Digitaria ctenantha	0.1	60 cm		
Enneapogon lindleyanus	0.1	50 cm		
Enneapogon polyphyllus	0.1	10 cm		
Eragrostis cumingii	0.1	30 cm		
Eragrostis eriopoda	0.1	15 cm		
Eremophila longifolia	0.1	380 cm		
Eriachne tenuiculmis	0.1	100 cm		
Euphorbia australis var. *subtomentosa*	0.1	15 cm	BIL-RSWA02	
Euphorbia coghlanii	0.1	20 cm	BIL-RSWA08	
Euphorbia tannensis subsp. *eremophila*	0.1	30 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	25 cm		
Goodenia microptera	0.1	30 cm		
Gossypium robinsonii	0.5	240 cm		
Grevillea wickhamii subsp. *hispidula*	0.1	380 cm	BIL-RSWA01	
Heliotropium cunninghamii	0.1	30 cm	BIL-RSWA21	
Hibiscus leptocladus	0.1	25 cm	BIL-RSWA19	
Hibiscus sturtii var. *platychlamys*	0.1	80 cm	BIL-RSWA13	
Indigofera colutea	0.1	35 cm		
Indigofera monophylla	0.1	70 cm	BIL-RSWA04	
Paraneurachne muelleri	0.1	60 cm		
Paspalidium rarum	0.1	20 cm	BIL-RSWA17	
Paspalidium rarum	0.1	10 cm	BIL-RSWA22	
Perotis rara	0.1	15 cm		
Phyllanthus erwinii	0.1	20 cm	BIL-RSWA18	
Phyllanthus maderaspatensis	0.1	15 cm		
Polycarpaea corymbosa var. *corymbosa*	0.1	10 cm		
Polycarpaea longiflora	0.1	20 cm		
Polymeria ambigua	0.1	15 cm	BIL-RSWA11	
Pterocaulon sphacelatum	0.1	25 cm	BIL-RSWA06	
Ptilotus astrolasius	0.1	40 cm		
Ptilotus auriculifolius	0.1	35 cm		
Rhynchosia minima	0.1	100 cm		
Salsola australis	0.1	15 cm		

Species	Cover (%)	Height	Specimen	Notes
Santalum lanceolatum	0.1	340 cm	BIL-RSWA10	
Senna artemisioides subsp. *helmsii*	0.1	140 cm		
Senna artemisioides subsp. *oligophylla*	15	210 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	60 cm		
Senna notabilis	0.1	15 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	15 cm	BIL-RSWA03, -24	Ferruginous form.
Solanum lasiophyllum	0.1	30 cm		
Swainsona formosa	0.1	40 cm		
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.1	110 cm	BIL-RSWA07	R. Butcher confirmed.
Trachymene oleracea subsp. *oleracea*	0.1	10 cm		
Tragus australianus	0.1	20 cm		
Trianthema pilosa	0.1	10 cm		
Tribulopis angustifolia	0.1	10 cm	BIL-RSWA20	
Tribulus macrocarpus	0.1	10 cm	BIL-RSWA23	
Trichodesma zeylanicum var. *zeylanicum*	0.1	15 cm		
Triodia epactia	5	45 cm		
Triodia pungens	0.1	50 cm	BIL-RSWA15	
Triraphis mollis	0.1	60 cm		
Urochloa holosericea subsp. *velutina*	0.1	25 cm	BIL-RSWA12	
Yakirra australiensis var. *australiensis*	0.1	20 cm	BIL-RSWA16	

Yandi Billiards Level 2 Site H0R50
Described by PLSV Date 18-Mar-14 Type Resampled quadrat 50 x 50 m
Location 78.6 km SE of Auski Roadhouse, 16.5 km SSW of Marillana and 77.5 km NNW of Newman.
MGA Zone 50 739563 mE 7480763 mN
Habitat Bank of Weeli Wolli Creek.
Soil 2.5YR 3/3 dark reddish brown sandy loam.
Rock Type Riverstone and ironstone cobbles (5%), pebbles (20%), and gravel (60%).
Vegetation *Eucalyptus victrix* low open woodland over *Acacia citrinoviridis*, *A. coriacea* subsp. *pendens* low open forest over *Corchorus crozophorifolius*, *Ptilotus obovatus* low open shrubland over *Cenchrus ciliaris*, *Enneapogon lindleyanus*, *E. robustissimus* very open tussock grassland over *Triodia pungens, T. longiceps* scattered hummock grasses.
Veg Condition Good (**Cenchrus ciliaris*, **Malvastrum americanum, *Setaria verticillata*).
Fire Age No sign of recent fire.

Species	Cover	Height	Specimen	Notes
Abutilon fraseri	0.1	40 cm		
Abutilon macrum	0.1	80 cm		
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	35 cm	HOR50-06	M Trudgen confirmed.
Acacia citrinoviridis	30	800 cm		
Acacia coriacea subsp. *pendens*	5	800 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	40 cm		
Amaranthus undulatus	0.1	15 cm	HOR50-05	
Amyema hilliana	0.1			Growing on A. citrinoviridis.
Aristida contorta	0.1	40 cm		
Atalaya hemiglauca	0.1	230 cm		
Boerhavia burbidgeana	0.1	15 cm	HOR50-09	
Boerhavia coccinea	0.1	40 cm		
Boerhavia coccinea	0.1	30 cm	HOR50-10	
Cenchrus ciliaris	9	50 cm		
Cenchrus setiger	0.1	50 cm		
Corchorus crozophorifolius	2	90 cm		
Corchorus tridens	0.1	20 cm		
Cymbopogon procerus	0.1	130 cm		
Dicladanthera forrestii	0.1	25 cm		
Digitaria brownii	0.1	60 cm		
Digitaria ctenantha	0.1	30 cm		
Duperreya commixta	0.1	250 cm		
Enneapogon lindleyanus	0.5	40 cm		
Enneapogon robustissimus	0.5	45 cm		
Eriachne lanata	0.1	30 cm		
Eriachne pulchella	0.1	10 cm		
Eucalyptus victrix	8	1100 cm		
Eulalia aurea	0.1	60 cm		
Euphorbia australis var. *subtomentosa*	0.1	10 cm	HOR50-04	
Euphorbia trigonosperma	0.1	25 cm	HOR50-02	
Evolvulus alsinoides var. *decumbens*	0.1	10 cm		
Heliotropium cunninghamii	0.1	25 cm	HOR50-03	
Hybanthus aurantiacus	0.1	20 cm		
Indigofera monophylla	0.1	100 cm	HOR50-07	
Indigofera monophylla	0.1	50 cm		
Malvastrum americanum	0.1	40 cm		
Paspalidium clementii	0.1	20 cm	HOR50-08	
Phyllanthus maderaspatensis	0.1	15 cm		
Polycarpaea longiflora	0.1	15 cm		
Ptilotus astrolasius	0.1	40 cm		
Ptilotus obovatus	0.5	60 cm		
Rhagodia eremaea	0.1	110 cm		
Rhynchosia minima	0.1	60 cm		
Salsola australis	0.1	15 cm		

Species	Cover	Height	Specimen	Notes
Senna artemisioides subsp. *helmsii*	0.1	170 cm		
Setaria verticillata	0.1	50 cm		
Solanum lasiophyllum	0.1	80 cm		
Solanum phlomoides	0.1	60 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	40 cm		
Themeda triandra	0.1	40 cm		
Triodia longiceps	0.5	40 cm		
Triodia pungens	1	35 cm	HOR50-01	
Triodia wiseana	0.1	25 cm		
Waltheria indica	0.1	45 cm		

Yandi Billiards Level 2 Site HDAR08
Described by PLSV Date 16-Mar-14 Type Resampled quadrat 50 x 50 m
Location 24.4 km SSW of Marillana and 74.8 km NW of Newman and 78.6 km SE of Auski Roadhouse
MGA Zone 50 734810 mE 7474423 mN
Habitat Clayey Mulga floodplain, fringing southern side of Weeli Wolli Creek.
Soil Dark reddish brown light clay.
Rock Type Nil.
Vegetation *Acacia aptaneura x ayersiana*, (*Acacia pruinocarpa*) low woodland over *Eremophila forrestii* subsp. *forrestii*, *Senna artemisioides* subsp. *helmsii* scattered shrubs over *Aristida pruinosa, *Cenchrus ciliaris, *C. setiger* very open tussock grassland.
Veg Condition Good (**Cenchrus* spp., **Malvastrum americanum, *Setaria verticillata*, **Bidens bipinnata*).
Fire Age Not recorded.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	60 cm		
Abutilon lepidum	0.1	70 cm	HDAR08-11	
Abutilon lepidum	0.1	50 cm	HDAR08-07	
Abutilon macrum	0.1	90 cm		
Abutilon otocarpum	0.1	40 cm		
Acacia aptaneura	0.1	200 cm	HDAR08-20	
Acacia aptaneura x ayersiana	27	900 cm	HDAR08-19	
Acacia bivenosa	0.1	380 cm		
Acacia pruinocarpa	2	600 cm		
Acacia sibirica	0.1	220 cm	HDAR08-17	M Trudgen confirmed
Acacia synchronicia	0.1	30 cm		
Alternanthera nana	0.1	25 cm		
Alternanthera nana	0.1	25 cm		
Amaranthus undulatus	0.1	30 cm	HDAR08-16	
Anthobolus leptomerioides	0.1	80 cm		
Aristida contorta	0.1	40 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Aristida pruinosa	1	110 cm	HDAR08-06	
Bidens bipinnata	0.1	50 cm		N=70.
Boerhavia coccinea	0.1	30 cm		
Boerhavia repleta	0.1	35 cm		
Bulbostylis barbata	0.1	10 cm		
Bulbostylis turbinata	0.1	20 cm	HDAR08-12	
Calandrinia sp.	0.1	8 cm		
Cenchrus ciliaris	1	70 cm		
Cenchrus setiger	1	70 cm		
Chrysopogon fallax	0.1	110 cm		
Cleome viscosa	0.1	70 cm		
Corchorus tectus	0.1	50 cm	HDAR08-08	M Trudgen confirmed.
Corchorus tridens	0.1	40 cm		
Corymbia candida	0.1	90 cm		
Corymbia hamersleyana	0.1	400 cm		
Cucumis variabilis	0.1	65 cm		
Cymbopogon ambiguus	0.1	60 cm		
Cymbopogon obtectus	0.1	90 cm		
Dichanthium sericeum subsp. *humilius*	0.1	40 cm		
Digitaria brownii	0.1	90 cm		
Digitaria ctenantha	0.1	30 cm		
Dodonaea petiolaris	0.1	70 cm		
Duperreya commixta	0.1	220 cm		
Dysphania melanocarpa forma *melanocarpa*	0.1	25 cm	HDAR08-13	
Enchylaena tomentosa var. *tomentosa*	0.1	70 cm		
Enneapogon caerulescens	0.1	30 cm		

Species	Cover (%)	Height	Specimen	Notes
Enneapogon polyphyllus	0.1	40 cm		
Eragrostis falcata	0.1	30 cm	HDAR08-18	
Eremophila forrestii subsp. *forrestii*	1	170 cm		
Eremophila longifolia	0.1	110 cm		
Eriachne mucronata (typical form)	0.1	60 cm		
Euphorbia biconvexa	0.1	40 cm	HDAR08-01	
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Glycine canescens	0.1	150 cm		
Gomphrena cunninghamii	0.1	20 cm		
Goodenia microptera	0.1	30 cm		
Goodenia nuda	0.1	35 cm		N=5.
Goodenia prostrata	0.1	20 cm		
Gossypium australe	0.1	50 cm		
Hakea lorea subsp. *lorea*	0.1	230 cm		
Heliotropium inexplicitum	0.1	20 cm	HDAR08-14	
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		
Hybanthus aurantiacus	0.1	30 cm		
Ipomoea muelleri	0.1	35 cm		
Iseilema membranaceum	0.1	20 cm	HDAR08-02	
Keraudrenia nephrosperma	0.1	60 cm		
Maireana planifolia x *villosa*	0.1	50 cm	HDAR08-09	
Maireana villosa	0.1			
Malvastrum americanum	0.1	45 cm		
Melhania oblongifolia	0.1	50 cm		
Paraneurachne muelleri	0.1	40 cm		
Paspalidium clementii	0.1	30 cm	HDAR08-04	
Perotis rara	0.1	15 cm		
Phyllanthus erwinii	0.1	10 cm		
Polycarpaea corymbosa var. *corymbosa*	0.1	20 cm		
Portulaca oleracea/intraterranea	0.1	20 cm	HDAR08-03	
Portulaca pilosa	0.1	20 cm		
Pterocaulon sphacelatum	0.1	50 cm		
Ptilotus gaudichaudii subsp. *gaudichaudii*	0.1	50 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	35 cm		
Ptilotus obovatus var. *obovatus*	0.1	70 cm		
Rhagodia eremaea	0.1	240 cm		
Salsola australis	0.1	25 cm		
Sclerolaena cornishiana	0.1	30 cm		
Senna artemisioides subsp. *helmsii*	0.5	140 cm		
Senna artemisioides subsp. *oligophylla* (thinly sericeous form MET 15,035) x subsp. *helmsii*	0.1	40 cm	HDAR08-05	
Setaria verticillata	0.1	120 cm		N=5.
Sida fibulifera	0.1	30 cm		
Sida arsiniata	0.1	40 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	80 cm		
Solanum elatius	0.1	90 cm	HDAR08-15	
Solanum lasiophyllum	0.1			
Spermacoce brachystema	0.1	15 cm		
Sporobolus australasicus	0.1	25 cm		
Streptoglossa bubakii	0.1	30 cm		
Themeda triandra	0.1	110 cm		
Tribulus macrocarpus	0.1	25 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	15 cm		
Triodia wiseana	0.1	80 cm		
Waltheria indica	0.1	80 cm		

Yandi Billiards Level 2 Site HDAR09

Described by CFSV Date 12-Mar-14 Type Resampled quadrat 50 x 50 m

Location 19.5 km SSW of Marillana and 76.7 km NNW of Newman and 78.2 km SE of Auski Roadhouse.

MGA Zone 50 737492 mE 7478481 mN

Habitat Floodplain / broad creek bank; fringing the southern side of Weeli Wolli Creek.

Soil 2.5YR 3/3 dark reddish brown clay loam with hard-set surface.

Rock Type Ironstone gravel (1%).

Vegetation *Eucalyptus victrix* open forest over *Acacia citrinoviridis*, *Corymbia hamersleyana, Acacia coriacea* subsp. *pendens*, *Atalaya hemiglauca* low open forest over *Acacia sclerosperma* subsp. *sclerosperma*, *Hakea lorea* subsp. *lorea* tall open shrubland over **Cenchrus setiger, *C. ciliaris* closed tussock grassland.

Veg Condition Very Poor (**Cenchrus* spp.).

Fire Age No sign of recent fire.

Notes Most ground cover species absent due to 95% **Cenchrus* spp.

Species	Cover	Height	Specimen	Notes
Acacia citrinoviridis	50	900 cm		
Acacia coriacea subsp. *pendens*	3	900 cm		
Acacia sclerosperma subsp. *sclerosperma*	3	550 cm		
Achyranthes aspera	0.1	50 cm		
Atalaya hemiglauca	2	900 cm		
Bidens bipinnata	0.1	20 cm		N=7.
Bothriochloa ewartiana	0.1	30 cm	HDAR09-05	
Cenchrus ciliaris	35	130 cm		
Cenchrus setiger	60	130 cm		
Corymbia candida	0.1	810	HDAR09-06	
Corymbia hamersleyana	8	900 cm		
Duperreya commixta	0.1	250 cm		
Eragrostis cumingii	0.1	20 cm		
Eragrostis tenellula	0.1	15 cm		
Eucalyptus victrix	45	1200 cm		
Euphorbia biconvexa	0.1	15 cm	HDAR09-03	
Hakea lorea subsp. *lorea*	1	500 cm		
Malvastrum americanum	0.1	20 cm		N=10.
Paspalidium clementii	0.1	30 cm	HDAR09-01	
Phyllanthus maderaspatensis	0.1	20 cm		
Sida fibulifera	0.1	15 cm	HDAR09-04	M Trudgen confirmed.
Themeda triandra	0.1	40 cm		
Vachellia farnesiana	0.1	410 cm		N=4.

Yandi Billiards Level 2 Site HDAR24
Described by PLCA Date 12-Mar-14 Type Resampled quadrat 50 x 50 m
Location 18.7 km SW of Marillana, 77 km SE of Auski Roadhouse and 78.1 km NNW of Newman.
MGA Zone 50 736902 mE 7479803 mN
Habitat Slope of low stony hill, gently sloping to northeast.
Soil Red-brown skeletal clay loam with continuous surface layer of stones and pebbles.
Rock Type Basalt (with outcropping) large boulders (5%), boulders (35%), cobbles (30%), pebbles (20%), and gravel (10%).
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Acacia bivenosa* (wispy/weeping form) scattered tall shrubs over *A. adoxa* var. *adoxa, Goodenia stobbsiana* scattered low shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) (*T. wiseana*) very open hummock grassland.
Veg Condition Excellent.
Fire Age Burnt 3-5 years ago.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.5	40 cm		
Acacia bivenosa (wispy/weeping form)	0.5	240 cm		
Acacia dictyophleba	0.1	30 cm		
Acacia hilliana	0.1	40 cm		
Acacia pruinocarpa	0.1	40 cm		
Amphipogon sericeus	0.1	30 cm	HDAR24-02	
Aristida holathera var. *holathera*	0.1	25 cm		
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	10 cm		
Calytrix carinata	0.1	60 cm		
Dodonaea coriacea	0.1	100 cm		
Eriachne mucronata (typical form)	0.1	40 cm		
Eriachne pulchella	0.1	15 cm		
Eucalyptus leucophloia subsp. *leucophloia*	5	440 cm		
Goodenia stobbsiana	0.5	30 cm		
Goodenia triodiophila	0.1	40 cm		
Grevillea wickhamii	0.1	50 cm		Sterile.
Hakea chordophylla	0.1	200 cm		
Paraneurachne muelleri	0.1	35 cm		
Ptilotus astrolasius	0.1	45 cm		
Ptilotus calostachyus	0.1	40 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	30 cm		
Ptilotus rotundifolius	0.1	40 cm		
Senna artemisioides subsp. *oligophylla*	0.1	90 cm		
Senna glutinosa subsp. *glutinosa*	0.1	160 cm		
Senna glutinosa subsp. *pruinosa*	0.1	180 cm		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	30 cm	HDAR24-03	M Trudgen confirmed;
Solanum phlomoides	0.1	35 cm		
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.1	70 cm	HDAR24-01	R. Butcher confirmed.
Trianthema glossostigma	0.1	10 cm	HDAR24-04	
Triodia pungens	0.1	40 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	9	35 cm		
Triodia wiseana	0.5	45 cm		

Yandi Billiards Level 2 Site YAQR12
Described by PLCA Date 12-Mar-14 Type Resampled quadrat 50 x 50 m
Location 18.7 km SSW of Marillana, 77 km NNW of Newman and 78.2 km SE of Auski Roadhouse.
MGA Zone 50 738023 mE 7479157 mN
Habitat Low-lying, flat bank of major creek (Weeli Wolli Creek); dissected by creek channels, draining southwest to northeast.
Soil Brown sandy clay.
Rock Type Nil.
Vegetation *Acacia citrinoviridis, Eucalyptus victrix* open forest over *Atalaya hemiglauca* tall open shrubland over **Cenchrus ciliaris, *C. setiger* closed tussock grassland.
Veg Condition Very Poor (high cover of **Cenchrus* spp. **Setaria verticillata*, **Vachellia farnesiana, *Bidens bipinnata, *Malvastrum americanum*).
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon amplum	0.1	50 cm		
Abutilon fraseri	0.1	70 cm		
Acacia citrinoviridis	35	1200 cm		
Acacia coriacea subsp. *pendens*	0.1	350 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	230 cm		
Acacia sclerosperma subsp. *sclerosperma*	0.1	220 cm		
Achyranthes aspera	0.1	110 cm		
Acrachne racemosa	0.1	30 cm	YAQR12-04	
Amaranthus undulatus	0.1	20 cm	YAQR12-02	
Amphipogon sericeus	0.1	70 cm		
Amyema hilliana	0.1	300 cm	YAQR12-03	Growing on *Acacia citrinoviridis*
Atalaya hemiglauca	2	400 cm		
Bidens bipinnata	0.1	20 cm		N=20.
Boerhavia coccinea	0.1	10 cm		
Cenchrus ciliaris	60	70 cm		
Cenchrus setiger	15	70 cm		
Cleome viscosa	0.1	40 cm		
Clerodendrum floribundum var. *angustifolium*	0.1	100 cm		
Corchorus tridens	0.1	10 cm		
Cymbopogon procerus	0.1	120 cm		
Duperreya commixta	0.1	80 cm		
Enneapogon lindleyanus	0.1	30 cm		
Eucalyptus victrix	15	1500 cm		
Eulalia aurea	0.1	130 cm		
Euphorbia biconvexa/coghlanii/trigonosperma	0.1	40 cm		Sterile.
Flaveria trinervia	0.1	15 cm		N=1.
Malvastrum americanum	0.1	20 cm		N=20.
Melhania oblongifolia	0.1	20 cm		
Notoleptopus decaisnei var. *decaisnei*	0.1	10 cm		
Peripleura hispidula var. *hispidula*	0.1	30 cm	YAQR12-06	ID to be confirmed
Phyllanthus maderaspatensis	0.1	30 cm		
Portulaca oleracea/intraterranea	0.1	10 cm	YAQR12-05	
Pterocaulon sphacelatum	0.1	40 cm		
Rhagodia eremaea	0.1	130 cm		
Rhynchosia minima	0.1	20 cm		
Scaevola spinescens	0.1	60 cm		Broad form.
Senna glutinosa subsp. *glutinosa*	0.1	120 cm		
Setaria dielsii	0.1	60 cm	YAQR12-01	
Setaria verticillata	0.1	60 cm		N=1.
Stemodia grossa	0.1	10 cm		
Stylobasium spathulatum	0.1	400 cm		

Species	Cover (%)	Height	Specimen	Notes
Themeda triandra	0.1	120 cm		
Triodia longiceps	0.1	70 cm		
Vachellia farnesiana	0.1	230 cm		N=1.
Waltheria indica	0.1	30 cm		

Yandi Billiards Level 2 Site YAQR14
Described by PLSW Date 15-Mar-14 Type Resampled quadrat 50 x 50 m
Location 23.1 km SW of Marillana, 76.2 km SE of Auski Roadhouse and 77.4 km NW of Newman.
MGA Zone 50 733648 mE 7476780 mN
Habitat Crest of low stony hill; moderately sloping to the east.
Soil Dark reddish brown sandy clay loam.
Rock Type Ironstone and basalt cobbles (40%), pebbles (30%), and gravel (15%).
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Acacia bivenosa* tall open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen
Acacia adoxa var. *adoxa*	0.1	35 cm	
Acacia bivenosa	3.5	210 cm	
Acacia hilliana	0.1	30 cm	
Acacia inaequilatera	0.1	330 cm	
Acacia pruinocarpa	0.1	100 cm	
Amphipogon sericeus	0.1	35 cm	
Cymbopogon obtectus	0.1	40 cm	
Enneapogon polyphyllus	0.1	35 cm	
Eriachne pulchella	0.1	20 cm	
Eucalyptus leucophloia subsp. *leucophloia*	2	420 cm	
Fimbristylis dichotoma	0.1	20 cm	
Fimbristylis simulans	0.1	10 cm	
Goodenia muelleriana	0.1	25 cm	
Goodenia stobbsiana	0.1	20 cm	
Goodenia triodiophila	0.1	40 cm	
Indigofera monophylla	0.1	40 cm	
Mollugo molluginea	0.1	15 cm	
Polycarpaea holtzei	0.1	1 cm	
Ptilotus calostachyus	0.1	70 cm	
Ptilotus rotundifolius	0.1	90 cm	
Senna artemisioides subsp. *oligophylla*	0.1	55 cm	YAQR14-01
Senna glutinosa subsp. *pruinosa*	0.1	160 cm	
Senna glutinosa subsp. *x luerssenii*	0.1	130 cm	
Tribulus suberosus	0.1	100 cm	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	16	40 cm	
Triodia wiseana	0.1	40 cm	

Yandi Billiards Level 2 Site YAQR16

Described by PLSW Date 16-Mar-14 Type Resampled quadrat 50 x 50 m

Location 21.8 km SW of Marillana, 75.8 km SE of Auski Roadhouse and 78.2 km NW of Newman.

MGA Zone 50 734140 mE 7478049 mN

Habitat Flat plain, immediately south of floodplain fringing major creek (Marillana Creek).

Soil Dark reddish brown sandy loam (with some clay).

Rock Type Ironstone pebbles (5%) and gravel (2%).

Vegetation *Corymbia hamersleyana* low open woodland over *Acacia dictyophleba, A. pruinocarpa, A. sclerosperma* subsp. *sclerosperma*, *Atalaya hemiglauca* tall open shrubland over *Scaevola spinescens, Senna artemisioides* subsp. *oligophylla* x subsp. *helmsii* open shrubland over *Triodia pungens* hummock grassland and *Eulalia* sp. (Three Rivers Station, B.Forsyth AQ6789133), **Cenchrus ciliaris*, *Themeda triandra* scattered tussock grasses.

Veg Condition Good (**Cenchrus ciliaris, *Bidens bipinnata, *Malvastrum americanum*).

Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	60 cm		
Abutilon macrum	0.1	50 cm		
Abutilon otocarpum	0.1	30 cm		
Acacia ancistrocarpa	0.1	240 cm		
Acacia citrinoviridis	0.1	320 cm		
Acacia coriacea subsp. *pendens*	0.1	170 cm		
Acacia dictyophleba	4.5	300 cm		
Acacia inaequilatera	0.1	130 cm		
Acacia pachyacra	0.1	370 cm		
Acacia pruinocarpa	3.5	580 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	340 cm		
Acacia sclerosperma subsp. *sclerosperma*	1	340 cm		
Acacia tumida var. *pilbarensis*	0.1	210 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Aristida pruinosa	0.1	80 cm	YAQR16-08	
Atalaya hemiglauca	0.5	310 cm		
Bidens bipinnata	0.1	30 cm		N=30
Boerhavia coccinea	0.1	10 cm	YAQR16-12	
Bonamia erecta	0.1	30 cm		
Bothriochloa ewartiana	0.1	150 cm		
Cenchrus ciliaris	0.5	60 cm		
Cenchrus setiger	0.1	60 cm		
Cheilanthes sieberi subsp. *sieberi*	0.1	10 cm		
Chrysopogon fallax	0.1	100 cm		
Corchorus tridens	0.1	40 cm	YAQR16-10	
Corymbia hamersleyana	4	640 cm		
Crotalaria medicaginea var. *neglecta*	0.1	20 cm		
Cymbopogon ambiguus	0.1	110 cm		
Cymbopogon obtectus	0.1	130 cm		
Dactyloctenium radulans	0.1	5 cm		
Digitaria ctenantha	0.1	50 cm		
Duperreya commixta	0.1	220 cm		
Enneapogon lindleyanus	0.1	60 cm		
Enneapogon polyphyllus	0.1	50 cm		
Eragrostis cumingii	0.1	30 cm		
Eragrostis eriopoda	0.1	40 cm		
Eriachne mucronata (typical form)	0.1	60 cm		
Eulalia aurea	0.1	80 cm		
Eulalia sp. (Three Rivers Station, B.Forsyth AQ6789133)	0.5	70 cm	YAQR16-07	
Euphorbia biconvexa	0.1	60 cm	YAQR16-02	
Euphorbia tannensis subsp. *eremophila*	0.1	40 cm		
Evolvulus alsinoides var. *decumbens*	0.1	40 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		

Species	Cover (%)	Height	Specimen	Notes
Goodenia microptera	0.1	25 cm		
Goodenia nuda	0.1	50 cm	YAQR16-06	N=4.
Gossypium australe	0.1	50 cm		
Gossypium robinsonii	0.1	400 cm		
Hakea chordophylla	0.1	430 cm		
Hakea lorea subsp. *lorea*	0.1	300 cm		
Hibiscus sturtii var. *platychlamys*	0.1	30 cm		
Indigofera colutea	0.1	20 cm		
Iseilema membranaceum	0.1	30 cm	YAQR16-05	
Jasminum didymum subsp. *lineare*	0.1	80 cm		
Malvastrum americanum	0.1	60 cm		N=20.
Melhania oblongifolia	0.1	50 cm		
Panicum effusum	0.1	70 cm	YAQR16-09	
Paraneurachne muelleri	0.1	40 cm		
Paspalidium rarum	0.1	20 cm	YAQR16-04	
Polycarpaea corymbosa var. *corymbosa*	0.1	10 cm		
Polymeria ambigua	0.1	30 cm	YAQR16-01	
Ptilotus astrolasius	0.1	50 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	10 cm		
Rhynchosia minima	0.1	20 cm		
Salsola australis	0.1	20 cm		
Santalum lanceolatum	0.1	240 cm		
Scaevola spinescens	2	110 cm		Broad form.
Senna artemisioides subsp. *helmsii*	0.1	90 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	1	100 cm		
Setaria dielsii	0.1	80 cm		
Setaria verticillata	0.1	60 cm		
Sida fibulifera	0.1	20 cm	YAQR16-11	
Sida arsiniata	0.1	30 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	160 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	50 cm		
Solanum lasiophyllum	0.1	50 cm		
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	0.1	30 cm	YAQR16-03	R. Butcher confirmed.
Themeda triandra	0.5	120 cm		
Tribulopis angustifolia	0.1	10 cm		
Tribulus macrocarpus	0.1	15 cm		
Triodia pungens	40	50 cm		
Waltheria indica	0.1	60 cm		

Yandi Billiards Level 2 Site YAQR23

Described by SVSW Date 10-Mar-14 Type Resampled quadrat 50 x 50 m

Location 18.8 km SSW of Marillana, 76.4 km NNW of Newman and 78.8 km SE of Auski Roadhouse

MGA Zone 50 738475 mE 7478807 mN

Habitat Colluvial plain.

Soil 2.5YR 3/4 dark reddish brown sandy loam.

Rock Type Nil.

Vegetation *Eucalyptus gamophylla* scattered low mallee trees over *Corchorus tectus* scattered low shrubs over *Triodia basedowii* very open hummock grassland over *Aristida holathera* var. *holathera* scattered bunch grasses.

Veg Condition Excellent.

Fire Age Burnt 3-5 years ago.

Notes Quadrat recently burnt.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	30 cm		
Acacia ancistrocarpa	0.1	30 cm		
Acacia ancistrocarpa	0.1	20 cm		
Acacia inaequilatera	0.1	65 cm		
Acacia pachyacra	0.1	30 cm	YAQR23-02	
Acacia pruinocarpa	0.1	30 cm		
Acacia tumida var. *pilbarensis*	0.1	50 cm		
Aristida holathera var. *holathera*	1	50 cm		
Corchorus tectus	1	40 cm	YAQR23-01	
Corymbia hamersleyana	0.1	420 cm		
Cymbopogon obtectus	0.1	80 cm		
Dicrastylis cordifolia	0.1	40 cm		
Dodonaea coriacea	0.1	20 cm	YAQR23-09	
Eragrostis eriopoda	0.1	45 cm		
Eriachne aristidea	0.1	10 cm		
Eucalyptus gamophylla	0.5	210 cm		
Euphorbia australis var. *hispidula*	0.1	20 cm	YAQR23-06	
Euphorbia biconvexa/coghlanii/trigonosperma	0.1	10 cm		Sterile.
Gomphrena affinis subsp. *pilbarensis*	0.1	10 cm	YAQR23-07	
Goodenia microptera	0.1	30 cm		
Goodenia muelleriana	0.1	30 cm	YAQR23-08	
Goodenia stobbsiana	0.1	30 cm		
Gossypium robinsonii	0.1	80 cm		
Hakea chordophylla	0.1	350 cm		
Heliotropium pachyphyllum	0.1	25 cm	YAQR23-04	
Hibiscus leptocladus	0.1	20 cm	YAQR23-11	
Hibiscus sturtii var. *platychlamys*	0.1	15 cm		
Hybanthus aurantiacus	0.1	45 cm		
Indigofera monophylla	0.1	40 cm		
Mollugo molluginea	0.1	20 cm		
Paraneurachne muelleri	0.1	30 cm		
Petalostylis cassioides	0.1	35 cm	YAQR23-12	
Ptilotus astrolasius	0.1	30 cm		
Ptilotus auriculifolius	0.1	30 cm		
Ptilotus calostachyus	0.1	70 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	15 cm		
Ptilotus polystachyus	0.1	25 cm		
Senna artemisioides subsp. *helmsii*	0.1	30 cm		
Senna artemisioides subsp. *oligophylla*	0.1	30 cm		
Senna glutinosa subsp. *glutinosa x S. stricta*	0.1	40 cm	YAQR23-10	M Trudgen confirmed.
Senna notabilis	0.1	12 cm		
Sida arenicola	0.1	100 cm		
Sida cardiophylla	0.1	40 cm	YAQR23-14	
Solanum elatius	0.1	60 cm	YAQR23-13	

Species	Cover (%)	Height	Specimen	Notes
Solanum lasiophyllum	0.1	15 cm		
Solanum phlomoides	0.1	40 cm		
Themeda triandra	0.1	60 cm		
Trianthema pilosa	0.1	10 cm		
Triodia basedowii	3	30 cm		
Yakirra australiensis var. *australiensis*	0.1	15 cm	YAQR23-05	

Yandi Billiards Level 2 Site YAQR25

Described by SVSW Date 9-Mar-14 Type Resampled quadrat 50 x 50 m

Location 12.9 km SW of Marillana, 77.3 km ESE of Auski Roadhouse and 80.4 km NNW of Newman.

MGA Zone 50 740429 mE 7484492 mN

Habitat Low, rocky upper hill slope.

Soil 2.5YR 2.4/4 dark reddish brown sandy loam.

Rock Type Ironstone shale, cobbles, pebbles, gravel.

Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *A. bivenosa, A. pruinocarpa* scattered tall shrubs over *A. hilliana* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland.

Veg Condition Excellent.

Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia aptaneura	0.1	130 cm	YAQR25-01	
Acacia bivenosa	1	390 cm		
Acacia hilliana	3	40 cm		
Acacia inaequilatera	0.1	180 cm		
Acacia pruinocarpa	0.5	420 cm		
Aristida holathera var. *holathera*	0.1	30 cm		
Eucalyptus leucophloia subsp. *leucophloia*	2	550 cm		
Fimbristylis dichotoma	0.1	15 cm		
Fimbristylis simulans	0.1	15 cm		
Grevillea wickhamii	0.1	420 cm		Sterile.
Ptilotus calostachyus	0.1	60 cm		
Senna artemisioides subsp. *helmsii*	0.1	70 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	40 cm	YAQR25-02	
Senna glutinosa subsp. *glutinosa*	0.1	140 cm		
Senna glutinosa subsp. *glutinosa x* subsp. *x luerssenii*	0.1	130 cm	YAQR25-03	
Senna glutinosa subsp. *pruinosa*	0.1	130 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	70 cm		
Solanum lasiophyllum	0.1	60 cm		
Trachymene oleracea subsp. *oleracea*	0.1	3 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	55	30 cm		

Yandi Billiards Level 2 Site YAQR27
Described by PLSV Date 19-Mar-14 Type Resampled quadrats 50 x 50 m
Location 14.5 km SW of Marillana, 77.1 km ESE of Auski Roadhouse and 79.8 km NNW of Newman.
MGA Zone 50 739365 mE 7483241 mN
Habitat Crest and mid-slope of a low hill facing towards the southwest.
Soil 2.5YR 3/3 dark reddish brown sandy clay loam.
Rock Type Ironstone surface plates and broken plates (continuous); cobbles (40%), pebbles (40%), and gravel (18%).
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Acacia pruinocarpa*, *A. bivenosa* scattered tall shrubs over *A. hilliana* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	50 cm		
Acacia bivenosa	0.5	230 cm		
Acacia hilliana	6	50 cm		
Acacia pruinocarpa	1	350 cm		
Corchorus crozophorifolius	0.1	10 cm		
Eucalyptus leucophloia subsp. *leucophloia*	2	500 cm		
Fimbristylis simulans	0.1	15 cm		
Goodenia stobbsiana	0.1	30 cm		
Goodenia triodiophila	0.1	25 cm		
Grevillea wickhamii subsp. *hispidula*	0.1	220 cm		
Indigofera monophylla	0.1	40 cm		
Mollugo molluginea	0.1	25 cm		
Ptilotus obovatus var. *obovatus*	0.1	35 cm		
Ptilotus rotundifolius	0.1	110 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	60 cm		
Senna glutinosa subsp. *glutinosa*	0.1	20 cm		
Senna glutinosa subsp. *glutinosa x S. stricta*	0.1	170 cm	YAQR27-01	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	110 cm		
Sida arenicola	0.1	35 cm		
Solanum phlomoides	0.1	30 cm		
Triodia pungens	0.1	40 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	12	30 cm		

Yandi Billiards Level 2 Site YAQR30

Described by PLCA Date 9-Mar-14 Type Resampled quadrat 50 x 50 m

Location 11.5 km SW of Marillana, 76.9 km ESE of Auski Roadhouse and 81.4 km NNW of Newman.

MGA Zone 50 740834 mE 7485857 mN

Habitat Broad flat plain.

Soil Dark reddish brown silty clay loam.

Rock Type Scattered ironstone pebbles and gravel (10%).

Vegetation *Acacia pruinocarpa, A. citrinoviridis, A. sclerosperma* subsp. *sclerosperma* tall open shrubland over **Cenchrus ciliaris, *C. setiger* open tussock grassland.

Veg Condition Poor (**Cenchrus* spp., cow scats).

Fire Age Very long unburnt.

Species	Cover (%)	Height	Specimen
Acacia citrinoviridis	1	950 cm	
Acacia pruinocarpa	2	500 cm	
Acacia sclerosperma subsp. *sclerosperma*	1	300 cm	
Atalaya hemiglauca	0.1	450 cm	
Boerhavia burbidgeana	0.1	25 cm	YAQR30-02
Boerhavia coccinea	0.1	30 cm	
Cenchrus ciliaris	15	80 cm	
Cenchrus setiger	5	90 cm	
Cleome viscosa	0.1	60 cm	
Duperreya commixta	0.1	210 cm	
Heliotropium cunninghamii	0.1	20 cm	YAQR30-01
Ptilotus obovatus var. *obovatus*	0.1	60 cm	
Senna artemisioides subsp. *helmsii*	0.1	25 cm	
Solanum lasiophyllum	0.1	50 cm	
Triodia angusta	0.1	30 cm	

Yandi Billiards Level 2 Site YBIR01
Described by SVSW Date 11-Mar-14 Type Resampled quadrat 50 x 50 m
Location 15.4 km SSW of Marillana, 77.7 km ESE of Auski Roadhouse and 78.8 km NNW of Newman.
MGA Zone 50 739445 mE 7482141 mN
Habitat Braided creek bed (Weeli Wolli Creek).
Soil 5YR 3/3 dark reddish brown skeletal sand.
Rock Type Ironstone, basalt, sandstone, chert, dolerite, shale cobbles (5%), pebbles (60%), and gravel (30%).
Vegetation *Eucalyptus victrix* woodland over *Acacia citrinoviridis* scattered tall shrubs.
Veg Condition Very Good (cow scats throughout).
Fire Age No sign of recent fire.
Notes A lot of dead shrubs and herbs due to lack of water.

Species	Cover (%)	Height	Specimen
Acacia citrinoviridis	0.5	240 cm	
Acacia pyrifolia var. *pyrifolia*	0.1	110 cm	YBIR01-02
Boerhavia coccinea	0.1	5 cm	
Cleome viscosa	0.1	10 cm	
Corchorus crozophorifolius	0.1	110 cm	
Cymbopogon procerus	0.1	140 cm	
Eriachne pulchella	0.1	8 cm	
Eriachne tenuiculmis	0.1	40 cm	
Eucalyptus victrix	15	1800 cm	
Eulalia aurea	0.1	45 cm	YBIR01-04
Gomphrena cunninghamii	0.1	3 cm	YBIR01-06
Goodenia lamprosperma	0.1	25 cm	YBIR01-05
Heliotropium cunninghamii	0.1	15 cm	YBIR01-01
Indigofera monophylla	0.1	15 cm	
Phyllanthus maderaspatensis	0.1	40 cm	
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	45 cm	
Waltheria indica	0.1	30 cm	

Yandi Billiards Level 2 Site YBIR05

Described by PLSV Date 11-Mar-14 Type Resampled quadrat 50 x 50 m

Location 17.8 km SSW of Marillana, 77.6 km SE of Auski Roadhouse and 77.9 km NNW of Newman.

MGA Zone 50 738018 mE 7480233 mN

Habitat Steep, northeast facing slope of low hill; adjacent to broad floodplain of river (Weeli Wolli Creek).

Soil Dark reddish brown sandy loam.

Rock Type Ironstone and shale cobbles (80%), pebbles, and gravel over bedrock.

Vegetation *Corymbia hamersleyana* scattered low trees over *Triodia wiseana* hummock grassland.

Veg Condition Excellent.

Fire Age No sign of recent fire.

Notes *Acacia aneura* outside of quadrat.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	30 cm	YBIR05-10	M Trudgen confirmed.
Acacia bivenosa (wispy/weeping form)	0.1	220 cm		
Acacia citrinoviridis	0.1	150 cm		
Acacia pruinocarpa	0.1	160 cm		
Atalaya hemiglauca	0.1	200 cm		
Boerhavia coccinea	0.1	30 cm		
Bulbostylis barbata	0.1	10 cm		
Cleome viscosa	0.1	20 cm		
Corchorus lasiocarpus subsp. *parvus*	0.1	20 cm	YBIR05-06	M Trudgen confirmed.
Corymbia hamersleyana	1	600 cm		
Cucumis variabilis	0.1	150 cm		
Dicladanthera forrestii	0.1	30 cm	YBIR05-04	
Eriachne mucronata (arid form) (MET 12 736)	0.1	40 cm	YBIR05-02	
Eucalyptus leucophloia subsp. *leucophloia*	0.1	580 cm		
Euphorbia australis var. *subtomentosa*	0.1	6 cm	YBIR05-05	
Euphorbia tannensis subsp. *eremophila*	0.1	50 cm	YBIR05-08	
Gomphrena cunninghamii	0.1	10 cm		
Hakea chordophylla	0.1	560 cm		
Heliotropium cunninghamii	0.1	35 cm	YBIR05-11	
Paspalidium clementii	0.1	35 cm	YBIR05-03	
Polycarpaea longiflora	0.1	15 cm		
Ptilotus astrolasius	0.1	30 cm		
Ptilotus rotundifolius	0.1	40 cm		
Rhynchosia minima	0.1	35 cm		
Senna artemisioides subsp. *oligophylla*	0.1	60 cm	YBIR05-07	
Senna glutinosa subsp. *glutinosa*	0.1	140 cm		
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.1	15 cm	YBIR05-09	R. Butcher confirmed.
Tribulus suberosus	0.1	40 cm		
Triodia wiseana	65	40 cm		

Yandi Billiards Level 2 Site YBIR06

Described by PLCA Date 11-Mar-14 Type Resampled quadrat 50 x 50 m

Location 17.1 km SSW of Marillana, 77.5 km SE of Auski Roadhouse and 78.2 km NNW of Newman

MGA Zone 50 738298 mE 7480840 mN

Habitat Flat alluvial plain; west of river floodplain (Weeli Wolli Creek).

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone.

Vegetation *Acacia inaequilatera, A. pruinocarpa, A. ancistrocarpa* tall open shrubland over *Senna artemisioides* subsp. *oligophylla* x subsp. *helmsii* scattered low shrubs over *Triodia basedowii* (*T. pungens*) hummock grassland with **Cenchrus ciliaris, *C. setiger* very open tussock grassland.

Veg Condition Good (**Cenchrus* spp.).

Fire Age Very long unburnt.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	50 cm	YBIR06-09	M Trudgen confirmed.
Acacia adsurgens	0.1	230 cm		
Acacia ancistrocarpa	1	260 cm		
Acacia aptaneura	0.1	230 cm	YBIR06-06	
Acacia bivenosa (wispy/weeping form)	0.1	260 cm		
Acacia citrinoviridis	0.1	210 cm		
Acacia dictyophleba	0.1	50 cm		
Acacia hilliana	0.1	40 cm		
Acacia inaequilatera	2	300 cm		
Acacia pruinocarpa	1	320 cm		
Anthobolus leptomerioides	0.1	90 cm		
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Atalaya hemiglauca	0.1	200 cm		
Boerhavia coccinea	0.1	30 cm		
Cenchrus ciliaris	1	80 cm		N=100.
Cenchrus setiger	1	100 cm		N=100.
Corchorus tectus	0.1	40 cm		
Duperreya commixta	0.1	40 cm		
Eragrostis eriopoda	0.1	45 cm		
Eremophila forrestii subsp. *forrestii*	0.1	80 cm		
Euphorbia australis var. *australis*	0.1	15 cm	YBIR06-03	ID to be confirmed
Euphorbia biconvexa	0.1	45 cm	YBIR06-02	
Euphorbia tannensis subsp. *eremophila*	0.1	30 cm	YBIR06-01	
Evolvulus alsinoides var. *decumbens*	0.1	20 cm		
Gomphrena affinis subsp. *pilbarensis*	0.1	20 cm		
Gomphrena cunninghamii	0.1	15 cm		
Gossypium australe	0.1	40 cm		
Gossypium robinsonii	0.1	190 cm		
Hakea lorea subsp. *lorea*	0.1	260 cm		
Hibiscus burtonii	0.1	50 cm		
Hibiscus sturtii var. *platychlamys*	0.1	70 cm		
Hybanthus aurantiacus	0.1	40 cm		
Maireana villosa	0.1	50 cm	YBIR06-07	
Paraneurachne muelleri	0.1	40 cm		
Paspalidium clementii	0.1	25 cm	YBIR06-05	
Perotis rara	0.1	20 cm		
Polygala glaucifolia	0.1	6 cm	YBIR06-04	
Ptilotus astrolasius	0.1	40 cm		
Ptilotus obovatus var. *obovatus*	0.1	80 cm		
Senna artemisioides subsp. *helmsii*	0.1	100 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.5	90 cm		
Senna glutinosa subsp. *glutinosa x S. stricta*	0.1	160 cm		
Senna notabilis	0.1	10 cm		

Species	Cover (%)	Height	Specimen	Notes
Sida fibulifera	0.1	30 cm	YBIR06-08	
Sida cardiophylla	0.1	90 cm		
Sida echinocarpa	0.1	90 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	25 cm		
Solanum lasiophyllum	0.1	80 cm		
Themeda triandra	0.1	90 cm		
Tribulopis angustifolia	0.1			
Tribulus macrocarpus	0.1	20 cm		
Triodia basedowii	40	35 cm		
Triodia pungens	1	50 cm		
Triodia wiseana	0.1	40 cm		

Yandi Billiards Level 2 Site YBIR07
Described by PLSV Date 18-Mar-14 Type Resampled quadrat 50 x 50 m
Location 17.2 km SSW of Marillana, 76.1 km NNW of Newman and 79.9 km SE of Auski Roadhouse.
MGA Zone 50 740314 mE 7479562 mN
Habitat Broad plain surrounded by low hills.
Soil Dark reddish brown fine sandy loam.
Rock Type Ironstone.
Vegetation *Acacia ancistrocarpa* (*A. pachyacra, A. tumida* var. *pilbarensis*) tall open shrubland over *Solanum elatius* open shrubland over *Senna artemisioides* subsp. *oligophylla*, *Bonamia erecta* low open shrubland over *Triodia basedowii* hummock grassland.
Veg Condition Very Good (**Cenchrus ciliaris*).
Fire Age Not recorded.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	60 cm	YBIR07-06	M Trudgen confirmed.
Abutilon otocarpum	0.1	40 cm		
Acacia adsurgens	0.1	170 cm		
Acacia ancistrocarpa	6	240 cm		
Acacia pachyacra	2	220 cm		
Acacia tumida var. *pilbarensis*	0.5	280 cm		
Anthobolus leptomerioides	0.1	190 cm		
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Bonamia erecta	1	40 cm		
Cenchrus ciliaris	0.1	60 cm		N=1.
Cleome viscosa	0.1	60 cm		
Corchorus tectus	0.1	45 cm		
Cymbopogon obtectus	0.1	75 cm		
Dicrastylis cordifolia	0.1	45 cm		
Enneapogon polyphyllus	0.1	30 cm		
Eragrostis eriopoda	0.1	45 cm		
Eremophila forrestii subsp. *forrestii*	0.1	100 cm		
Eremophila longifolia	0.1	210 cm		
Eriachne aristidea	0.1	25 cm		
Euphorbia australis var. *hispidula*	0.1	15 cm	YBIR07-04	
Euphorbia australis var. *subtomentosa*	0.1	15 cm	YBIR07-03	
Euphorbia boophthona	0.1	20 cm		
Gomphrena affinis subsp. *pilbarensis*	0.1	30 cm		
Gomphrena cunninghamii	0.1	15 cm		
Goodenia microptera	0.1	25 cm		
Grevillea wickhamii subsp. *hispidula*	0.1	210 cm	YBIR07-05	
Hakea chordophylla	0.1	190 cm		
Hakea lorea subsp. *lorea*	0.1	240 cm		
Hibiscus sturtii var. *platychlamys*	0.1	50 cm		
Indigofera georgei	0.1	70 cm		
Mollugo molluginea	0.1	25 cm		
Paraneurachne muelleri	0.1	40 cm		
Perotis rara	0.1	20 cm		
Petalostylis cassioides	0.1	110 cm		
Ptilotus astrolasius	0.1	40 cm		
Ptilotus obovatus var. *obovatus*	0.1	50 cm		
Scaevola parvifolia subsp. *pilbarae*	0.1	30 cm		
Senna artemisioides subsp. *helmsii*	0.1	70 cm		
Senna artemisioides subsp. *oligophylla*	4	90 cm	YBIR07-01	
Sida cardiophylla	0.1	55 cm		
Solanum elatius	2	190 cm	YBIR07-02	
Solanum lasiophyllum	0.1	70 cm		
Tribulus macrocarpus	0.1	25 cm		
Tribulus platypterus	0.1	30 cm	BILPL-35=	
Trichodesma zeylanicum var. *zeylanicum*	0.1	30 cm		

Species	Cover (%)	Height	Specimen	Notes
Triodia basedowii	35	45 cm		
Yakirra australiensis var. *australiensis*	0.1	25 cm		

Yandi Billiards Level 2 Site YBIR08

Described by CEFCASW Date 16-Mar-14 Type Resampled quadrat 50 x 50 m

Location 16.8 km SSW of Marillana, 77 km NNW of Newman and 79.1 km SE of Auski Roadhouse.

MGA Zone 50 739866 mE 7480290 mN

Habitat Floodplain fringing river (eastern side of Weeli Wolli Creek).

Soil 2.5YR 3/3 dark reddish brown sandy loam.

Rock Type Ironstone cobbles (1%), pebbles (1%), and gravel (1%).

Vegetation *Acacia citrinoviridis, A. pruinocarpa*, *A. ayersiana, Corymbia hamersleyana*, *Atalaya hemiglauca* low woodland over *Triodia pungens* very open hummock grassland with **Cenchrus ciliaris, *C. setiger* open tussock grassland.

Veg Condition Poor (weeds and cattle scats).

Fire Age No sign of recent fire.

Species	Cover	Height	Specimen	Notes
Abutilon otocarpum	0.1	30 cm		
Abutilon sp. Pilbara (W.R. Barker 2025)	0.1	60 cm	YBIR08-06	
Acacia aptaneura	0.1	600 cm	YBIR08-01	
Acacia ayersiana	4	600 cm	YBIR08-02	Narrow phyllode variant
Acacia citrinoviridis	16	800 cm		
Acacia inaequilatera	0.1	130 cm		
Acacia pruinocarpa	7	800 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	120 cm	YBIR08-05	
Acacia sclerosperma subsp. *sclerosperma*	0.1	170 cm		
Amyema hilliana	0.1	YBIR08-25		Growing on *A. citrinoviridis.*
Aristida contorta	0.1	30 cm		
Aristida pruinosa	0.1	120 cm	YBIR08-14	
Atalaya hemiglauca	0.5	600 cm		
Boerhavia coccinea	0.1	5 cm	YBIR08-13	
Bonamia erecta	0.1	40 cm		
Cenchrus ciliaris	15	45 cm		
Cenchrus setiger	10	45 cm		
Chrysopogon fallax	0.1	100 cm		
Cleome viscosa	0.1	35 cm		
Corchorus sidoides subsp. *sidoides*	0.1	45 cm	BIL18-21=	
Corymbia hamersleyana	1	700 cm		
Dicrastylis cordifolia	0.1	50 cm		
Duperreya commixta	0.1	20 cm		
Enneapogon caerulescens	0.1	25 cm	YBIR08-15	
Enneapogon polyphyllus	0.1	20 cm		
Eragrostis eriopoda	0.1	40 cm		
Euphorbia australis var. *subtomentosa*	0.1	18 cm	YBIR08-21	
Euphorbia trigonosperma	0.1	40 cm	YBIR08-10	
Evolvulus alsinoides var. *decumbens*	0.1	10 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	25 cm		
Hakea lorea subsp. *lorea*	0.1	400 cm		
Heliotropium inexplicitum	0.1	15 cm	YBIR08-19	
Hibiscus sturtii var. *platychlamys*	0.1	20 cm	YBIR08-12	
Maireana planifolia	0.1	50 cm		
Melhania oblongifolia	0.1	20 cm		
Paspalidium rarum	0.1	10 cm	YBIR08-18	
Petalostylis cassioides	0.1	250 cm		
Polymeria ambigua	0.1	5 cm	YBIR08-09	
Ptilotus astrolasius	0.1	35 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	3 cm		
Ptilotus obovatus var. *obovatus*	0.1	50 cm		
Rhagodia eremaea	0.1	35 cm		
Rhynchosia minima	0.1	60 cm		
Sclerolaena cornishiana	0.1	20 cm	YBIR08-16	
Senna artemisioides subsp. *helmsii*	0.1	40 cm		

Species	Cover	Height	Specimen	Notes
Senna artemisioides subsp. *oligophylla*	0.1	60 cm	YBIR08-08	
Sida cardiophylla	0.1	60 cm	YBIR08-24	
Sida echinocarpa	0.1	50 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	30 cm	YBIR08-04	
Solanum lasiophyllum	0.1	35 cm		
Sporobolus australasicus	0.1	10 cm		
Stylobasium spathulatum	0.1	220 cm		
Themeda triandra	0.1	80 cm		
Tribulopis angustifolia	0.1		YBIR08-20	
Tribulus macrocarpus	0.1	35 cm	YBIR08-23	
Tribulus macrocarpus	0.1			
Triodia longiceps	0.1	60 cm	YBIR08-11	
Triodia pungens	6	45 cm	YBIR08-03	
Triumfetta clementii	0.1	60 cm	YBIR08-22	

Yandi Billiards Level 2 Site YBIR09
Described by PLSV Date 20-Mar-14 Type Resampled quadrat 50 x 50 m
Location 17.6 km SSW of Marillana, 76.8 km NNW of Newman and 78.9 km SE of Auski Roadhouse.
MGA Zone 50 739209 mE 7479686 mN
Habitat Flat alluvial plain; adjacent to river floodplain (eastern side of Weeli Wolli Creek).
Soil Dark reddish brown fine sandy loam.
Rock Type Ironstone cobbles (5%), and gravel (5%).
Vegetation *Corymbia hamersleyana* low open woodland over *Acacia sclerosperma* subsp. *sclerosperma*, (*A. inaequilatera, A. aptaneura* x, *Hakea lorea* subsp. *lorea*) tall open shrubland over *Eremophila longiflora* scattered shrubs over *Senna artemisioides* subsp. *oligophylla*, *Ptilotus obovatus* scattered low shrubs over *Triodia basedowii* (*T. pungens*) open hummock grassland and **Cenchrus ciliaris* very open tussock grassland.
Veg Condition Good (**Cenchrus ciliaris, *Bidens bipinnata*).
Fire Age Very long unburnt.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	40 cm		
Abutilon lepidum	0.1	70 cm	YBIR09-07	M Trudgen confirmed.
Acacia aptaneura x	0.5	400 cm	YBIR09-08	
Acacia citrinoviridis	0.1	230 cm		
Acacia dictyophleba	0.1	230 cm		
Acacia inaequilatera	1	230 cm		
Acacia pachyacra	0.1	130 cm		
Acacia pruinocarpa	0.1	230 cm		
Acacia sclerosperma x	0.1	180 cm		
Acacia sclerosperma subsp. *sclerosperma*	4	350 cm		
Acrachne racemosa	0.1	25 cm		
Amyema hilliana	0.1	190 cm	YBIR09-05	Growing on *A. inaequilatera*.
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Aristida pruinosa	0.1	90 cm	YBIR09-03	
Bidens bipinnata	0.1	40 cm		N=150.
Boerhavia coccinea	0.1	30 cm		
Bulbostylis barbata	0.1	15 cm		
Cenchrus ciliaris	3	60 cm		N=200.
Cenchrus setiger	0.1	80 cm		N=10.
Cleome viscosa	0.1	25 cm		
Corchorus sidoides subsp. *sidoides*	0.1	45 cm	YBIR09-04	
Corymbia hamersleyana	4	700 cm		
Cymbopogon obtectus	0.1	120 cm		
Dactyloctenium radulans	0.1	20 cm		
Duperreya commixta	0.1	100 cm		
Enchylaena tomentosa var. *tomentosa*	0.1	80 cm		
Enneapogon caerulescens	0.1	30 cm		
Enneapogon polyphyllus	0.1	35 cm		
Eragrostis eriopoda	0.1	40 cm		
Eremophila longifolia	0.5	190 cm		
Eriachne aristidea	0.1	40 cm		
Eriachne pulchella	0.1	10 cm		
Euphorbia australis var. *subtomentosa*	0.1	5 cm	YBIR09-11	
Euphorbia tannensis subsp. *eremophila*	0.1	40 cm		
Evolvulus alsinoides var. *decumbens*	0.1	25 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	25 cm		
Gossypium australe	0.1	80 cm		
Hakea lorea subsp. *lorea*	0.5	400 cm		
Hibiscus sturtii var. *platychlamys*	0.1	35 cm		
Maireana villosa	0.1	45 cm		
Melhania oblongifolia	0.1	40 cm		
Paraneurachne muelleri	0.1	35 cm		

Species	Cover (%)	Height	Specimen	Notes
Paspalidium rarum	0.1	30 cm	YBIR09-06	
Perotis rara	0.1	15 cm		
Polycarpaea corymbosa var. *corymbosa*	0.1	20 cm		
Ptilotus astrolasius	0.1	35 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	40 cm		
Ptilotus obovatus	0.5	70 cm		
Rhagodia eremaea	0.1	100 cm		
Rhyncharrhena linearis	0.1	45 cm		
Rhynchosia minima	0.1	35 cm		
Sclerolaena cornishiana	0.1	40 cm		
Senna artemisioides subsp. *helmsii*	0.1	80 cm		
Senna artemisioides subsp. *oligophylla*	1	90 cm	YBIR09-02	
Senna artemisioides subsp. *oligophylla* (thinly sericeous form MET 15,035)	0.1	70 cm	YBIR09-10	
Setaria dielsii	0.1	25 cm		
Setaria verticillata	0.1	30 cm		N=2.
Sida echinocarpa	0.1	90 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	25 cm		
Solanum lasiophyllum	0.1	50 cm		
Sporobolus australasicus	0.1	10 cm		
Tribulus macrocarpus	0.1	10 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	10 cm		
Triodia basedowii	25	40 cm		
Triodia pungens	2	50 cm	YBIR09-01	
Urochloa subquadripara	0.1	30 cm	YBIR09-09	

Yandi Billiards Level 2 Site YBIR10
Described by CEFCASW Date 15-Mar-14 Type Quadrat 50 x 50 m
Location 21.2 km SW of Marillana, 77 km SE of Auski Roadhouse and 77.2 km NW of Newman.
MGA Zone 50 735440 mE 7477825 mN
Habitat Broad colluvial floodplain of river (Marillana Creek).
Soil 2.5YR 3/3 dark reddish brown loamy sand.
Rock Type Ironstone cobbles (2%), pebbles (2%), and gravel (1%).
Vegetation *Acacia pruinocarpa, A. citrinoviridis*, *A. sclerosperma* subsp. *sclerosperma*, *Atalaya hemiglauca* open scrub over *Triodia pungens* very open hummock grassland and **Cenchrus ciliaris, *C. setiger* open tussock grassland.
Veg Condition Poor (**Cenchrus* spp., **Setaria verticillata, *Tribulus terrestris*)
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	50 cm	YBIR10-09	
Abutilon otocarpum	0.1	50 cm		
Acacia citrinoviridis	12	650 cm		
Acacia coriacea subsp. *pendens*	0.1	170 cm		
Acacia dictyophleba	0.1	180 cm		
Acacia pruinocarpa	30	650 cm		
Acacia sclerosperma subsp. *sclerosperma*	6	500 cm		
Aristida holathera var. *holathera*	0.1	45 cm		
Atalaya hemiglauca	3	600 cm		
Bidens bipinnata	0.1	25 cm		N=75.
Boerhavia coccinea	0.1	10 cm	YBIR10-19	
Cenchrus ciliaris	25	45 cm		
Cenchrus setiger	3	60 cm		
Cleome viscosa	0.1	50 cm		
Corchorus crozophorifolius	0.1	50 cm	YBIR10-16	
Corchorus tridens	0.1	10 cm	YBIR10-06	
Duperreya commixta	0.1	400 cm		
Dysphania melanocarpa forma *melanocarpa*	0.1	10 cm	YBIR10-14	
Enchylaena tomentosa var. *tomentosa*	0.1	40 cm	YBIR10-08	
Eragrostis eriopoda	0.1	40 cm		
Euphorbia tannensis subsp. *eremophila*	0.1	45 cm	YBIR10-17	
Euphorbia trigonosperma	0.1	20 cm	YBIR10-05	
Evolvulus alsinoides var. *decumbens*	0.1	40 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Indigofera colutea	0.1	10 cm	YBIR10-20	
Jasminum didymum subsp. *lineare*	0.1	150 cm		
Melhania oblongifolia	0.1	30 cm		
Perotis rara	0.1	10 cm		
Rhagodia eremaea	0.1	140 cm		
Salsola australis	0.1	25 cm		
Senna artemisioides subsp. *helmsii*	0.1	50 cm		
Senna glutinosa subsp. *glutinosa x S. stricta*	0.1	160 cm	YBIR10-07	M Trudgen confirmed.
Setaria dielsii	0.1	70 cm	YBIR10-15	
Setaria verticillata	0.1	30 cm		N=15.
Sida fibulifera	0.1	20 cm	YBIR10-02	
Trianthema pilosa	0.1	10 cm		
Tribulus macrocarpus	0.1			
Tribulus terrestris	0.1	10 cm	YBIR10-12	
Triodia basedowii	0.1	35 cm		
Triodia longiceps	0.1	35 cm	YBIR10-04	
Triodia pungens	5	40 cm	YBIR10-01	
Triraphis mollis	0.1	40 cm	YBIR10-11	
Urochloa piligera	0.1	15 cm	YBIR10-03	

Yandi Billiards Level 2				Site	YBIR11
Described by	PLSW	Date	15-Mar-14	Type	Resampled quadrat 50 x 50 m
Location	21.1 km SSW of Marillana, 76.3 km NW of Newman and 78.1 km SE of Auski Roadhouse.				
MGA Zone	50	736414 mE	7477306 mN		
Habitat	Gently sloping alluvial plain between river (Weeli Wolli Creek) and drainage area to the east; sloping to the west.				
Soil	Dark reddish-brown fine sandy clay-loam; alluvial.				
Rock Type	Calcareous with small amount of ironstone pebbles (10%).				
Vegetation	*Corymbia hamersleyana* scattered low trees over *Acacia pruinocarpa, A. sclerosperma* subsp. *sclerosperma*, *A. aptaneura, A. citrinoviridis, A. tenuissima* tall shrubland over *Corchorus sidoides* subsp. *sidoides* scattered low shrubs over *Triodia longiceps*, (*T. basedowii*) hummock grassland over **Cenchrus ciliaris, Paraneurachne muelleri, Eragrostis eriopoda* scattered tussock grasses.				
Veg Condition	Very Good (**Cenchrus ciliaris*).				
Fire Age	No sign of recent fire.				
Notes	All fruiting *Corchorus* appears to be *Corchorus sidoides* rather than *C. tectus*.				

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	80 cm	YBIR11-08	
Abutilon otocarpum	0.1	30 cm		
Abutilon sp. Pilbara (W.R. Barker 2025)	0.1	50 cm		
Acacia aptaneura	1	420 cm	YBIR11-11	
Acacia citrinoviridis	1	410 cm		
Acacia coriacea subsp. *pendens*	0.1	430 cm		
Acacia inaequilatera	0.1	400 cm		
Acacia pruinocarpa	3	570 cm		
Acacia sclerosperma subsp. *sclerosperma*	3	400 cm		
Acacia tenuissima	1	260 cm		
Acrachne racemosa	0.1	30 cm	YBIR11-14	
Aristida contorta	0.1	30 cm		
Aristida holathera var. *holathera*	0.1	40 cm	YBIR11-16	
Aristida holathera var. *holathera*	0.1	40 cm		
Boerhavia coccinea	0.1	10 cm		
Cenchrus ciliaris	2	60 cm		
Cleome viscosa	0.1	20 cm		
Corchorus crozophorifolius	0.1	50 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	40 cm		
Corchorus sidoides subsp. *sidoides*	0.5	70 cm	YBIR11-01	
Corchorus tridens	0.1	10 cm		
Corymbia hamersleyana	1	550 cm		
Dichanthium sericeum subsp. *humilius*	0.1	20 cm	YBIR11-15	
Digitaria ctenantha	0.1	30 cm		
Duperreya commixta	0.1	310 cm		
Enneapogon caerulescens	0.1	40 cm		
Eragrostis eriopoda	0.5	30 cm		
Eremophila forrestii subsp. *forrestii*	0.1	90 cm		
Eremophila longifolia	0.1	245 cm		
Euphorbia australis var. *subtomentosa*	0.1	15 cm	YBIR11-04	
Euphorbia biconvexa	0.1	15 cm	YBIR11-05	
Euphorbia boophthona	0.1	30 cm		
Euphorbia tannensis subsp. *eremophila*	0.1	20 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	15 cm		
Goodenia microptera	0.1	30 cm		
Heliotropium cunninghamii	0.1	30 cm	YBIR11-18	
Heliotropium inexplicitum	0.1	20 cm	YBIR11-07	
Hibiscus sturtii var. *platychlamys*	0.1	400 cm		
Indigofera linifolia	0.1	15 cm		
Iseilema dolichotrichum	0.1	20 cm	YBIR11-17	
Maireana villosa	0.1	5 cm	YBIR11-12	
Melhania oblongifolia	0.1	40 cm		
Paraneurachne muelleri	0.5	70 cm		

Species	Cover (%)	Height	Specimen	Notes
Pterocaulon sphacelatum	0.1	15 cm		
Ptilotus astrolasius	0.1	80 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	10 cm		
Ptilotus obovatus var. *obovatus*	0.1	50 cm		
Rhagodia eremaea	0.1	210 cm		
Rhynchosia minima	0.1	110 cm		
Senna artemisioides subsp. *helmsii*	0.1	70 cm		
Senna artemisioides subsp. *oligophylla*	0.1	100 cm	YBIR11-02	
Sida fibulifera	0.1	30 cm		
Sida arsiniata	0.1	40 cm		
Sida echinocarpa	0.1	60 cm	YBIR11-10	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	20 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	35 cm		
Solanum lasiophyllum	0.1	45 cm		
Sporobolus australasicus	0.1	15 cm		
Tephrosia supina	0.1	40 cm	YBIR11-09	R. Butcher confirmed.
Tribulus macrocarpus	0.1	10 cm		
Tribulus terrestris	0.1	10 cm	YBIR11-03	
Triodia basedowii	0.5	60 cm		
Triodia longiceps	40	80 cm		
Triodia pungens	0.1	40 cm	YBIR11-13	

Yandi Billiards Level 2 Site YBIR12
Described by PLSV Date 17-Mar-14 Type Resampled quadrat 50 x 50 m
Location 23.4 km SSW of Marillana, 75.1 km NW of Newman and 78.6 km SE of Auski Roadhouse
MGA Zone 50 735505 mE 7475221 mN
Habitat Flat alluvial clay plain, associated with drainage area to the east of Weeli Wolli Creek; plain is bordered by hills to the east.
Soil Dark reddish brown light clay; alluvial.
Rock Type Some quartz present (very small amounts); probably ironstone underneath.
Vegetation *Acacia aptaneura, A. pruinocarpa* low open forest over *A. aptaneura x ayersiana* tall open shrubland over *Eremophila forrestii* subsp. *forrestii*, *Senna artemisioides* subsp. *helmsii* (*Gossypium australe*) open shrubland over **Malvastrum americanum*, *Abutilon macrum, A. fraseri* scattered low shrubs over *Themeda triandra, Aristida pruinosa, *Cenchrus ciliaris, *C. setiger, Paspalidium clementii* very open tussock grassland and *Bidens bipinnata* very open herbland.
Veg Condition Good (**Bidens bipinnata, *Malvastrum americanum, *Cenchrus* spp, other weeds, cattle scats).
Fire Age Very long unburnt.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.5	45 cm		
Abutilon lepidum	0.1	40 cm		
Abutilon macrum	0.5	70 cm		
Abutilon otocarpum	0.1	45 cm		
Acacia aptaneura	40	1000 cm	YBIR12-01	
Acacia aptaneura x ayersiana	2	300 cm	YBIR12-11	
Acacia coriacea subsp. *pendens*	0.1	400 cm		
Acacia pruinocarpa	2	800 cm		
Alternanthera denticulata	0.1	25 cm	YBIR12-16	
Alternanthera nana	0.1	15 cm		
Aristida contorta	0.1	40 cm		
Aristida holathera var. *holathera*	0.1	35 cm		
Aristida inaequiglumis	0.1	170 cm		
Aristida pruinosa	1	120 cm	YBIR12-12	
Atalaya hemiglauca	0.1	150 cm		
Bidens bipinnata	2	70 cm		N=1000.
Boerhavia coccinea	0.1	40 cm	YBIR12-04	
Boerhavia repleta	0.1	25 cm		
Bulbostylis barbata	0.1	10 cm		
Calandrinia ptychosperma	0.1	8 cm	YBIR12-02	
Cenchrus ciliaris	0.5	80 cm		
Cenchrus setiger	0.5	80 cm		
Chloris pectinata	0.1	50 cm	YBIR12-15	
Chrysocephalum gilesii	0.1	10 cm	YBIR12-21	
Chrysopogon fallax	0.1	110 cm		
Convolvulus clementii	0.1	80 cm	YBIR12-06	
Corchorus crozophorifolius	0.1	140 cm		
Corchorus sidoides subsp. *sidoides*	0.1	45 cm	YBIR12-24	
Corchorus tridens	0.1	25 cm		
Corymbia hamersleyana	0.1	500 cm		
Cucumis variabilis	0.1	190 cm		
Cullen leucochaites	0.1	70 cm		
Cymbopogon ambiguus	0.1	120 cm		
Cymbopogon obtectus	0.1	80 cm		
Cymbopogon procerus	0.1	140 cm		
Dichanthium sericeum subsp. *humilius*	0.1	40 cm	YBIR12-03	
Digitaria brownii	0.1	20 cm	YBIR12-19	
Digitaria ctenantha	0.1	50 cm		
Duperreya commixta	0.1	120 cm		
Dysphania melanocarpa forma *melanocarpa*	0.1	25 cm	YBIR12-10	
Enchylaena tomentosa var. *tomentosa*	0.1	80 cm		
Enneapogon polyphyllus	0.1	60 cm		

Species	Cover (%)	Height	Specimen	Notes
Enneapogon robustissimus	0.1	100 cm		
Eragrostis cumingii	0.1	20 cm		
Eremophila forrestii subsp. *forrestii*	2	140 cm		
Eremophila lanceolata	0.1	40 cm		
Eriachne mucronata (typical form)	0.1	60 cm	YBIR12-14	
Eulalia aurea	0.1	110 cm		
Euphorbia biconvexa	0.1	40 cm	YBIR12-09	
Evolvulus alsinoides var. *villosicalyx*	0.1	25 cm		
Glycine canescens	0.1	110 cm		
Goodenia nuda	0.1	35 cm	YBIR12-22	N=1.
Goodenia prostrata	0.1	10 cm		
Gossypium australe	0.5	150 cm		
Hakea chordophylla	0.1	140 cm		
Hakea lorea subsp. *lorea*	0.1	60 cm		
Hibiscus sturtii var. *grandiflorus*	0.1	25 cm	YBIR12-01b	
Hybanthus aurantiacus	0.1	45 cm		
Iseilema membranaceum	0.1	20 cm	YBIR12-07	
Maireana planifolia	0.1	70 cm		
Maireana planifolia x villosa	0.1	40 cm	YBIR12-20	
Maireana villosa	0.1	45 cm		
Malvastrum americanum	2	50 cm		
Melhania oblongifolia	0.1	30 cm		
Panicum effusum	0.1	80 cm		
Paraneurachne muelleri	0.1	90 cm		
Paspalidium clementii	0.5	25 cm	YBIR12-05	
Perotis rara	0.1	15 cm		
Phyllanthus erwinii	0.1	10 cm		
Phyllanthus maderaspatensis	0.1	40 cm		
Polycarpaea corymbosa var. *corymbosa*	0.1	10 cm		
Portulaca oleracea/intraterranea	0.1	10 cm	YBIR12-17	
Psydrax latifolia	0.1	100 cm		
Pterocaulon sphacelatum	0.1	60 cm		
Ptilotus gaudichaudii subsp. *gaudichaudii*	0.1	35 cm		
Ptilotus obovatus var. *obovatus*	0.1	70 cm		
Rhagodia eremaea	0.1	100 cm		
Rhynchosia minima	0.1	100 cm		
Salsola australis	0.1	25 cm		
Senna artemisioides subsp. *helmsii*	1	120 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	70 cm		
Sida fibulifera	0.1	40 cm	YBIR12-23	
Sida platycalyx	0.1	10 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	90 cm		
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	35 cm		
Sigesbeckia orientalis	0.1	40 cm	YBIR12-08	
Solanum lasiophyllum	0.1	40 cm		
Spermacoce brachystema	0.1	20 cm		
Sporobolus australasicus	0.1	20 cm		
Stemodia grossa	0.1	90 cm		
Themeda triandra	3	140 cm	YBIR12-18	
Tribulus macrocarpus	0.1	25 cm		
Triodia wiseana	0.1	30 cm		
Vachellia farnesiana	0.1	30 cm		N=1.
Waltheria indica	0.1	80 cm		

Yandi Billiards Level 2 Site YBIR15

Described by PLSW Date 16-Mar-14 Type Resampled quadrat 50 x 50 m

Location 21.1 km SSW of Marillana, 76 km NW of Newman and 78.3 km SE of Auski Roadhouse.

MGA Zone 50 736653 mE 7477156 mN

Habitat Drainage area through broad plain, to the east of a river (Weeli Wolli Creek).

Soil Dark reddish brown fine light clay.

Rock Type Nil.

Vegetation *Acacia aptaneura,* (*Corymbia candida, Acacia pruinocarpa, A. citrinoviridis, Atalaya hemiglauca, Hakea lorea* subsp. *lorea*) low open forest over *Triodia longiceps* scattered hummock grasses with *Bothriochloa ewartiana *Cenchrus setiger, *C. ciliaris* very open tussock grassland.

Veg Condition Good (**Cenchrus* spp, **Malvastrum americanum, *Bidens bipinnata, *Setaria verticillata*, cattle activity).

Fire Age No sign of recent fire.

Notes Cattle activity - numerous tracks and light grazing.
Bothriochloa ewartiana possibly mis-identified as *Eulalia* in previous sampling.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	40 cm		
Abutilon lepidum	0.1	40 cm	YBIR15-14	
Abutilon macrum	0.1	40 cm		
Abutilon otocarpum	0.1	20 cm		
Acacia aptaneura	22	800 cm	YBIR15-01	
Acacia ayersiana	0.1	210 cm	YBIR15-26	Narrow phyllode variant.
Acacia citrinoviridis	2	800 cm		
Acacia coriacea subsp. *pendens*	0.1	180 cm		
Acacia pruinocarpa	3	1000 cm		
Acrachne racemosa	0.1	30 cm		
Alternanthera angustifolia	0.1	10 cm	YBIR15-33	
Alternanthera nana	0.1	25 cm		
Aristida contorta	0.1	15 cm		
Aristida holathera var. *holathera*	0.1	40 cm		
Aristida hygrometrica	0.1	40 cm	YBIR15-25	
Aristida pruinosa	0.1	70 cm	YBIR15-31	
Atalaya hemiglauca	1	800 cm		
Bidens bipinnata	0.1	10 cm		N=570.
Blumea tenella	0.1	10 cm	YBIR15-22	
Boerhavia burbidgeana	0.1	10 cm	YBIR15-06	
Boerhavia coccinea	0.1	25 cm		
Boerhavia repleta	0.1	5 cm	YBIR15-36	
Bothriochloa ewartiana	4	60 cm		
Bulbostylis barbata	0.1	10 cm		
Bulbostylis turbinata	0.1	20 cm	YBIR15-38	
Calandrinia ptychosperma	0.1	5 cm	YBIR15-29	
Cenchrus ciliaris	2	60 cm		
Cenchrus setiger	0.1	60 cm		
Cenchrus setiger	3	60 cm		
Chrysopogon fallax	0.1	60 cm		
Cleome viscosa	0.1	60 cm		
Corchorus sidoides subsp. *sidoides*	0.1	30 cm	YBIR15-32	
Corchorus tridens	0.1	20 cm		
Corymbia candida	11	800 cm		
Cucumis variabilis	0.1	10 cm		
Dactyloctenium radulans	0.1	10 cm		
Dichanthium sericeum subsp. *humilius*	0.1	25 cm	YBIR15-16	
Digitaria brownii	0.1	50 cm		
Digitaria ctenantha	0.1	30 cm		
Duperreya commixta	0.1	600 cm		
Dysphania melanocarpa forma *melanocarpa*	0.1	25 cm	YBIR15-28	

Species	Cover (%)	Height	Specimen	Notes
Dysphania rhadinostachya subsp. *inflata*	0.1	30 cm	YBIR15-08	
Enchylaena tomentosa var. *tomentosa*	0.1	100 cm		
Enneapogon polyphyllus	0.1	30 cm		
Enteropogon ramosus	0.1	80 cm		
Eragrostis cumingii	0.1	15 cm		
Eragrostis falcata	0.1	15 cm	YBIR15-10	
Eragrostis leptocarpa	0.1	20 cm	YBIR15-19	
Eragrostis pergracilis	0.1	20 cm	YBIR15-07	
Eragrostis tenellula	0.1	25 cm	YBIR15-24	
Eragrostis xerophila	0.1	40 cm		
Eremophila lanceolata	0.1	40 cm		
Eriachne mucronata (typical form)	0.1	60 cm	YBIR15-17	
Eriachne pulchella	0.1	15 cm		
Euphorbia trigonosperma	0.1	10 cm	YBIR15-02	
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Glycine canescens	0.1	40 cm		
Goodenia nuda	0.1	25 cm	YBIR15-03	N=23.
Goodenia prostrata	0.1	5 cm	YBIR15-04	
Gossypium australe	0.1	40 cm		
Hakea lorea subsp. *lorea*	1	690 cm		
Heliotropium cunninghamii	0.1	20 cm	YBIR15-34	
Indigofera linifolia	0.1	20 cm		
Iseilema membranaceum	0.1	10 cm	YBIR15-05	
Maireana planifolia	0.1	20 cm		
Maireana villosa	0.1	60 cm	YBIR15-23	
Malvastrum americanum	0.1	15 cm		N=535.
Melhania oblongifolia	0.1	15 cm		
Paspalidium clementii	0.1	15 cm	YBIR15-18	
Perotis rara	0.1	10 cm		
Phyllanthus erwinii	0.1	10 cm	YBIR15-20	
Phyllanthus maderaspatensis	0.1	30 cm		
Pluchea dunlopii	0.1	15 cm	YBIR15-11	
Polycarpaea corymbosa var. *corymbosa*	0.1	10 cm		
Portulaca filifolia	0.1	10 cm	YBIR15-12	
Portulaca oleracea/intraterranea	0.1	5 cm	YBIR15-21	
Pterocaulon sphacelatum	0.1	40 cm		
Ptilotus gaudichaudii subsp. *gaudichaudii*	0.1	40 cm	YBIR15-13	
Ptilotus nobilis subsp. *nobilis*	0.1	10 cm	YBIR15-29	
Ptilotus obovatus var. *obovatus*	0.1	40 cm		
Rhagodia eremaea	0.1	130 cm		
Rhynchosia minima	0.1	10 cm		
Salsola australis	0.1	10 cm		
Sclerolaena cornishiana	0.1	10 cm		
Senna artemisioides subsp. *helmsii*	0.1	170 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	70 cm		
Setaria dielsii	0.1	50 cm	YBIR15-27	
Setaria verticillata	0.1	60 cm		N=1.
Sida fibulifera	0.1	25 cm	YBIR15-15	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	20 cm		
Spermacoce brachystema	0.1	10 cm		
Sporobolus australasicus	0.1	10 cm		
Stemodia grossa	0.1	20 cm		
Streptoglossa bubakii	0.1	10 cm		
Tragus australianus	0.1	20 cm		
Tribulus terrestris	0.1	15 cm	YBIR15-35	
Triodia basedowii	0.1	40 cm		
Triodia longiceps	0.5	60 cm		
Triodia pungens	0.1	40 cm		
Waltheria indica	0.1	30 cm		

Yandi Billiards Level 2 Site YBIR17
Described by CEFCASW Date 17-Mar-14 Type Resampled quadrat 50 x 50 m
Location 23.7 km SSW of Marillana, 75.4 km NW of Newman and 78.1 km SE of Auski Roadhouse.
MGA Zone 50 734841 mE 7475215 mN
Habitat Flat plain just east of river floodplain (Weeli Wolli Creek).
Soil Dark reddish brown silty clay with 5% cover of pebbles.
Rock Type Not recorded.
Vegetation *Acacia bivenosa, A. pyrifolia* var. *pyrifolia* open shrubland over *Sida fibulifera* scattered low shrubs over *Triodia longiceps* very open hummock grassland with **Cenchrus ciliaris* very open tussock grassland and **Malvastrum americanum* open herbland.
Veg Condition Poor (**Cenchrus* spp., **Malvastrum americanum, *Aerva javanica, *Flaveria trinervia, *Bidens bipinnata*; cow scats; very close to cleared drill lines).
Fire Age Burnt 3-5 years ago.
Notes Site has been burnt since the first phase of sampling (approximately 3-5 years ago). *Triodia* hummocks are still large but many of the tall shrubs (*Hakea lorea, Acacia citrinoviridis* etc.) are resprouting from the base. Could not find *Corymbia hamersleyana*; possibly killed by fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon amplum	0.1	50 cm	YBIR17-31	
Abutilon otocarpum	0.1	30 cm	YBIR17-22	
Abutilon otocarpum	0.1	40 cm		
Acacia bivenosa	2	160 cm		
Acacia citrinoviridis	0.1	250 cm		
Acacia dictyophleba	0.1	40 cm		
Acacia pyrifolia var. *pyrifolia*	1	120 cm		
Acrachne racemosa	0.1	20 cm	YBIR17-26	
Aerva javanica	0.1	40 cm		N=3.
Alternanthera nana	0.1	5 cm	YBIR17-16	
Aristida contorta	0.1	30 cm		
Atalaya hemiglauca	0.1	110 cm		
Bidens bipinnata	0.1	20 cm		N=5.
Boerhavia coccinea	0.1	30 cm		
Boerhavia coccinea	0.1	5 cm	YBIR17-03	
Cenchrus ciliaris	8	60 cm		
Cenchrus setiger	0.1	35 cm		
Cleome viscosa	0.1	50 cm		
Codonocarpus cotinifolius	0.1	170 cm		
Corchorus crozophorifolius	0.1	120 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	35 cm	YBIR17-14	M Trudgen confirmed.
Corchorus sidoides subsp. *sidoides*	0.1	15 cm		
Corchorus tridens	0.1	5 cm	YBIR17-30	
Crotalaria medicaginea var. *neglecta*	0.1	30 cm		
Cymbopogon procerus	0.1	40 cm	YBIR17-23	
Cymbopogon procerus	0.1	150 cm		
Duperreya commixta	0.1	60 cm		
Enchylaena tomentosa var. *tomentosa*	0.1	45 cm	YBIR17-25	
Enneapogon lindleyanus	0.1	15 cm	YBIR17-07	
Enneapogon lindleyanus	0.1	55 cm	YBIR17-28	
Enneapogon polyphyllus	0.1	20 cm		
Eragrostis cumingii	0.1	5 cm		
Eragrostis eriopoda	0.1	25 cm		
Eragrostis pergracilis	0.1	25 cm	YBIR17-29	
Eragrostis tenellula	0.1	20 cm		
Eremophila longifolia	0.1	20 cm		
Eriachne mucronata (typical form)	0.1	35 cm		
Euphorbia australis var. *subtomentosa*	0.1	5 cm	YBIR17-02	
Euphorbia tannensis subsp. *eremophila*	0.1	120 cm	YBIR17-24	
Euphorbia trigonosperma	0.1	20 cm	YBIR17-05	
Evolvulus alsinoides var. *villosicalyx*	0.1	10 cm		
Flaveria trinervia	0.1	20 cm		N=5.

Species	Cover (%)	Height	Specimen	Notes
Gossypium sturtianum var. *sturtianum*	0.1	130 cm		
Hakea lorea subsp. *lorea*	0.1	110 cm		Resprouting.
Heliotropium cunninghamii	0.1	15 cm	YBIR17-13	
Hibiscus sturtii var. *platychlamys*	0.1	10 cm		
Hybanthus aurantiacus	0.1	15 cm		
Indigofera linifolia	0.1	20 cm	YBIR17-20	
Malvastrum americanum	1	10 cm		N=300.
Melhania oblongifolia	0.1	30 cm		
Notoleptopus decaisnei var. *decaisnei*	0.1	15 cm	YBIR17-17	
Paraneurachne muelleri	0.1	20 cm		
Phyllanthus maderaspatensis	0.1	20 cm	YBIR17-08	
Polymeria ambigua	0.1	2 cm	YBIR17-01	
Portulaca oleracea/intraterranea	0.1	10 cm	YBIR17-09	
Pterocaulon sphacelatum	0.1	25 cm	YBIR17-15	
Ptilotus astrolasius	0.1	40 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	5 cm		
Ptilotus obovatus var. *obovatus*	0.1	80 cm		
Rhynchosia minima	0.1	5 cm		
Salsola australis	0.1	30 cm		
Scaevola amblyanthera var. *centralis*	0.1	25 cm	YBIR17-21	
Sclerolaena cornishiana	0.1	5 cm	YBIR17-10	
Senna artemisioides subsp. *helmsii*	0.1	40 cm		
Senna artemisioides subsp. *oligophylla*	0.1	20 cm	YBIR17-12	
Setaria dielsii	0.1	40 cm		
Sida fibulifera	1	20 cm	YBIR17-04	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	100 cm		
Solanum lasiophyllum	0.1	30 cm		
Sporobolus australasicus	0.1	10 cm		
Stemodia grossa	0.1	30 cm		
Stylobasium spathulatum	0.1	220 cm		
Themeda triandra	0.1	100 cm		
Tragus australianus	0.1	15 cm		
Tribulus macrocarpus	0.1	5 cm	YBIR17-27	
Trichodesma zeylanicum var. *zeylanicum*	0.1	20 cm		
Triodia longiceps	2	40 cm		
Triraphis mollis	0.1	35 cm	YBIR17-11	
Triraphis mollis	0.1	30 cm	YBIR17-06	

Yandi Billiards Level 2 Site YBIR20
Described by PLSV Date 17-Mar-14 Type Resampled quadrat 12.5 x 200 m
Location 26.5 km SSW of Marillana, 73.5 km NW of Newman and 79.5 km SE of Auski Roadhouse.
MGA Zone 50 734275 mE 7472369 mN
Habitat Bed of moderate-sized creek line (feeds into Weeli Wolli Creek).
Soil 2.5YR 3/3 dark reddish brown sandy loam with 50% cover of pebbles and 40% cover of gravel.
Rock Type Alluvial material; Ironstone, Basalt, Chert.
Vegetation *Eucalyptus victrix* open woodland over *Corymbia hamersleyana* low open woodland over *Acacia tumida* var. *pilbarensis*, (*Grevillea wickhamii* subsp. *hispidula, A. pyrifolia* var. *pyrifolia*) tall shrubland over *Cymbopogon ambiguus, *Cenchrus ciliaris* very open tussock grassland.
Veg Condition Good (**Cenchrus ciliaris*).
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen
Acacia pyrifolia var. *pyrifolia*	1	210 cm	
Acacia tumida var. *pilbarensis*	20	350 cm	
Aristida contorta	0.1	35 cm	
Aristida holathera var. *holathera*	0.1	20 cm	
Aristida hygrometrica	0.1	40 cm	YBIR20-07
Aristida pruinosa	0.1	45 cm	YBIR20-06
Atalaya hemiglauca	0.1	180 cm	
Bonamia erecta	0.1	35 cm	
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	5 cm	
Cenchrus ciliaris	1	40 cm	
Cleome viscosa	0.1	40 cm	
Corchorus crozophorifolius	0.1	150 cm	
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	50 cm	
Corchorus tectus	0.1	30 cm	
Corymbia hamersleyana	10	800 cm	
Cymbopogon ambiguus	1	50 cm	
Cymbopogon procerus	0.1	110 cm	
Digitaria brownii	0.1	40 cm	
Digitaria ctenantha	0.1	20 cm	
Duperreya commixta	0.1	300 cm	
Enneapogon lindleyanus	0.1	40 cm	
Enneapogon robustissimus	0.1	60 cm	YBIR20-02
Eragrostis eriopoda	0.1	30 cm	
Eriachne mucronata (typical form)	0.1	40 cm	
Eriachne pulchella	0.1	20 cm	
Eriachne tenuiculmis	0.1	30 cm	
Eucalyptus victrix	8	1100 cm	
Euphorbia australis var. *subtomentosa*	0.1	10 cm	YBIR20-13
Evolvulus alsinoides var. *villosicalyx*	0.1	10 cm	
Gomphrena cunninghamii	0.1	15 cm	
Goodenia muelleriana	0.1	40 cm	
Gossypium australe	0.1	50 cm	
Gossypium robinsonii	0.1	230 cm	
Grevillea wickhamii subsp. *hispidula*	1	350 cm	YBIR20-04
Heliotropium cunninghamii	0.1	20 cm	YBIR20-10
Heliotropium pachyphyllum	0.1	25 cm	YBIR20-11
Hibiscus coatesii	0.1	20 cm	YBIR20-12
Hybanthus aurantiacus	0.1	40 cm	
Indigofera monophylla	0.1	70 cm	YBIR20-09
Indigofera monophylla	0.1	40 cm	
Mollugo molluginea	0.1	10 cm	
Paraneurachne muelleri	0.1	25 cm	
Phyllanthus maderaspatensis	0.1	30 cm	
Polymeria ambigua	0.1	10 cm	
Ptilotus astrolasius	0.1	50 cm	

Species	Cover (%)	Height	Specimen
Ptilotus nobilis subsp. *nobilis*	0.1	15 cm	
Ptilotus obovatus var. *obovatus*	0.1	50 cm	
Senna artemisioides subsp. *helmsii*	0.1	60 cm	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	70 cm	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	25 cm	
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	45 cm	
Themeda triandra	0.1	50 cm	
Triodia pungens	0.1	40 cm	YBIR20-03
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	0.1	25 cm	
Triodia wiseana	0.1	40 cm	
Waltheria indica	0.1	60 cm	

Yandi Billiards Level 2 Site YBIR24
Described by CASV Date 16-Mar-14 Type Resampled quadrat 50 x 50 m
Location 15.5 km SSW of Marillana, 77.2 km NNW of Newman and 79.4 km ESE of Auski Roadhouse.
MGA Zone 50 740878 mE 7481198 mN
Habitat Crest of low stony hill.
Soil 2.5YR 3/3 dark reddish brown skeletal sandy clay loam.
Rock Type Ironstone cobbles (80%), pebbles (10%), and gravel (5%).
Vegetation *Hakea chordophylla, Acacia arida* tall open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia arida	2	250 cm		
Acacia inaequilatera	0.1	110 cm		
Amphipogon sericeus	0.1	20 cm	YBIR24-03	
Amyema hilliana	0.1		YBIR24-07	
Aristida holathera var. *holathera*	0.1	30 cm		
Calytrix carinata	0.1	90 cm		
Corymbia hamersleyana	0.1	250 cm		
Cymbopogon obtectus	0.1	110 cm		
Dampiera candicans	0.1	20 cm		
Eriachne mucronata (typical form)	0.1	15-30 cm	YBIR24-04. 06	
Fimbristylis simulans	0.1	10 cm	YBIR24-02	
Goodenia stobbsiana	0.1	15 cm		
Gossypium robinsonii	0.1	160 cm		
Grevillea wickhamii	0.1	180 cm		Sterile.
Hakea chordophylla	2	300 cm		
Pterocaulon sphacelatum	0.1	20 cm	YBIR24-05	
Ptilotus calostachyus	0.1	60 cm		
Ptilotus rotundifolius	0.1	90 cm		
Schizachyrium fragile	0.1	15 cm		
Senna artemisioides subsp. *oligophylla*	0.1	60 cm	YBIR24-01	
Senna glutinosa subsp. *glutinosa*	0.1	220 cm		
Senna glutinosa subsp. *glutinosa x* subsp. *pruinosa*	0.1	120 cm		
Senna glutinosa subsp. *glutinosa x* subsp. *x luerssenii*	0.1	130 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	35	35 cm	YBIR24-08	
Triodia wiseana	0.1	40 cm		

Yandi Billiards Level 2 Site YBIR27

Described by PLSV Date 14-Mar-14 Type Resampled quadrat 50 x 50 m

Location 14.2 km SSW of Marillana, 78.2 km NNW of Newman and 79 km ESE of Auski Roadhouse.

MGA Zone 50 741208 mE 7482450 mN

Habitat Lower slope of colluvial rise between base of ridge (to east) and river floodplain (Weeli Wolli Creek, to west); sloping gently to the northwest.

Soil Dark reddish brown fine sandy loam with 1% cover of pebbles and 1% cover of gravel.

Rock Type Ironstone.

Vegetation *Acacia ancistrocarpa, Grevillea wickhamii* subsp. *hispidula* scattered tall shrubs over *Senna artemisioides* subsp. *oligophylla* x subsp. *helmsii* scattered low shrubs over *Triodia basedowii* hummock grassland.

Veg Condition Excellent.

Fire Age No sign of recent fire.

Notes A number of species that were recorded in the previous phase of sampling were not recorded. The vegetation appears to have changed from a post-fire successional community to mature/climax community.

Species	Cover	Height
Acacia ancistrocarpa	0.5	300 cm
Acacia dictyophleba	0.1	60 cm
Acacia inaequilatera	0.1	250 cm
Acacia pachyacra	0.1	90 cm
Aristida holathera var. *holathera*	0.1	45 cm
Bonamia erecta	0.1	50 cm
Dicrastylis cordifolia	0.1	60 cm
Eragrostis eriopoda	0.1	40 cm
Grevillea wickhamii subsp. *hispidula*	0.5	220 cm
Hakea chordophylla	0.1	350 cm
Hybanthus aurantiacus	0.1	45 cm
Ptilotus astrolasius	0.1	35 cm
Ptilotus calostachyus	0.1	40 cm
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.5	80 cm
Sida cardiophylla	0.1	50 cm
Solanum phlomoides	0.1	35 cm
Trianthema pilosa	0.1	20 cm
Tribulopis angustifolia	0.1	10 cm
Triodia basedowii	35	45 cm
Yakirra australiensis var. *australiensis*	0.1	20 cm

Yandi Billiards Level 2 Site YBIR36
Described by PLDK Date 12-Mar-14 Type Resampled quadrat 50 x 50 m
Location 18 km SW of Marillana, 77.3 km SE of Auski Roadhouse and 78.1 km NNW of Newman.
MGA Zone 50 737594 mE 7480201 mN
Habitat Slope of colluvial spur; east-facing.
Soil Red-brown sandy loam with 10% cover of boulders 10% cover of cobbles and 80% cover of pebbles.
Rock Type Ironstone.
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia pruinocarpa* tall open shrubland over *Acacia bivenosa* (wispy/weeping form) scattered shrubs over *Goodenia stobbsiana* scattered low shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), (*T. wiseana*) open hummock grassland.
Veg Condition Excellent.
Fire Age Burnt 3-5 years ago.

Species	Cover (%)	Height	Specimen	Notes
Abutilon lepidum	0.1	20 cm	YBIR36-04	M Trudgen confirmed.
Acacia adoxa var. *adoxa*	0.1	50 cm		
Acacia bivenosa (wispy/weeping form)	0.5	200 cm		
Acacia inaequilatera	0.1	70 cm		
Acacia pruinocarpa	2	500 cm		
Amphipogon sericeus	0.1	30 cm	YBIR36-01	
Aristida holathera var. *holathera*	0.1	40 cm		
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	15 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	90 cm	YBIR36-07	M Trudgen confirmed.
Dodonaea coriacea	0.1	80 cm		
Eriachne aristidea	0.1	25 cm		
Eriachne mucronata (typical form)	0.1	40 cm		
Eriachne pulchella	0.1	10 cm		
Eucalyptus leucophloia subsp. *leucophloia*	1.5	600 cm		
Gomphrena cunninghamii	0.1	15 cm		
Goodenia microptera	0.1	25 cm		
Goodenia muelleriana	0.1	40 cm	YBIR36-02	
Goodenia stobbsiana	0.5	50 cm		
Goodenia triodiophila	0.1	30 cm		
Grevillea wickhamii	0.1	160 cm		Sterile.
Hakea lorea subsp. *lorea*	0.1	60 cm		
Mollugo molluginea	0.1	5 cm		
Paraneurachne muelleri	0.1	40 cm		
Polygala glaucifolia	0.1	2 cm	YBIR36-06	
Ptilotus astrolasius	0.1	50 cm		
Ptilotus calostachyus	0.1	60 cm		
Ptilotus nobilis subsp. *nobilis*	0.1	40 cm		
Ptilotus rotundifolius	0.1	140 cm		
Salsola australis	0.1	25 cm		
Senna glutinosa subsp. *glutinosa*	0.1	190 cm		
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	190 cm	YBIR36-05	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	140 cm		
Solanum lasiophyllum	0.1	50 cm		
Solanum phlomoides	0.1	30 cm		
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.1	20 cm	YBIR36-03	R. Butcher confirmed.
Tribulus suberosus	0.1	60 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	11	30 cm		
Triodia wiseana	2	40 cm		

Yandi Billiards Level 2 Site YEXR01
Described by PLSW Date 13-Mar-14 Type Resampled quadrat 50 x 50 m
Location 26.9 km SW of Marillana, 77.3 km SE of Auski Roadhouse and 75.5 km NW of Newman.
MGA Zone 50 732041 mE 7473229 mN
Habitat Gentle southeast facing slope at upper slope to crest of undulating hill.
Soil Dark reddish brown sandy loam.
Rock Type BIF/ironstone cobbles, pebbles, gravel.
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Hakea chordophylla* scattered tall shrubs over *Acacia hilliana* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.
Veg Condition Excellent.
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Acacia dictyophleba	0.1	100 cm		
Acacia hilliana	2	60 cm		
Amphipogon sericeus	0.1	20 cm	YEXR01-01	
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	5 cm		
Eriachne mucronata (typical form)	0.1	25 cm		
Eriachne pulchella	0.1	10 cm		
Eucalyptus leucophloia subsp. *leucophloia*	1	600 cm		
Fimbristylis dichotoma	0.1	15 cm		
Fimbristylis simulans	0.1	15 cm		
Goodenia stobbsiana	0.1	30 cm		
Goodenia triodiophila	0.1	30 cm		
Goodenia triodiophila	0.1	40 cm	YEXR01-02	M Trudgen confirmed.
Grevillea wickhamii	0.1	240 cm		
Hakea chordophylla	0.5	270 cm		
Ptilotus astrolasius	0.1	50 cm		
Ptilotus calostachyus	0.1	35 cm		
Ptilotus rotundifolius	0.1	70 cm		
Senna glutinosa subsp. *glutinosa*	0.1	130 cm		
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	110 cm	YEXR01-03	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	140 cm		
Solanum lasiophyllum	0.1	60 cm		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	13	40 cm		

Yandi Billiards Level 2 Site YEXR02

Described by CEFCASW Date 20-Mar-14 Type Resampled quadrat 10 x 250 m

Location 25.1 km SW of Marillana, 77.7 km SE of Auski Roadhouse and 75.5 km NW of Newman

MGA Zone 50 733554 mE 7474371 mN

Habitat East bank of Weeli Wolli Creek.

Soil Dark reddish brown clay with small amount of loam.

Rock Type Ironstone.

Vegetation *Acacia citrinoviridis, A. coriacea* subsp. *pendens*, *Atalaya hemiglauca, Gossypium robinsonii, Gossypium sturtianum* var. *sturtianum* tall open shrubland over **Cenchrus ciliaris* closed tussock grassland.

Veg Condition Very Poor (**Cenchrus* spp., cattle tracks and scats).

Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon amplum	0.1	20 cm	YEXR02-09	
Abutilon otocarpum	0.1	30 cm	YEXR02-11	
Acacia citrinoviridis	3	1000 cm		
Acacia coriacea subsp. *pendens*	2	600 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	260 cm		
Aerva javanica	0.1	40 cm		N=1.
Atalaya hemiglauca	2	600 cm		
Boerhavia burbidgeana	0.1	10 cm	YEXR02-10	
Bothriochloa ewartiana	0.1	140 cm	YEXR02-05; -06	
Cenchrus ciliaris	87	70 cm		
Corchorus crozophorifolius	0.1	160 cm		
Cyperus vaginatus	-	-		
Dodonaea lanceolata var. *lanceolata*	0.1	130 cm	YEXR02-04	
Duperreya commixta	0.1	130 cm		
Enneapogon lindleyanus	0.1	30 cm	YEXR02-01	
Eucalyptus victrix	-	-		
Euphorbia australis var. *subtomentosa*	0.1	10 cm	YEXR02-12	
Euphorbia biconvexa/coghlanii/trigonosperma	0.1	20 cm	YEXR02-07	Sterile.
Evolvulus alsinoides var. *decumbens*	0.1	20 cm		
Glycine canescens	0.1	30 cm	YEXR02-03	
Gossypium australe	0.1	60 cm		
Gossypium robinsonii	1	550 cm		
Gossypium sturtianum var. *sturtianum*	1	280 cm		
Jasminum didymum subsp. *lineare*	0.1	60 cm		
Malvastrum americanum	0.1	30 cm		N=4.
Melhania oblongifolia	0.1	30 cm		
Phyllanthus maderaspatensis	0.1	20 cm	YEXR02-13	
Ptilotus nobilis subsp. *nobilis*	0.1	25 cm	YEXR02-08	
Rhynchosia minima	0.1	20 cm		
Salsola australis	0.1	10 cm		
Stylobasium spathulatum	0.1	480 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	30 cm	YEXR02-02	R. Butcher confirmed.
Themeda triandra	0.1	100 cm		

Yandi Billiards Level 2 Site YEXR04
Described by CASV Date 14-Mar-14 Type Resampled quadrat 50 x 50 m
Location 25.8 km SW of Marillana, 77.5 km SE of Auski Roadhouse and 75.6 km NW of Newman.
MGA Zone 50 732961 mE 7473965 mN
Habitat Broad plain, located between Weeli Wolli Creek (to east) and hills (to west).
Soil Dark reddish brown silty clay.
Rock Type Scattered ironstone cobbles (1%), pebbles (3%), and gravel (3%).
Vegetation *Acacia aptaneura, Corymbia hamersleyana, Eucalyptus xerothermica* low woodland over *Acacia sibirica, A. pruinocarpa* tall open shrubland over *Eremophila forrestii* subsp. *forrestii* scattered low shrubs over *Themeda triandra, Chrysopogon fallax, Paraneurachne muelleri* very open tussock grassland and *Triodia wiseana* very open hummock grassland.
Veg Condition Very Good to Good (**Malvastrum americanum, *Bidens bipinnata*).
Fire Age Very long unburnt.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	30 cm	YEXR04-22	
Abutilon macrum	0.1	30 cm	YEXR04-09	
Abutilon otocarpum	0.1	35 cm		
Acacia aptaneura	20	900 cm	YEXR04-04	
Acacia bivenosa	0.1	300 cm		
Acacia kempeana	0.1	250 cm	YEXR04-05	Sterile.
Acacia pruinocarpa	1	550 cm		
Acacia sericophylla	0.1	280 cm	YEXR04-29	
Acacia sibirica	7	400 cm	YEXR04-03	
Acacia synchronicia	0.1	300 cm	YEXR04-19	
Aristida contorta	0.1	45 cm		
Bidens bipinnata	0.1	15 cm		N=80.
Boerhavia coccinea	0.1	10 cm	YEXR04-14	
Bonamia erecta	0.1	30 cm		
Bulbostylis barbata	0.1	2 cm	YEXR04-23	
Chrysopogon fallax	1	90 cm		
Cleome viscosa	0.1	30 cm		
Corchorus lasiocarpus subsp. *parvus*	0.1	30 cm	YEXR04-33	M Trudgen confirmed.
Corymbia hamersleyana	3	700 cm		
Cymbopogon procerus	0.1	110 cm		
Dactyloctenium radulans	0.1	10 cm		
Dichanthium sericeum subsp. *humilius*	0.1	20 cm	YEXR04-08	
Digitaria brownii	0.1	60 cm		
Digitaria ctenantha	0.1	40 cm		
Duperreya commixta	0.1	120 cm		
Dysphania rhadinostachya	0.1	15 cm		Sterile.
Enneapogon aff. *caerulescens*	0.1	30 cm	YEXR04-12	ID to be confirmed
Enneapogon polyphyllus	0.1	20 cm		
Eragrostis cumingii	0.1	20 cm		
Eremophila forrestii subsp. *forrestii*	1	120 cm		
Eremophila longifolia	0.1	70 cm		
Eriachne tenuiculmis	0.1	30 cm	YEXR08-02=	
Eucalyptus xerothermica	1	550 cm		
Eucalyptus xerothermica	0.1	650 cm	YEXR04-25	
Euphorbia australis var. *hispidula*	0.1	10 cm	YEXR04-35	
Euphorbia drummondii	0.1	10 cm	YEXR04-10	
Evolvulus alsinoides var. *villosicalyx*	0.1	10 cm		
Glycine canescens	0.1	130 cm	YEXR08-20=	
Goodenia microptera	0.1	20 cm		
Heliotropium tanythrix	0.1	10 cm	YEXR04-31	
Hibiscus burtonii	0.1	30 cm		
Hibiscus coatesii	0.1	30 cm	YEXR04-34	
Hibiscus sturtii var. *grandiflorus*	0.1	20 cm	YEXR04-24	

Species	Cover (%)	Height	Specimen	Notes
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		
Hybanthus aurantiacus	0.1	30 cm		
Indigofera monophylla	0.1	60 cm	YEXR04-27	
Iseilema membranaceum	0.1	30 cm	YEXR04-15	
Keraudrenia nephrosperma	0.1	40 cm	YEXR04-32	
Maireana planifolia	0.1	25 cm	YEXR04-11	
Malvastrum americanum	0.1	40 cm		N=8.
Melhania oblongifolia	0.1	40 cm		
Panicum effusum	0.1	40 cm	YEXR04-17	
Paraneurachne muelleri	1	30 cm		
Paspalidium clementii	0.1	10 cm	YEXR04-13	
Perotis rara	0.1	10 cm		
Polycarpaea corymbosa var. *corymbosa*	0.1	15 cm		
Portulaca oleracea/intraterranea	0.1	5 cm	YEXR04-20	
Psydrax latifolia	0.1	160 cm		
Pterocaulon sphacelatum	0.1	40 cm	YEXR04-18	
Ptilotus gaudichaudii subsp. *gaudichaudii*	0.1		YEXR04-02	
Ptilotus nobilis subsp. *nobilis*	0.1	5 cm		
Ptilotus obovatus var. *obovatus*	0.1	60 cm		
Sclerolaena cornishiana	0.1	20 cm	YEXR04-21	
Senna artemisioides subsp. *helmsii*	0.1	140 cm		
Senna glutinosa subsp. *glutinosa*	0.1	30 cm		
Senna glutinosa subsp. *x luerssenii*	0.1	110 cm		
Senna notabilis	0.1	5 cm		
Sida arsiniata	0.1	45 cm	YEXR04-16	
Sida echinocarpa	0.1	40 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	10 cm	YEXR08-25=	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1		YEXR04-01	
Solanum horridum	0.1	20 cm	YEXR04-30	
Solanum lasiophyllum	0.1	30 cm		
Spermacoce brachystema	0.1	7 cm	YEXR04-07	
Sporobolus australasicus	0.1	10 cm		
Themeda triandra	2	80 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	10 cm		
Triodia basedowii	0.1	30 cm	YEXR04-26	
Triodia wiseana	2	30 cm		

Yandi Billiards Level 2 Site YEXR06

Described by SVSW Date 14-Mar-14 Type Resampled quadrat 50 x 50 m

Location 26.3 km SW of Marillana, 76.7 km SE of Auski Roadhouse and 76.2 km NW of Newman.

MGA Zone 50 731993 mE 7474007 mN

Habitat Transitional slope, facing northeast.

Soil Dark reddish brown fine sandy clay loam with 40% cover of pebbles 30% cover of gravel and 20% cover of cobbles.

Rock Type Ironstone.

Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland *Acacia hilliana, A. adoxa* var. *adoxa* low shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland.

Veg Condition Very Good

Fire Age No sign of recent fire.

Notes The power line track running through the quadrat is old enough that it doesn't seem to affect the species assemblage.

Species	Cover (%)	Height	Specimen	Notes
Acacia adoxa var. *adoxa*	1	60 cm		
Acacia adsurgens	0.1	140 cm		
Acacia hilliana	13	50 cm		
Acacia tenuissima	0.1	90 cm		
Acacia tumida var. *pilbarensis*	0.1	120 cm		
Aristida holathera var. *holathera*	0.1	30 cm		
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.1	10 cm		
Eriachne aristidea	0.1	10 cm		
Eriachne mucronata (typical form)	0.1	40 cm		
Eucalyptus leucophloia subsp. *leucophloia*	3	720 cm		
Fimbristylis dichotoma	0.1	20 cm		
Fimbristylis simulans	0.1	15 cm		
Goodenia stobbsiana	0.1	30 cm		
Goodenia triodiophila	0.1	20 cm		
Grevillea wickhamii	0.1	280 cm		
Hakea chordophylla	0.1	250 cm		
Mollugo molluginea	0.1	10 cm		
Polycarpaea holtzei	0.1	1 cm	YEXR06-03	
Ptilotus calostachyus	0.1	15 cm		
Ptilotus rotundifolius	0.1	95 cm		
Senna glutinosa subsp. *glutinosa* x subsp. *pruinosa*	0.1	110 cm		
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	120 cm	YEXR06-02	M Trudgen confirmed.
Senna glutinosa subsp. *pruinosa*	0.1	70 cm		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	45 cm		
Solanum lasiophyllum	0.1	45 cm		
Triodia pungens	0.1	50 cm	YEXR06-01	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	31	40 cm		

Yandi Billiards Level 2 Site YEXR08
Described by CASV Date 15-Mar-14 Type Resampled quadrat 25 x 105 m
Location 25.5 km SW of Marillana, 77 km SE of Auski Roadhouse and 76.1 km NW of Newman.
MGA Zone 50 732719 mE 7474510 mN
Habitat Banks of minor drainage line (<10 m wide) flowing east to Weeli Wolli Creek.
Soil 2.5YR 3/3 dark reddish brown sandy clay loam.
Rock Type Ironstone cobbles (7%), pebbles (2%), and gravel (1%).
Vegetation *Corymbia hamersleyana, Eucalyptus victrix* open woodland over *Eucalyptus xerothermica* scattered low trees over *Eremophila longifolia, Acacia dictyophleba* tall open scrub over **Cenchrus ciliaris, Themeda triandra* closed tussock grassland.
Veg Condition Poor (**Cenchrus ciliaris, *Malvastrum americanum*)
Fire Age No sign of recent fire.

Species	Cover (%)	Height	Specimen	Notes
Abutilon otocarpum	0.1	20 cm		
Acacia ancistrocarpa	0.1	260 cm		
Acacia aptaneura	0.1	420 cm	YEXR08-21	
Acacia bivenosa	0.1	220 cm		
Acacia citrinoviridis	1	500 cm		
Acacia coriacea subsp. *pendens*	0.1	220 cm		
Acacia dictyophleba	15	200 cm		
Acacia pruinocarpa	0.1	220 cm		
Acacia pyrifolia var. *pyrifolia*	0.1	YEXR08-03		
Acacia tumida var. *pilbarensis*	0.1	450 cm		
Alternanthera nana	0.1	10 cm	YEXR08-04	
Ammannia multiflora	0.1	30 cm	YEXR08-28	
Androcalva luteiflora	0.1	180 cm		
Aristida holathera var. *holathera*	0.1	35 cm		
Atalaya hemiglauca	0.1	500 cm		
Bidens bipinnata	0.1	40 cm		N=3.
Boerhavia coccinea	0.1	15 cm		
Boerhavia repleta	0.1	10 cm	YEXR08-17	
Cenchrus ciliaris	60	50 cm		
Centipeda minima subsp. *macrocephala*	0.1	5 cm	YEXR08-11	
Chrysopogon fallax	0.1	120 cm		
Cleome viscosa	0.1	70 cm		
Corymbia candida	0.1	600 cm	YEXR08-06	
Corymbia hamersleyana	4	1200 cm		
Crotalaria medicaginea var. *neglecta*	0.1	30 cm		
Cucumis variabilis	0.1	180 cm		
Cyperus difformis	0.1	40 cm	YEXR08-14	
Digitaria brownii	0.1	70 cm	YEXR08-29	
Duperreya commixta	0.1	250 cm		
Eragrostis cumingii	0.1	20 cm		
Eragrostis eriopoda	0.1	30 cm		
Eragrostis tenellula	0.1	10 cm		
Eremophila longifolia	20	250 cm		
Eriachne tenuiculmis	0.1	40 cm	YEXR08-02	
Eucalyptus victrix	3	1500 cm		
Eucalyptus xerothermica	1	800 cm		
Eulalia aurea	0.1	60 cm		
Euphorbia biconvexa	0.1	35 cm	YEXR08-01	
Evolvulus alsinoides var. *decumbens*	0.1	15 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	15 cm		
Fimbristylis microcarya	0.1	10 cm	YEXR08-12	
Glycine canescens	0.1	100 cm	YEXR08-22	
Glycine canescens	0.1	260 cm	YEXR08-20	
Goodenia microptera	0.1	35 cm		
Goodenia muelleriana	0.1	35 cm	YEXR08-27	
Goodenia stellata	0.1	5 cm	YEXR08-19	
Gossypium australe	0.1	110 cm		

Species	Cover (%)	Height	Specimen	Notes
Gossypium robinsonii	0.1	210 cm		
Hakea lorea subsp. *lorea*	0.1	350 cm		
Hibiscus sturtii var. *platychlamys*	0.1	20 cm		
Indigofera linnaei	0.1	30 cm	YEXR08-15	
Ipomoea muelleri	0.1	1 cm	YEXR08-10	
Ipomoea polymorpha	0.1	15 cm	YEXR08-08	
Iseilema membranaceum	0.1	15 cm	YEXR08-30	
Jasminum didymum subsp. *lineare*	0.1	70 cm		
Malvastrum americanum	0.1	40 cm		N=100.
Mollugo molluginea	0.1	10 cm		
Operculina aequisepala	0.1	100 cm		
Paraneurachne muelleri	0.1	35 cm		
Perotis rara	0.1	20 cm		
Polycarpaea corymbosa var. *corymbosa*	0.1	10 cm		
Polymeria ambigua	0.1	2 cm	YEXR08-26	
Polymeria ambigua	0.1	30 cm	YEXR08-32	
Pterocaulon sphacelatum	0.1	15 cm	YEXR08-05	
Ptilotus astrolasius	0.1	40 cm		
Ptilotus obovatus var. *obovatus*	0.1	70 cm		
Rhynchosia minima	0.1	30 cm		
Salsola australis	0.1	30 cm		
Santalum lanceolatum	0.1	170 cm		
Senna artemisioides subsp. *oligophylla*	0.1	100 cm	YEXR08-13	
Senna artemisioides subsp. *oligophylla*	0.1	140 cm	YEXR08-33	
Setaria surgens	0.1	50 cm	YEXR08-23	
Setaria verticillata	0.1	20 cm		N=6.
Sida fibulifera	0.1	30 cm	YEXR08-07	
Sida arsiniata	0.1	50 cm	YEXR08-31	
Sida fibulifera	0.1	25 cm		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	150 cm	YEXR08-25	
Solanum lasiophyllum	0.1	50 cm		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	50 cm	YEXR08-09	R. Butcher confirmed.
Themeda triandra	25	70 cm		
Trichodesma zeylanicum var. *zeylanicum*	0.1	60 cm		
Triodia pungens	0.1	40 cm	YEXR08-18	
Waltheria indica	0.1	40 cm		

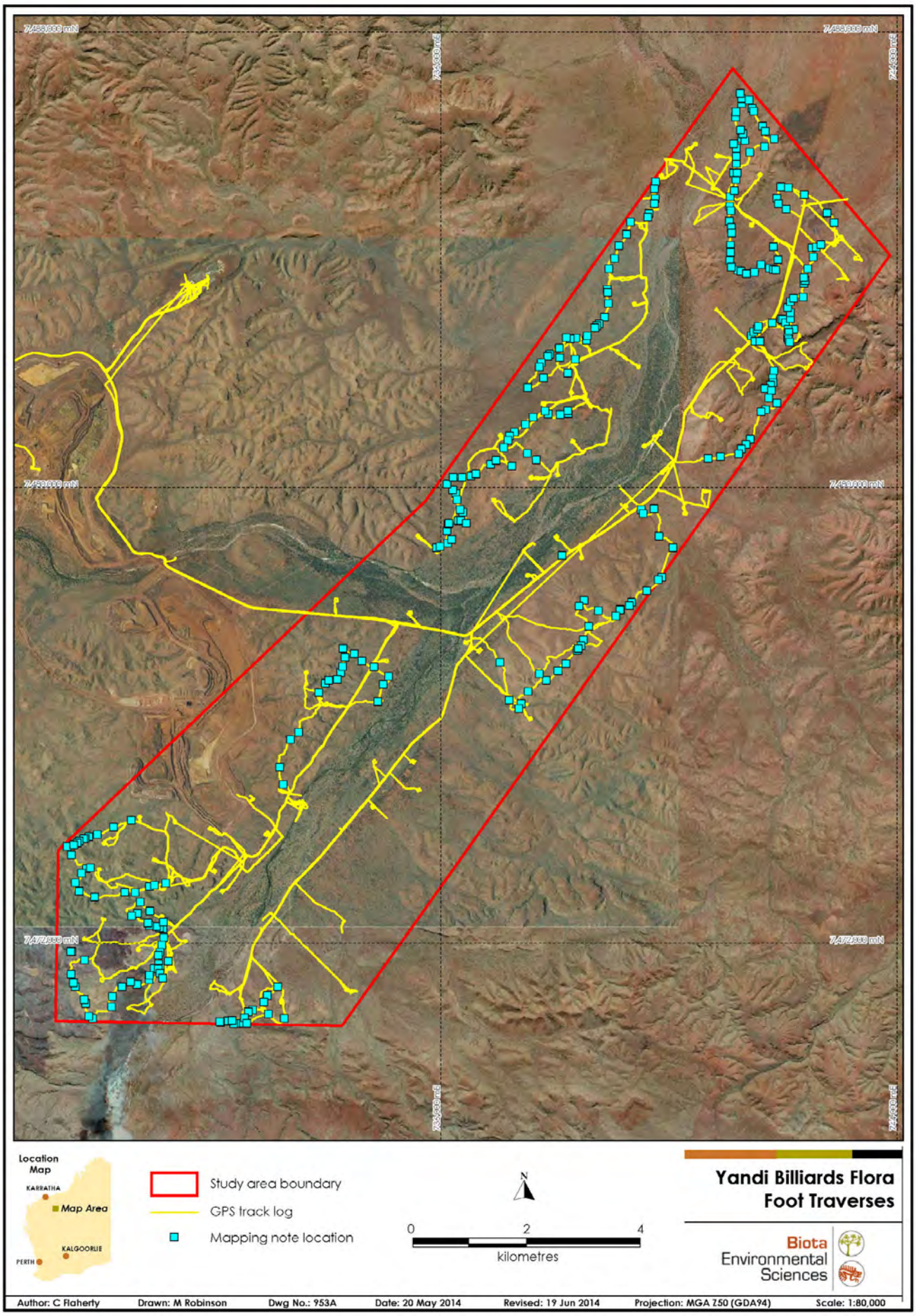
Yandi Billiards Level 2 Site YEXR38
Described by PLSW Date 15-Mar-14 Type Resampled quadrat 50 x 50 m
Location 25.1 km SW of Marillana, 77.7 km SE of Auski Roadhouse and 75.5 km NW of Newman.
MGA Zone 50 733590 mE 7474408 mN
Habitat Floodplain fringing river channel (Weeli Wolli Creek).
Soil Dark reddish brown sandy clay loam.
Rock Type Ironstone.
Vegetation *Corymbia hamersleyana* low open woodland over *Acacia bivenosa* (*A. pruinocarpa, Gossypium robinsonii, A. citrinoviridis*) tall shrubland over *Gossypium sturtianum* var. *sturtianum* scattered shrubs over **Cenchrus ciliaris* tussock grassland.
Veg Condition Good (**Cenchrus* spp., **Malvastrum americanum*, cow disturbance).
Fire Age Very long unburnt.

Species	Cover (%)	Height	Specimen	Notes
Abutilon fraseri	0.1	40 cm		
Abutilon otocarpum	0.1	40 cm		
Acacia bivenosa	8	400 cm		
Acacia citrinoviridis	1	900 cm		
Acacia pruinocarpa	2	300 cm		
Acacia synchronicia	0.1	350 cm		
Acacia tenuissima	0.1	160 cm		
Aerva javanica	0.1	60 cm		N=10.
Androcalva luteiflora	0.1	140 cm		
Aristida holathera var. *holathera*	0.1	30 cm		
Aristida pruinosa	0.1	140 cm	YEXR38-03	
Atalaya hemiglauca	0.1	400 cm		
Boerhavia coccinea	0.1	30 cm		
Bothriochloa ewartiana	0.1	120 cm		
Cenchrus ciliaris	45	80 cm		
Cenchrus setiger	0.1	80 cm		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	50 cm		
Corchorus tridens	0.1	10 cm		
Corymbia hamersleyana	6	800 cm		
Duperreya commixta	0.1	140 cm		
Enneapogon polyphyllus	0.1	30 cm		
Eragrostis eriopoda	0.1	50 cm		
Eulalia aurea	0.1	60 cm		
Euphorbia australis var. *subtomentosa*	0.1	10 cm	YEXR38-01	
Euphorbia biconvexa	0.1	30 cm	YEXR38-02	
Euphorbia tannensis subsp. *eremophila*	0.1	45 cm		
Evolvulus alsinoides var. *decumbens*	0.1	25 cm		
Evolvulus alsinoides var. *villosicalyx*	0.1	20 cm		
Flaveria trinervia	0.1	30 cm		N=2.
Goodenia aff. *muelleriana*	0.1	30 cm	YEXR38-05	ID to be confirmed
Gossypium australe	0.1	160 cm		
Gossypium robinsonii	2	350 cm		
Gossypium sturtianum var. *sturtianum*	1	180 cm	YEXR38-06	
Hakea lorea subsp. *lorea*	0.1	100 cm		
Hibiscus sturtii var. *platychlamys*	0.1	40 cm		
Hybanthus aurantiacus	0.1	40 cm		
Malvastrum americanum	0.1	30 cm		N=23.
Melhania oblongifolia	0.1	40 cm		
Paraneurachne muelleri	0.1	45 cm		
Pluchea ferdinandi-muelleri	0.1	50 cm		
Polymeria ambigua	0.1	25 cm	YEXR38-04	
Pterocaulon sphacelatum	0.1	30 cm		
Ptilotus obovatus var. *obovatus*	0.1	40 cm		
Rhynchosia minima	0.1	35 cm		
Salsola australis	0.1	40 cm		
Senna artemisioides subsp. *oligophylla x* subsp. *helmsii*	0.1	50 cm		

Species	Cover (%)	Height	Specimen	Notes
Sida fibulifera	0.1	35 cm		
Solanum lasiophyllum	0.1	45 cm		
Solanum phlomoides	0.1	50 cm		
Streptoglossa decurrens	0.1	35 cm		
Stylobasium spathulatum	1	300 cm		
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.1	40 cm		
Themeda triandra	0.1	130 cm		
Triodia longiceps	13	100 cm		

Appendix 7

Survey Effort – Foot Traverses and Mapping Note Locations in the Study Area


Location Map
KARRATHA
Map Area
KALGOORLIE
PERTH
Study area boundary
GPS track log
Mapping note location
N
0
2
4
kilometres
Yandi Billiards Flora
Foot Traversers
Biota Environmental Sciences
Author: C Flaherty
Drawn: M Robinson
Dwg No.: 953A
Date: 20 May 2014
Revised: 19 Jun 2014
Projection: MGA Z50 (GDA94)
Scale: 1:80,000

Appendix 8

List of Flora Taxa Recorded in the Study Area

Vascular Flora Taxa

Species (ordered by Family)
Acanthaceae
Dicladanthera forrestii
Dipteracanthus australasicus subsp. *australasicus*
Aizoaceae
Trianthema glossostigma
Trianthema pilosa
Zaleya galericulata subsp. *galericulata*
Amaranthaceae
Achyranthes aspera
**Aerva javanica*
Alternanthera angustifolia
Alternanthera denticulata
Alternanthera nana
Amaranthus cuspidifolius
Amaranthus undulatus
Gomphrena affinis subsp. *pilbarensis*
Gomphrena cunninghamii
Ptilotus aervoides
Ptilotus astrolasius
Ptilotus auriculifolius
Ptilotus calostachyus
Ptilotus clementii
Ptilotus fusiformis
Ptilotus gaudichaudii subsp. *gaudichaudii*
Ptilotus helipteroides
Ptilotus nobilis subsp. *nobilis*
Ptilotus obovatus var. *obovatus*
Ptilotus polystachyus
Ptilotus roei
Ptilotus rotundifolius
Apocynaceae
Rhyncharrhena linearis
Tylophora flexuosa
Araliaceae
Trachymene oleracea subsp. *oleracea*
Asteraceae
**Bidens bipinnata*
Blumea tenella
Calotis plumulifera
Centipeda minima subsp. *macrocephala*
Chrysocephalum apiculatum
Chrysocephalum gilesii
Chrysocephalum pterochaetum
**Flaveria trinervia*
Helichrysum luteoalbum
Ixiochlamys cuneifolia
Peripleura arida
Peripleura hispidula var. *hispidula* (ID to be confirmed)

Species (ordered by Family)

Pluchea dentex
Pluchea dunlopii
Pluchea ferdinandi-muelleri
Pluchea rubelliflora
Pterocaulon sphacelatum
Rhodanthe floribunda
**Sigesbeckia orientalis*
**Sonchus oleraceus*
Streptoglossa bubakii
Streptoglossa decurrens
Streptoglossa odora

Boraginaceae

Heliotropium chrysocarpum
Heliotropium cunninghamii
Heliotropium glabellum (ID to be confirmed)
Heliotropium heteranthum
Heliotropium inexplicitum
Heliotropium pachyphyllum
Heliotropium tanythrix
Heliotropium tenuifolium
Trichodesma zeylanicum var. *zeylanicum*

Brassicaceae

Lepidium catapycnon (Threatened) (recorded by Hamersley Iron (2006) and Biota (2009b); population not relocated in 2014)
Lepidium pedicellosum
Lepidium phlebopetalum
Lepidium pholidogynum
**Sisymbrium orientale*

Campanulaceae

Lobelia arnhemiaca
Wahlenbergia tumidifructa

Capparaceae

Capparis lasiantha
Capparis spinosa var. *nummularia*

Caryophyllaceae

Polycarpaea corymbosa var. *corymbosa*
Polycarpaea holtzei
Polycarpaea longiflora

Chenopodiaceae

Dysphania cristata
Dysphania kalpari
Dysphania melanocarpa forma *melanocarpa*
Dysphania plantaginella
Dysphania rhadinostachya (subsp. not determined)
Dysphania rhadinostachya subsp. *inflata*
Dysphania rhadinostachya subsp. *rhadinostachya*
Dysphania sp. (juvenile; insufficient material to determine species)
Enchylaena tomentosa var. *tomentosa*
Maireana planifolia
Maireana planifolia x *villosa*

Species (ordered by Family)

Maireana villosa
Rhagodia eremaea
Salsola australis
Sclerolaena cornishiana
Sclerolaena eriacantha

Cleomaceae

Cleome viscosa

Convolvulaceae

Bonamia erecta
Bonamia pannosa
Bonamia sp. Dampier (A.A. Mitchell PRP 217)
Convolvulus clementii
Duperreya commixta
Evolvulus alsinoides (sterile; var. not determined)
Evolvulus alsinoides var. *decumbens*
Evolvulus alsinoides var. *villosicalyx*
Ipomoea muelleri
Ipomoea polymorpha
Operculina aequisepala
Polymeria ambigua (variation observed within this species)

Cucurbitaceae

**Cucumis melo* subsp. *agrestis*
Cucumis variabilis

Cyperaceae

Bulbostylis barbata
Bulbostylis turbinata
Cyperus cunninghamii subsp. *cunninghamii*
Cyperus difformis
Cyperus iria
Cyperus ixiocarpus
Cyperus squarrosus
Cyperus vaginatus
Eleocharis atropurpurea
Fimbristylis dichotoma
Fimbristylis microcarya
Fimbristylis simulans
Schoenoplectus subulatus

Euphorbiaceae

Euphorbia australis (specimen lost)
Euphorbia australis var. *australis* (ID to be confirmed)
Euphorbia australis var. *erythrantha* (ID to be confirmed)
Euphorbia australis var. *hispidula*
Euphorbia australis var. *subtomentosa*
Euphorbia biconvexa
Euphorbia biconvexa/coghlanii/trigonosperma (sterile)
Euphorbia boophthona
Euphorbia coghlanii
Euphorbia drummondii
Euphorbia tannensis subsp. *eremophila*

Species (ordered by Family)
Euphorbia trigonosperma
Euphorbia sp. (inadequate material to determine species)
Fabaceae
Acacia adoxa var. *adoxa*
Acacia adsurgens
Acacia ancistrocarpa
Acacia ancistrocarpa x *arida*
Acacia aptaneura
Acacia aptaneura x *ayersiana*
Acacia aptaneura x *incurvaneura*
Acacia aptaneura x *macraneura*
Acacia aptaneura x
Acacia arida
Acacia arida x *hilliana*
Acacia ayersiana
Acacia bivenosa
Acacia bivenosa (wispy/weeping form)
Acacia catenulata
Acacia citrinoviridis
Acacia coriacea subsp. *pendens*
Acacia dictyophleba
Acacia elachantha
Acacia hilliana
Acacia inaequilatera
Acacia kempeana
Acacia maitlandii
Acacia monticola
Acacia pachyacra
Acacia pruinocarpa
Acacia pyrifolia (var. not determined)
Acacia pyrifolia var. *morrisonii*
Acacia pyrifolia var. *pyrifolia*
Acacia sclerosperma subsp. *sclerosperma*
Acacia sclerosperma hybrid
Acacia sericophylla
Acacia sibirica
Acacia spondylophylla
Acacia synchronicia
Acacia tenuissima
Acacia tetragonophylla
Acacia trudgeniana
Acacia tumida var. *pilbarensis*
Alysicarpus muelleri
Crotalaria medicaginea var. *neglecta*
Crotalaria novae-hollandiae subsp. *novae-hollandiae*
Cullen lachnostachys
Cullen leucochaites
Cullen martinii
Glycine canescens

Species (ordered by Family)
Gompholobium oreophilum
Indigofera colutea
Indigofera georgei
Indigofera linifolia
Indigofera linnaei
Indigofera monophylla (more than one form observed)
Indigofera rugosa
Isotropis atropurpurea
Petalostylis cassioides
Petalostylis labicheoides
Rhynchosia minima
Senna artemisioides subsp. x *artemisioides*
Senna artemisioides subsp. *helmsii*
Senna artemisioides subsp. *oligophylla*
Senna artemisioides subsp. *oligophylla* (thinly sericeous form MET 15,035)
Senna artemisioides subsp. *oligophylla* (thinly sericeous form MET 15,035) *x* subsp. *helmsii*
Senna artemisioides subsp. *oligophylla* x *S. glutinosa* subsp. *glutinosa*
Senna artemisioides subsp. *oligophylla* x subsp. *helmsii*
Senna ferraria
Senna glutinosa subsp. *glutinosa*
Senna glutinosa subsp. *glutinosa* x *S. stricta*
Senna glutinosa subsp. *glutinosa* x subsp. *pruinosa*
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*
Senna glutinosa subsp. x *luerssenii*
Senna glutinosa subsp. *pruinosa*
Senna glutinosa subsp. *pruinosa* x subsp. ? *glutinosa*
Senna glutinosa subsp. *pruinosa x*
Senna notabilis
Senna sericea
Senna sp. Meekatharra (E. Bailey 1-26) (ID to be confirmed)
Senna sp. (inadequate material for further identification)
Sesbania cannabina
Swainsona formosa
Swainsona kingii
Swainsona maccullochiana
Tephrosia oxalidea
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)
Tephrosia supina
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)
Tephrosia sp. Fortescue (A.A. Mitchell 606)
Tephrosia sp. Newman (A.A. Mitchell PRP 29)
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)
**Vachellia farnesiana*
Goodeniaceae
Dampiera candicans
Goodenia lamprosperma
Goodenia microptera
Goodenia muelleriana
Goodenia aff. *muelleriana* (ID to be confirmed)

Species (ordered by Family)

Goodenia nuda (Priority 4)
Goodenia prostrata
Goodenia stellata
Goodenia stobbsiana
Goodenia triodiophila
Scaevola amblyanthera var. *centralis*
Scaevola parvifolia subsp. *pilbarae*
Scaevola spinescens

Gyrostemonaceae
Codonocarpus cotinifolius

Haloragaceae
Haloragis gossei (sterile specimen; var. not determined)
Haloragis gossei var. *gossei*

Lamiaceae
Clerodendrum floribundum var. *angustifolium*
Dicrastylis cordifolia

Lauraceae
Cassytha filiformis

Loranthaceae
Amyema hilliana
Diplatia grandibractea

Lythraceae
Ammannia baccifera
Ammannia multiflora

Malvaceae
Abutilon amplum
Abutilon cryptopetalum
Abutilon fraseri
Abutilon lepidum (variation observed within this species)
Abutilon leucopetalum
Abutilon macrum
Abutilon otocarpum
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)
Abutilon sp. Pilbara (W.R. Barker 2025)
Abutilon sp. (inadequate material for further determination)
Androcalva luteiflora
Corchorus crozophorifolius
Corchorus lasiocarpus (subsp. not determined)
Corchorus lasiocarpus subsp. *lasiocarpus*
Corchorus lasiocarpus subsp. *parvus*
Corchorus sidoides (subsp. not determined)
Corchorus sidoides subsp. *sidoides*
Corchorus sidoides subsp. *vermicularis*
Corchorus tectus
Corchorus tridens
Corchorus sp.
Gossypium australe (two forms observed)
Gossypium robinsonii
Gossypium sturtianum var. *sturtianum*

Species (ordered by Family)
Hibiscus brachychlaenus
Hibiscus burtonii
Hibiscus coatesii (variation was observed within this species)
Hibiscus goldsworthii
Hibiscus leptocladus
Hibiscus sturtii (var. not determined)
Hibiscus sturtii var. *campylochlamys*
Hibiscus sturtii var. *grandiflorus*
Hibiscus sturtii var. *platychlamys*
Hibiscus sp. Mt Robinson (G. Byrne 3537)(ID to be confirmed)
Hibiscus sp.
Keraudrenia nephrosperma
Keraudrenia velutina subsp. *elliptica*
**Malvastrum americanum*
Melhania oblongifolia
Sida arenicola
Sida arsiniata
Sida cardiophylla
Sida echinocarpa
Sida ectogama
Sida fibulifera sens lat.(variation observed within this sp.)
Sida platycalyx
Sida sp. Excedentifolia (J.L. Egan 1925)
Sida sp. Pilbara (A.A. Mitchell PRP 1543)
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)
Sida sp. verrucose glands (F.H. Mollemans 2423)
Triumfetta clementii
Triumfetta maconochieana
Waltheria indica
Molluginaceae
Mollugo molluginea
Moraceae
Ficus brachypoda
Myrtaceae
Calytrix carinata
Corymbia aspera
Corymbia candida
Corymbia deserticola subsp. *deserticola*
Corymbia ferriticola
Corymbia hamersleyana
Eucalyptus camaldulensis subsp. *refulgens*
Eucalyptus gamophylla
Eucalyptus leucophloia subsp. *leucophloia*
Eucalyptus victrix
Eucalyptus xerothermica
Melaleuca argentea
Nyctaginaceae
Boerhavia burbidgeana
Boerhavia coccinea

Species (ordered by Family)
Boerhavia gardneri
Boerhavia repleta
Oleaceae
Jasminum didymum subsp. *lineare*
Papaveraceae
**Argemone ochroleuca* subsp. *ochroleuca*
Phyllanthaceae
Notoleptopus decaisnei var. *decaisnei*
Notoleptopus decaisnei var. *orbicularis* (A.B. Craig 428)
Phyllanthus erwinii
Phyllanthus maderaspatensis
Plantaginaceae
Stemodia grossa
Poaceae
Acrachne racemosa
Amphipogon sericeus
Aristida contorta
Aristida holathera var. *holathera*
Aristida hygrometrica
Aristida inaequiglumis
Aristida ingrata
Aristida latifolia
Aristida pruinosa
Aristida sp.
Bothriochloa ewartiana
Brachyachne prostrata
**Cenchrus ciliaris*
**Cenchrus setiger*
Chloris pectinata
Chrysopogon fallax
Cymbopogon ambiguus
Cymbopogon obtectus
Cymbopogon procerus
Cymbopogon sp. (sterile material)
Dactyloctenium radulans
Dichanthium sericeum subsp. *humilius*
Digitaria brownii
Digitaria ctenantha
Enneapogon caerulescens
Enneapogon aff. *caerulescens* (ID to be confirmed)
Enneapogon lindleyanus
Enneapogon polyphyllus
Enneapogon robustissimus
Enteropogon ramosus
Eragrostis cumingii
Eragrostis desertorum
Eragrostis dielsii
Eragrostis elongata
Eragrostis eriopoda

Species (ordered by Family)
Eragrostis falcata
Eragrostis leptocarpa
Eragrostis pergracilis
Eragrostis setifolia
Eragrostis tenellula
Eragrostis xerophila
Eriachne aristidea
Eriachne lanata
Eriachne mucronata (form not determined)
Eriachne mucronata (arid form) (MET 12 736)
Eriachne mucronata (typical form)
Eriachne pulchella
Eriachne tenuiculmis
Eulalia aurea
Eulalia sp. (Three Rivers Station, B.Forsyth AQ6789133)
Iseilema dolichotrichum
Iseilema macratherum
Iseilema membranaceum
Iseilema vaginiflorum
Panicum effusum
Paraneurachne muelleri
Paspalidium basicladum
Paspalidium clementii
Paspalidium rarum
Perotis rara
Schizachyrium fragile
Setaria dielsii
Setaria surgens
**Setaria verticillata*
Sorghum plumosum
Sorghum timorense
Sporobolus australasicus
Themeda triandra
Themeda aff. *triandra* (ID to be confirmed)
Triodia angusta
Triodia basedowii
Triodia epactia
Triodia longiceps
Triodia pungens
Triodia schinzii
Triodia wiseana
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)
Triraphis mollis
Urochloa holosericea subsp. *velutina*
Urochloa occidentalis var. *occidentalis*
Urochloa piligera
Urochloa subquadripara
Yakirra australiensis var. *australiensis*

Species (ordered by Family)
Polygalaceae
Polygala glaucifolia
Polygonaceae
**Acetosa vesicaria*
Portulacaceae
Calandrinia ptychosperma
Calandrinia sp.
Portulaca filifolia
Portulaca intraterranea (ID to be confirmed)
Portulaca oleracea/intraterranea
Portulaca pilosa
Proteaceae
Grevillea pyramidalis subsp. *leucadendron*
Grevillea wickhamii (sterile; subsp. not determined)
Grevillea wickhamii subsp. *aprica*
Grevillea wickhamii subsp. *hispidula*
Hakea chordophylla
Hakea lorea subsp. *lorea*
Pteridaceae
Cheilanthes brownii (ID to be confirmed)
Cheilanthes contigua
Cheilanthes sieberi subsp. *sieberi*
Rubiaceae
Oldenlandia crouchiana
Psydrax latifolia
Psydrax suaveolens
Spermacoce brachystema
Synaptantha tillaeacea var. *tillaeacea*
Santalaceae
Anthobolus leptomerioides
Santalum lanceolatum
Santalum spicatum
Sapindaceae
Atalaya hemiglauca
Dodonaea coriacea
Dodonaea lanceolata var. *lanceolata*
Dodonaea petiolaris
Dodonaea viscosa
Scrophulariaceae
Eremophila forrestii subsp. *forrestii*
Eremophila forrestii x *latrobei*
Eremophila fraseri subsp. *fraseri*
Eremophila jucunda subsp. *pulcherrima*
Eremophila lanceolata
Eremophila latrobei subsp. *filiformis*
Eremophila latrobei subsp. *latrobei*
Eremophila longifolia
Solanaceae
**Datura leichhardtii*

Species (ordered by Family)
Nicotiana benthamiana
Nicotiana occidentalis subsp. *obliqua*
Nicotiana occidentalis subsp. *occidentalis*
Nicotiana rosulata
Nicotiana simulans
Solanum cleistogamum
Solanum elatius
Solanum horridum
Solanum lasiophyllum
**Solanum nigrum*
Solanum phlomoides
Solanum sp.
Surianaceae
Stylobasium spathulatum
Typhaceae
Typha domingensis
Violaceae
Hybanthus aurantiacus
Zygophyllaceae
Tribulopis angustifolia
Tribulus astrocarpus
Tribulus hirsutus
Tribulus macrocarpus
Tribulus platypterus
Tribulus suberosus
**Tribulus terrestris*
Tribulus sp.
Zygophyllum eichleri

Fungi Taxa

Species (ordered by Family)
Agaricaceae
Podaxis pistillaris
Polyporaceae
Pycnoporus coccineus

Biota Environmental Sciences

A Flora and Vegetation Survey of the Billiards Deposit, near Yandi

Prepared for Rio Tinto Iron Ore

December 2009

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A Flora and Vegetation Survey of the Yandi Billiards Deposit

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1.0 Background to the Study

1.1 The Proposed Project

The Yandicoogina (Yandi) iron ore project is located approximately 75 km northwest of Newman, in the Pilbara region of Western Australia (see Figure 1.1). This minesite is owned and operated by Rio Tinto Iron Ore (RTIO).

RTIO plans to develop iron ore resources within the Yandi area, including the Billiards deposit, which lies to the east of existing operations. Botanical survey work at Yandi Billiards commenced in June 2007. Following this survey, the original project footprint was altered and consequently, two additional botanical surveys were conducted in 2008 and 2009.

1.2 Scope and Objectives of this Study

Biota Environmental Sciences (Biota) was commissioned to describe the vegetation and flora values associated with the Yandi Billiard Deposit. The field surveys were planned and implemented as far as practicable according to 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 objectives of the botanical surveys were to:

- describe and map the vegetation types occurring within the study area;
- identify any vegetation types of conservation significance (see Appendix 1) within the study area;
- document the suite of flora species occurring within the study area;
- locate any flora of conservation significance (including Declared Rare Flora (DRF), Priority flora and other flora of interest; see Appendix 1);
- address the Ten Clearing Principles under Schedule 5 of the *Environmental Protection Act 1986*; and
- make recommendations for management of vegetation types and flora of conservation significance within the study area.

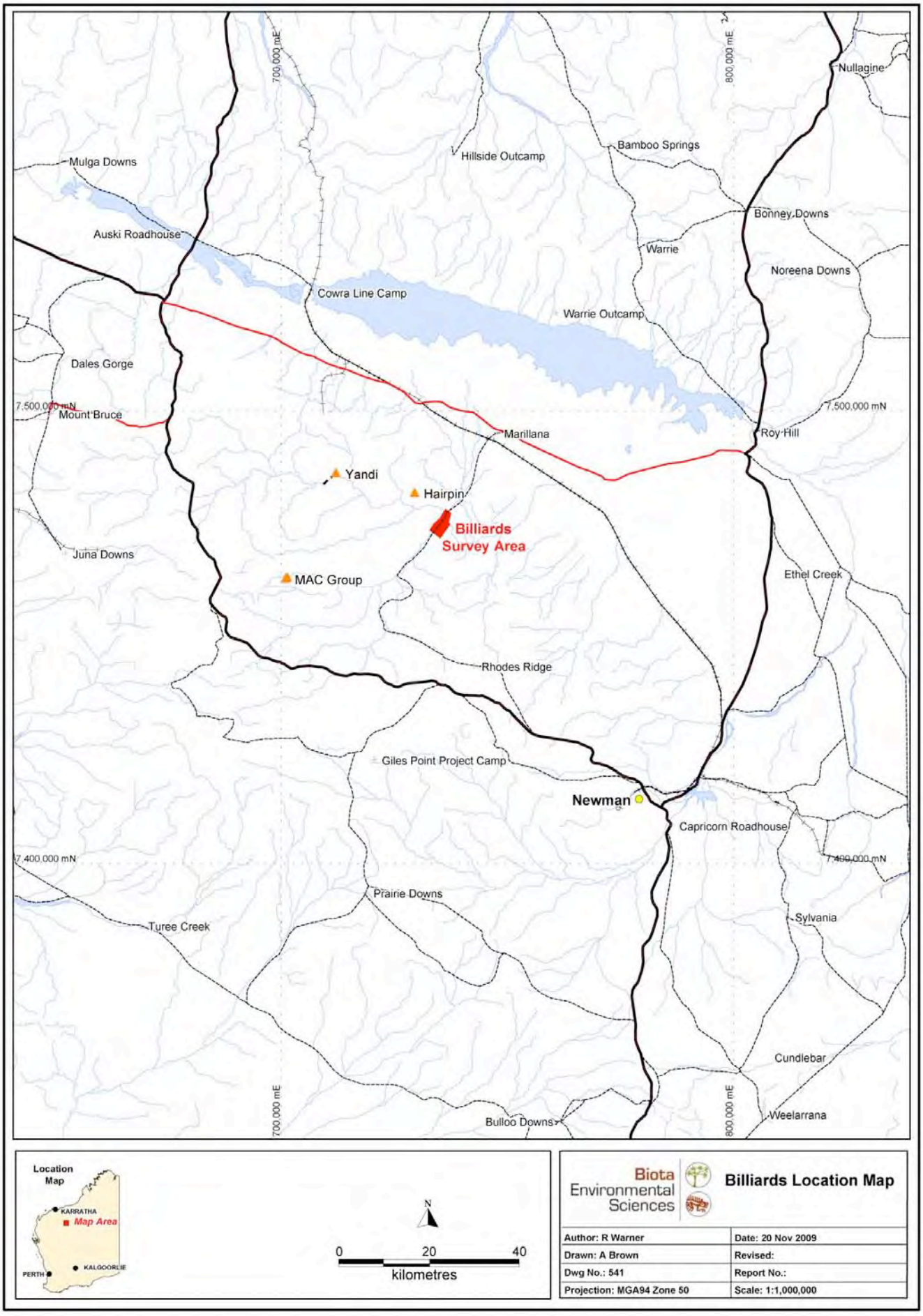

Figure 1.1: Location of the Yandi Billiards study area.

2.0 Methodology

2.1 Database Searches

An online search of the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters database was carried out on the 20th of May 2009, centred on the following coordinate -22°47'38" S; 119°14'07" E, with a 50 km buffer. A NatureMap (Department of Environment and Conservation (DEC) 2007) search was also conducted on the 12th of November 2009 for Priority flora occurring in the vicinity of the study area. The search area was centred on the following coordinate: 22°48'46" S and 119°17'34" E, and included a 20 km buffer.

2.2 Field Surveys

2.2.1 Field Team and Survey Timing

The study area was initially visited between the 11th and 20th of June in 2007 by five botanists from Biota (Rachel Warner, Raimond Orifici, Paul Hoffman, Rachel Butler and Britta Mathews) and a private consultant (Brian Morgan).

Following a change to the original survey area, the study area was re-visited on two occasions for subsequent quadrat establishment and re-sampling. The second survey was conducted between the 27th of July and the 6th of August in 2008 by four botanists (Raimond Orifici, Preeti Chukowry, Jeni Alford and Rachel Butler, of Biota). A final visit was made between the 3rd and 9th of June in 2009 by four botanists (Rachel Warner, Prue Anderson, Preeti Chukowry and Rachel Butler, of Biota).

While the 2007 survey followed substantial rainfall, conditions at the time of the 2008 and 2009 surveys were drier than usual and were not optimal for the collection of annual and cryptic perennial species. The closest official meteorological recording station to the study area is at Newman, approximately 75 km to the southeast of the Billiard study area. Data from this station indicate that there was relatively limited rainfall in the two to three months prior to the 2008/2009 field surveys (Figure 2.1).

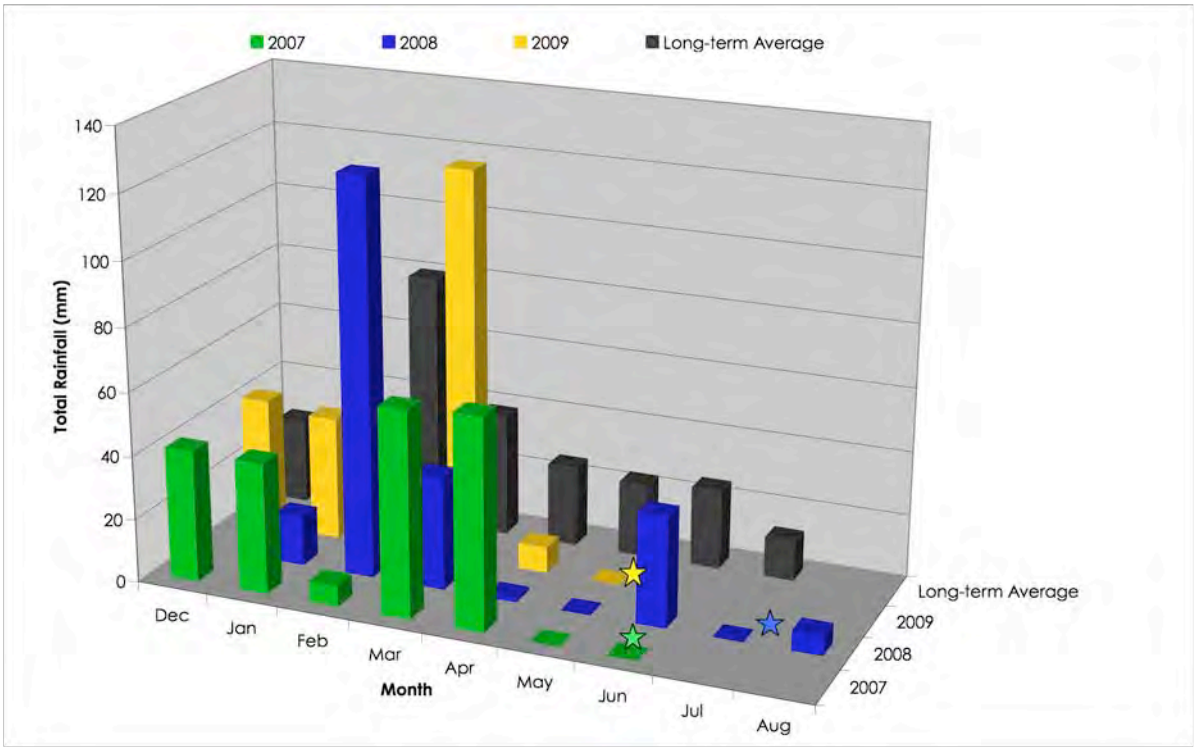

Figure 2.1: Monthly rainfall for the Newman recording station for the months preceding the field surveys (data from the WA Bureau of Meteorology, website http://www.bom.gov.au/ accessed 31st July 2009; stars indicate field survey timing).

2.2.2 Vegetation Description and Mapping

Vegetation descriptions were based on the height and estimated cover of dominant species using Aplin's (1979) modification of the vegetation classification of Specht (1970) to include a hummock grassland category (see Appendix 2). Descriptions were made at each of the floristic survey quadrats (see section 2.2.3). Additional vegetation descriptions were made and vegetation boundaries were ground-truthed during foot traverses through representative areas.

The vegetation descriptions were then grouped to arrive at vegetation units that were defined on the basis of a shared suite of perennial species with a similar range of cover values. These have been listed under the main landform/habitat types in which they were found to occur.

The coding system for the vegetation types incorporated the dominant flora species for the type, organised from tallest strata to lowest strata. Species names were abbreviated to capital letter(s) for the genus, followed by lower case letter(s) for species, with multiple letters used where necessary to avoid confusion (e.g. EvAciAprAThCEc = dominant species *Eucalyptus victrix, Acacia citrinoviridis, A. pruinocarpa, Atalaya hemiglauca* and **Cenchrus ciliaris*[1]).

The vegetation boundaries were subsequently digitised on-screen using the ArcView 3.2 package. The resulting shapefiles were "tagged" to provide each polygon with the vegetation unit code. Other point source datasets, such as locations of quadrats, weeds and priority flora, were generated into spatial data using MapInfo.

These datasets were subsequently saved as separate MapInfo shapefiles. These datasets, in conjunction with other data supplied from other organisations, were used in the production of the vegetation map contained in this report. All maps were produced using the Mapinfo package.

2.2.3 Assessment of Floristic Quadrats

The locations of the original 29 detailed flora-recording quadrats were chosen to represent the main vegetation types occurring within the original Billiard study area. The quadrats were uniquely numbered, from YBI01 to YBI29. During the second survey of the revised project area in 2008, six additional quadrats were established (YBI30S-YBI35S) and YBI11-YBI17, YBI20, YBI22, YBI28 and YBI29 were re-sampled. The final survey area incorporates only quadrats YBI11-YBI17, YBI22, YBI28, relevé[2] YBI-RO-RA and YBI31S-YBI35S.

Quadrats were typically 50 m x 50 m, as this size gives a good sample of flora presence in the Pilbara. It also gives a good indication of the shrub and grass layer vegetation structure for most vegetation types in the Pilbara that occur in 'uniform' habitats (eg. plains and hillslopes, where vegetation stands are typically greater than this quadrat size). Quadrat shape and/or size were adjusted as necessary to fit smaller or oddly shaped habitats (eg. flowlines).

Most quadrats were permanently marked using steel fence droppers at three or four corners of the quadrat. An optical square and measuring tapes were used to ensure that the quadrat sides were correctly positioned.

The following parameters were recorded for each quadrat:

1. Location: AMG coordinates recorded in WGS84 datum (within 1-2 m of GDA94) using a handheld Global Positioning System (GPS), to an accuracy usually within 5 m; readings taken for all four corners of the quadrat;
2. Vegetation Description: Broad description based on the height and estimated cover of dominant species after Aplin's (1979) modification of the vegetation classification system of Specht (1970) (see Appendix 2);
3. Habitat: Description of landform and habitat;

1 * is used in this document to denote introduced species (weeds).

2 A relevé is an unbounded flora survey site.

4. Soil: Broad description of soil type and stony surface mantle;
5. Disturbance Details: Condition ranked according to the scale developed by Trudgen (1988) as shown in Appendix 2, considering evidence of grazing, physical disturbance, weed invasion, frequent fires etc. Note that fire effects are only considered as a negative impact if they are caused by repeated burning (such as that done for pastoral purposes). Fire is a natural and frequent process in the Pilbara to which the vegetation has adapted, and to class areas as being in poor condition simply because they have been recently burnt is misleading; and
6. Percentage Foliar Cover: Cover was estimated visually for each species. Estimates were made to the nearest percent where possible, or a range (eg. 5-10%) was used. '+' was used where only occasional individuals were present, with a cover of less than 1%.

Colour photographs of the vegetation at each site were taken using a digital camera. A summary of quadrat data is provided in Appendix 3.

2.2.4 Rare Flora Searches

The Billiards survey area was not systematically searched for rare flora. Instead, representative foot traverses were walked over the majority of the area to search for rare species and to indicate the level of weed presence.

Any locations of rare flora were recorded using a GPS (WGS84 datum), together with an indication of the number of individuals present, the habitat and associated plant species. Voucher specimens were collected and will be lodged with the Western Australian Herbarium. Rare Flora Report Forms will be lodged with the DEC.

Native flora species were also recorded during foot traverses, and these records contribute to the species list for the area.

All records of rare flora and weeds are displayed on the vegetation mapping in Figure 4.1.

2.3 Specimen Identification, Nomenclature and Data Entry

Common species that were well known to the survey botanists were identified in the field. Voucher specimens of all other species were collected and assigned a unique number to facilitate tracking of data. These were pressed in the field, and dried upon returning to Perth.

These vouchers were then identified by keying out, reference to appropriate publications, use of reference collections and comparison to the collections held at the Western Australian Herbarium. Most specimens were identified by botanists from Biota, with assistance from Malcolm Trudgen (M.E. Trudgen and Associates) for difficult plant groups. Specimens will be lodged with the Western Australian Herbarium for all taxa where a gap in collecting records is identified and for which suitable material is available.

Nomenclature was checked against the current listing of scientific names recognised by the Western Australian Herbarium and updated as necessary. The only outdated nomenclature retained was that relating to *Cassia*. This genus is currently recognised as *Senna* (see Randell 1989), however the older *Cassia* classification (Symon 1966) was perceived to be a more realistic level of separation of the taxa (e.g. with taxa such as '*glutinosa*' and '*pruinosa*' recognised at specific rather than subspecific level). A more detailed discussion is contained in Trudgen and Casson (1998), while a comparison of the nomenclature under the two classifications is presented in Appendix 4.

2.4 Limitations of this Study

A number of limitations of the field survey and subsequent conservation assessments are discussed below. These are factors that must be considered when reviewing and applying the results of this study. Despite these limitations, the field study and the subsequent analyses are believed to give a reasonable representation of the flora and vegetation values of the Billiards survey area.

The main limitations of this study are as follows:

- Fungi and nonvascular flora (eg. algae, mosses and liverworts) were not specifically sampled, as is typical for surveys of this nature.
- Survey conditions during the 2008 and 2009 surveys were dry, with lower than average rainfall in the months prior to the field trips. Conditions were therefore not optimal for the collection of ephemeral flora or cryptic perennial species.
- The entire survey area was not systematically searched for flora, including rare species. The species list should therefore be taken as indicative rather than exhaustive.
- No floristic analysis has been conducted using the data from the quadrats established for this study.

3.0 Existing Environment

3.1 IBRA Bioregion and Subregion

3.1.1 Pilbara Bioregion

The Interim Biogeographic Regionalisation for Australia (IBRA) recognises 85 bioregions (Environment Australia 2000). The Billiards study area lies within the Pilbara bioregion.

With increasing survey work, it is becoming apparent that the Pilbara is a major centre of biodiversity in Western Australia. This appears to be related to the region's diversity of geological, altitudinal and climatic elements, as well as its location. The Pilbara is a transitional zone between the floras of the Eyrean (central desert) and southern Torresian (tropical) bioclimatic regions, and contains elements of both floras (see for example van Leeuwen and Bromilow (2002) for a detailed discussion of the significance of the Hamersley Range). Similarly, the Pilbara is also a transitional zone for fauna. In 2003, in recognition of the high species diversity and high levels of endemism in the region, the Pilbara was nominated as one of 15 national biodiversity "hotspots" by the Minister for the Environment and Heritage (go to http://www.environment.gov.au/biodiversity/hotspots/national-hotspots.html#14).

3.1.2 Hamersley Subregion

The Pilbara bioregion is divided into four subregions, described in Environment Australia (2000) as the four major components of the Pilbara Craton:

- Chichester (PIL1): Archaean granite and basalt plains supporting shrub steppes *of Acacia pyrifolia* over *Triodia pungens* hummock grasses, with Snappy Gum steppes occurring on the ranges;
- Fortescue Plains (PIL2): alluvial plains and river frontages with salt marsh, Mulga-bunch grass and short grass communities on alluvial plains and River Gum (*Eucalyptus camaldulensis*) woodlands fringing drainage lines;
- Hamersley (PIL3): mountainous area of Proterozoic ranges and plateaux with low Mulga (*Acacia aneura*) woodland over bunch grasses on fine textured soils, and Snappy Gum (*Eucalyptus leucophloia*) over *Triodia brizoides* on the skeletal sandy soils of the ranges; and
- Roebourne Plains (PIL4): quaternary alluvial plains with a grass savanna and shrub steppe of *Acacia translucens* over *Triodia pungens* and marine alluvial flats with samphire, Sporobolus and Mangal.

The study area is located towards the centre of the Hamersley subregion (see Kendrick 2001).

3.2 Conservation Reserves in the Locality

The main conservation reserve in the locality is Karijini National Park, some 100 km to the west-northwest of the Billiards survey area.

The Pilbara bioregion is listed as a medium priority for funding for land purchased under the National Reserves System Co-operative Program due to the limited representation of the area in conservation reserves. Portions of various pastoral leases in the region have been nominated for exclusion for public purposes in 2015, when the leases come up for renewal. Many of the submissions are from the DEC, with the intention of adding these areas to the existing conservation estate in order to provide a comprehensive, adequate and representative reserve system. None of these proposed exclusions are located in the vicinity of the Billiards survey area.

3.3 Land Systems

Land system mapping covering the expansion area under review has been prepared by the Western Australian Department of Agriculture (van Vreeswyk et al. 2004). These are broad units that each consist of a series of "land units" that occur on characteristic physiographic types within the land system. One hundred and seven (107) land systems occur in the Pilbara bioregion.[3]

The Billiards deposit contains four Land Systems (Table 3.1, Figure 4.1).

Table 3.1: Extent of Land Systems within the Billiard study area and the percentage this represents of their total extent in the Pilbara bioregion (source: van Vreeswyk et al. 2004; Payne et al. 1988).

Land System	Total Area in the Pilbara bioregion (Rank)	Area of Land System within the Study Area	
		Hectares	% of total in Pilbara bioregion
Boolgeeda	961, 635 ha (103)	587.9	0.06
McKay	426, 142 (99)	29.0	0.007
Newman	1, 993, 742 ha (106)	390.8	0.02
River	482, 176 (101)	506.7	0.11

Each of the land systems is briefly described in the following sections.

3.3.1 Boolgeeda

The Boolgeeda land system is characterised by stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands. Component landform units comprise:

- Low hills and rises;
- Stony slopes and upper plains;
- Stony lower plains;
- Groves; and
- Narrow drainage floors and channels (van Vreeswyk et al. 2004).

Within the Billiards study area, the Boolgeeda land system occurs centrally, extending towards the southwest boundary. All but the groves and stony slopes and upper plains landform units occur within the study area.

3.3.2 McKay

The McKay land system is characterised by hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands. Component landform units comprise:

- Hills, ridges and plateaux remnants;
- Breakaways;
- Lower footslopes;
- Stony Plains; and
- Drainage Floors

[3] This information was obtained by merging the Ashburton Land System mapping (Payne et al. 1988) and Pilbara Land System mapping (van Vreeswyk et al. 2004) and intersecting this with the Pilbara bioregion (Environment Australia 2000) in ArcView 3.2.

A small section of this land system occurs along the northwestern boundary of the study area. Two of these landform units occur within the Billiards study area: hills, ridges and plateaux remnants, and lower footslopes.

3.3.3 Newman

The Newman land system is characterised by rugged jaspilite plateaux and ridges and mountains supporting hard spinifex grasslands. Component landform units comprise:

- Plateaux, ridges, mountains and hills;
- Lower slopes;
- Stony plains; and
- Narrow drainage floors with channels.

The Newman land system dominates the range of hills along the eastern boundary of the Billiards study area. All of the component landform units occur within the Billiards area.

3.3.4 River

The River land system is characterised by active floodplains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands. Component landform units comprise:

- Sandy levees and sand sheets;
- Upper terraces;
- Floodplains and lower terraces;
- Stony plains; and
- Minor and major channels.

The River land system extends along the western boundary of the study area and contains two of the component landform units: minor and major channels, and floodplains. Marillana Creek is the main feature of this landsystem, with a minor section of Weeli Wolli Creek in the north of the study area.

3.4 Beard's Vegetation Mapping

Beard (1975) mapped the vegetation of the Pilbara at a scale of 1:1,000,000. The Billiards study area lies entirely within the Fortescue Botanical District of the Eremaean Botanical Province as defined by Beard. The vegetation of this province is typically open, and frequently dominated by spinifex, wattles and occasional eucalypts.

The study area intersects two of Beard's mapping units:

- Hamersley 82: Snappy Gum (*Eucalyptus leucophloia* subsp. *leucophloia*) scattered low trees over *Triodia wiseana* hummock grassland. This unit occurs along the eastern boundary of the study area, coinciding with the Newman land system (see Section 3.3.3). It is listed as a Low Priority for reservation (Kendrick 2001); and
- Fortescue Valley 29: sparse low Mulga (*Acacia aneura*) woodland. This unit occurs along the western and southern boundaries of the study area, overlying the Boolgeeda, McKay and River land systems (see Section 3.3.1, 3.3.2 and 3.3.4). It is listed as a Moderate Priority for reservation (Kendrick 2001).

Given the broad nature of Beard's mapping, these two units are only broadly applicable to the vegetation occurring within the study area (see Section 4.0).

3.5 Threatened and Priority Ecological Communities

Vegetation communities of the highest conservation concern are listed as Threatened Ecological Communities (TECs) by the Western Australian DEC. While some TECs for WA are also listed under the Commonwealth *EPBC Act 1999*, this does not apply to any currently described from the Pilbara bioregion. Other communities of conservation significance are listed as Priority Ecological Communities (PECs). While these communities do not have any legislative protection, it is best practice environmental management to avoid disturbance to these areas. The framework by which the DEC assigns levels of conservation significance to communities is provided in Appendix 1.

No vegetation communities listed by the DEC as TECs or PECs occur in the Billiards study area.

3.6 Flora of Conservation Significance in the Locality

3.6.1 Legislative and Administrative Levels of Flora Protection

While all native flora are protected under the Western Australian *Wildlife Conservation Act 1950-1979*, a number of plant species are assigned an additional level of conservation significance based on the limited number of known populations and the perceived threats to these populations. Species of the highest conservation concern are listed as DRF under the State listing prepared by the DEC (Atkins 2008). The two DRF currently in the Pilbara are also listed as threatened species under the Commonwealth *EPBC Act 1999*. Species that appear to be rare or threatened, but for which there is insufficient information to properly evaluate their conservation significance, are assigned to one of four Priority flora categories by DEC (see Atkins 2008). This is an administrative (rather than legislated) level of protection. The framework for ranking flora species of conservation significance is presented in Appendix 1.

3.6.2 Threatened Flora in the Locality

3.6.2.1 Declared Rare Flora

There are currently only two DRF in the Pilbara: Mountain Thryptomene (*Thryptomene wittweri*) and Hamersley Lepidium (*Lepidium catapycnon*). Both of these species are also listed as Threatened Flora Species under the *EPBC Act 1999*.

Mountain Thryptomene (*Thryptomene wittweri*) is only known from high-altitude mountaintops in the inland Pilbara, its distribution extending south into the Gascoyne and Little Sandy Desert bioregions. As there is no suitable habitat for *T. wittweri* in the Billiards survey area, this species would not be expected to occur.

Hamersley Lepidium (*Lepidium catapycnon*) is now known from a number of locations in the Hamersley Range, extending broadly from Tom Price across to Newman. *L. catapycnon* occurs in hummock grasslands on low stony hills and occasionally stony plains. This relatively short-lived low shrub species is often recorded from areas that have recently been disturbed, apparently persisting for only a few years. Hamersley Lepidium is known from the Yandi locality: it was recorded from the Oxbow deposit, some 12 km to the northwest of the Billiards survey area (Biota, in prep. a). Whilst there is suitable habitat for *L. catapycnon* in the Billiards survey area, extensive searches of the area have not located this species to date.

3.6.2.2 Priority Flora Known from the Locality

On the basis of the database searches (see Section 2.1), five Priority flora species have been previously recorded in the Billiards locality. Each species is described below:

- *Goodenia* sp. East Pilbara (A.A Mitchell PRP 727) Priority 1
  This small, annual herb has a basal rosette of leaves, yellow flowers and an indumentum of appressed sparse hairs. It occurs on red-brown clayey soil and calcrete areas on low, undulating or swampy plains.

- *Stylidium weeliwolli* Priority 2
  This slender, annual herb grows to 25 cm high and has pink or red flowers with four rod-shaped throat appendages. It has spathulate or lanceolate leaves that form a basal rosette and branched inflorescences. It occurs on sand and sandy clay on the edge of watercourses.
- *Fimbristylis sieberiana* Priority 3
  This rhizomatous, tufted, perennial sedge grows to 80 cm high, has a woody, creeping rhizome and stiff, flat leaves up to 35 cm long and 1.5 to 2 mm wide. It has brown flowers and the nut is borne on a distinct stalk. It occurs in muddy habitats on pool edges or skeletal soils on sandstone cliffs.
- *Goodenia nuda* Priority 3
  This slender, erect to ascending herb grows to 50 cm high with narrow, pale green to glaucous leaves. Basal leaves are entire or narrowly toothed, 4 to 10 cm long and 5 to 10 mm wide. It has yellow flowers, 14 to 16 mm long, and is found growing near creeklines and wet areas.
- *Tephrosia bidwillii* Priority 3
  This slender-leaved shrub grows up to 90 cm high and has leaves 8 to 14 cm long, with 7 to 11 narrowly elliptic to narrowly lanceolate leaflets. Leaves have an acute apex, glabrous upper surface and lower surface with appressed hairs. It has orange flowers and hairy linear pods, 3 to 5 cm long, which are sometimes compressed. It has previously been recorded on coastal plains, floodplains and gently undulating plains from the Pilbara, Carnarvon and Great Sandy Desert bioregions, extending into the Kimberley.

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4.0 Vegetation

4.1 Description of Vegetation Sub-Associations

Eight vegetation units are described individually below, grouped under the main landform categories present within the Billiards survey area. These units were described at the sub-association level, as defined under the National Vegetation Information System framework[4]. A summary of the area of extent of the vegetation sub-associations is presented in Table 4.1, while the distribution of the units is indicated on Figure 4.1.

4.1.1 Vegetation of Rocky Hill Slopes and Crests

ElGwAhiTsps *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Grevillea wickhamii* subsp. *hispidula* tall open shrubland over *Acacia hilliana* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland

This vegetation unit occupied 214.8 ha, occurring on the hills in the southeast and west of the survey area (Plate 4.1). Associated species included *Acacia adoxa* subsp. *adoxa*, *A. arida*, *A. bivenosa*, *A. spondylophylla*, *A. tenuissima*, *Cassia glutinosa*, *C. pruinosa*, *Fimbristylis dichotoma*, *Gompholobium* sp. Pilbara (N.F. Norris 908), *Goodenia stobbsiana*, *G. triodiophila*, *Petalostylis cassioides*, *Ptilotus calostachyus*, *P. rotundifolius*, *Schizachyrium fragile*, *Solanum lasiophyllum*, *Tribulus suberosus* and *Triodia wiseana*. The vegetation condition was rated as Excellent. Quadrat YBI33S.

Plate 4.1: Vegetation unit ElGwAhiTsps.

4.1.2 Vegetation of Moderate and Major Creeklines

EcEvMaCYPv *Eucalyptus camaldulensis*, *E. victrix* low open woodland over *Melaleuca argentea* tall open shrubland over *Cyperus vaginatus* low open shrubland

This vegetation occurs in the broad flat bed of Weeli Wolli Creek (Plate 4.2), and was extensively evaluated when the Billiard survey area originally extended further north. The current survey boundary contains only a small area of this unit (2.1 ha) in the north. Associated species included *Acacia citrinoviridis, Amaranthus undulatus, Ammannia baccifera, *Argemone ochroleuca* subsp. *ochroleuca, Atalaya hemiglauca, *Cenchrus ciliaris, Centipeda minima, Cleome viscosa, Corchorus crozophorifolius, Cymbopogon procerus, Dysphania plantaginella, Eragrostis tenellula, Heliotropium cunninghamii, Ipomoea muelleri, Lobelia quadrangularis, Phyllanthus maderaspatensis, Pluchea rubelliflora, Rhynchosia minima, Sesbania cannabina, *Setaria*

4 http://www.environment.gov.au/erin/nvis/publications/avam/section-2-1.html#hierarchy

verticillata, Sonchus oleraceus, Sorghum plumosum, Stemodia grossa, Streptoglossa decurrens, Tephrosia rosea var. *glabrior* and *Typha domingensis*. Quadrat YBI30S.

Plate 4.2: Vegetation unit EcEvMaCYPv.

EvAciAprAThCEc *Eucalyptus victrix* open woodland over *Acacia citrinoviridis, A. pruinocarpa, Atalaya hemiglauca* low woodland over **Cenchrus ciliaris* tussock grassland

This vegetation occurred in the broad creek (Marillana Creek) along the western boundary of the survey area and occupied 240.7 ha. Associated species included *Abutilon dioicum*, *Acacia coriacea* subsp. *pendens*, *Bonamia rosea*, **Cenchrus setiger*, *Cleome viscosa*, *Corchorus crozophorifolius*, *Euphorbia* sp. (site 1089), *Gossypium australe, G. robinsonii*, *Hybanthus aurantiacus*, *Phyllanthus maderaspatensis*, *Pluchea rubelliflora, Rhynchosia minima*, *Tephrosia rosea* var. *glabrior*, *Triodia epactia*, *T. longiceps* and *Waltheria indica*. The condition of this vegetation was rated as Very Good, due to the presence of some weeds.

ChApyGwTp *Corymbia hamersleyana* low open woodland over *Acacia pyrifolia, Grevillea wickhamii* tall shrubland over *Triodia pungens* open hummock grassland

This drainage area occupied 19.1 ha and extended in a northwesterly direction from between two hills in the east to meet with Marillana Creek (Plate 4.3). Associated species included *Acacia bivenosa, A. pachyacra, A. pruinocarpa, A. tumida* var. *pilbarensis, Bonamia rosea, Cassia oligophylla* x *helmsii, Crotalaria medicaginea, Duperreya commixta, Eragrostis eriopoda, Eucalyptus gamophylla, Euphorbia tannensis* subsp. *eremophila, Evolvulus alsinoides* var. *villosicalyx, Goodenia microptera, Gossypium robinsonii, Hibiscus sturtii* var. *platychlamys, Indigofera georgei, Jasminum didymum* subsp. *lineare, Paspalidium basicladium, Petalostylis cassioides, Ptilotus astrolasius* var. *astrolasius, Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90), *Solanum lasiophyllum, Trichodesma zeylanicum* var. *zeylanicum* and *Triodia brizoides*. The condition of this vegetation was rated as Excellent. Quadrat YBI35S.

Plate 4.3: Vegetation unit ChApyGwTp.

4.1.3 Vegetation of Plains

EgAbAaTb *Eucalyptus gamophylla* low open woodland over *Acacia bivenosa, A. ancistrocarpa* tall open shrubland over *Triodia basedowii* hummock grassland

This broad, plain vegetation unit occupied 139.9 ha below the eastern range of hills (Plate 4.4). Associated species included *Acacia pachyacra, A. pruinocarpa, A. pyrifolia, A. sibirica, Amphipogon caricinus, Aristida contorta, A. holathera* var. *holathera, Bonamia rosea, Cassia glutinosa, C. helmsii, C. luerssenii, C. oligophylla* x *helmsii, Codonocarpus cotinifolius, Corymbia hamersleyana, Digitaria brownii, Duperreya commixta, Eremophila forrestii* subsp. *forestii, Euphorbia biconvexa, Glycine canescens*, *Indigofera monophylla* (brown calyx form), *Keraudrenia velutina* subsp. *elliptica*, *Paraneurachne muelleri*, *Ptilotus astrolasius* var. *astrolasius*, *P. calostachyus*, *Petalostylis cassioides*, *Solanum lasiophyllum*, *S. sturtianum*, *Triodia pungens*, *T.* sp. Shovelanna Hill (S. van Leeuwen 3835) and *T. wiseana*. Quadrat YBI16.

AprAciAiAsclTlo *Acacia pruinocarpa* low open woodland over *A. citrinoviridis*, *A. inaequilatera*, *A. sclerosperma* open shrubland over *Triodia longiceps* hummock grassland

This vegetation unit occurred on the floodplains east of Marillana Creek and covered 812.0 ha (Plate 4.5). Associated species included *Acacia aneura* (various forms), *A. bivenosa*, *A. coriacea* subsp. *pendens, A. tenuissima, Aristida holathera* var. *holathera, Cassia helmsii, Cassia oligophylla, *Cenchrus ciliaris, Corymbia hamersleyana, Enneapogon caerulescens, Eragrostis eriopoda, Eremophila jucunda* subsp. *pulcherrima, Evolvulus alsinoides* var. *villosicalyx, Glycine canescens*, *Hakea lorea* subsp. *lorea*, *Heliotropium inexplicitum*, *Polymeria ambigua*, *Ptilotus obovatus* var. *obovatus*, *Rhagodia eremaea*, *Sclerolaena cornishiana*, *Sida* aff. *fibulifera* (oblong; MET 15 220), *Stylobasium spathulatum*, *Themeda triandra, Trichodesma zeylanicum* var. *zeylanicum* and *Triodia basedowii*. Quadrats YBI11 and YBI17.

Plate 4.4: Vegetation unit EgEbAaTb.

Plate 4.5: Vegetation unit AprAciAiAsclTlo.

AanCcHlG *Acacia aneura* var. *aneura*, *Corymbia candida* low open forest over *Hakea lorea* subsp. *lorea* tall open shrubland over mixed species scattered grassland

This vegetation unit occupied 20.4 ha in the northeastern section of the survey area on a clay substrate (Plate 4.6). The vegetation condition was rated as Good to Very Good, due to the presence of some weed species, evidence of cattle and some disturbance from the drilling program. Associated species included *Abutilon lepidum, A. macrum, Acacia citrinoviridis, A. pruinocarpa, Alternanthera nana, Aristida contorta, Atalaya hemiglauca, *Bidens bipinnata, Cassia helmsii, C. oligophylla* x *helmsii, *Cenchrus ciliaris, *C. setiger, Chrysopogon fallax, Corymbia hamersleyana, Digitaria ctenantha, Enneapogon polyphyllus, Eragrostis eriopoda, Eremophila lanceolata E. longifolia, Eriachne mucronata* (typical form), *Evolvulus alsinoides* var. *villosicalyx, Glycine canescens, Goodenia triodiophila, Hibiscus sturtii* var. *campylochlamys, *Malvastrum americanum, Maireana planifolia, Melhania* sp. (CH15-39), **Portulaca oleracea, P. pilosa, Ptilotus helipteroides, Ptilotus obovatus* var. *obovatus, Sclerolaena cornishiana, *Setaria verticillata, Sida* aff. *fibulifera* (oblong; MET 15 220), *Triodia epactia* and *T. longiceps*. Quadrat YBI15.

AanCAhERfoG *Acacia* aff. *aneura* (narrow fine veined; site 1259) low open forest over *Cassia helmsii, Eremophila forrestii* subsp. *forrestii* low open shrubland over mixed species open grassland

This vegetation unit occupied 54.1 ha and extended along a band of clayey soil, between the creek vegetation to the northwest and the foothills to the east (Plate 4.7). The condition of this vegetation was rated as Very Good. Associated species included *Abutilon* aff. *lepidum* (1) (MET 15 352), *A. macrum, Acacia coriacea* subsp. *pendens*, *A. pruinocarpa, Alternanthera nana, Aristida contorta, A. holathera* var. *holathera*, *A. inaequiglumis*, **Bidens bipinnata*, *Calandrinia ptychosperma, *Cenchrus ciliaris, Chrysopogon fallax, Cleome viscosa, Convolvulus angustissimus, Cucumis maderaspatanus, Cymbopogon ambiguus, Dichanthium sericeum* subsp. *humilius, Digitaria ctenantha, Duperreya commixta, Enchylaena tomentosa* var. *tomentosa, Dysphania rhadinostachya, Enneapogon lindleyanus, E. polyphyllus, Eremophila lanceolata, E. longifolia, Evolvulus alsinoides* var. *villosicalyx, Gossypium australe* (Burrup Peninsula form), *Hybanthus aurantiacus*, **Malvastrum americanum, Melhania oblongifolia, Nicotiana occidentalis* subsp. *occidentalis*, *Pluchea ferdinandi-muelleri, Psydrax latifolia, Pterocaulon sphacelatum, Ptilotus astrolasius, P. gaudichaudii* var. *gaudichaudii, P. helipteroides*, *P. obovatus, Sida* sp. verrucose glands (F.H. Mollemans 2423,) *Solanum lasiophyllum, S. sturtianum, *Vachellia farnesiana* and *Waltheria indica*. Quadrat YBI12.

Plate 4.6: Vegetation unit AanCcHlG.

Plate 4.7: Vegetation unit AanCAhERfoG.

Table 4.1: Summary of vegetation units and their area of extent within the Billiards study area.

Code	Description	Area (ha)
Vegetation of Rocky Hill Slopes and Crests		
ElGwAhiTsps	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Grevillea wickhamii* subsp. *hispidula* tall open shrubland over *Acacia hilliana* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland	214.8
Vegetation of Moderate and Major Creeklines		
EcEvMaCYPv	*Eucalyptus camaldulensis, E. victrix* low open woodland over *Melaleuca argentea* tall open shrubland over *Cyperus vaginatus* low open shrubland	2.1
EvAciAprAThCEc	*Eucalyptus victrix* open woodland over *Acacia citrinoviridis, A. pruinocarpa, Atalaya hemiglauca* low woodland over **Cenchrus ciliaris* tussock grassland	240.7
ChApyGwTp	*Corymbia hamersleyana* low open woodland over *Acacia pyrifolia, Grevillea wickhamii* subsp. *hispidula* tall shrubland over *Triodia pungens* open hummock grassland	19.1
Vegetation of Plains		
EgAbAaTb	*Eucalyptus gamophylla* low open woodland over *Acacia bivenosa, A. ancistrocarpa* tall open shrubland over *Triodia basedowii* hummock grassland	139.9
AprAciAiAsclTlo	*Acacia pruinocarpa* low open woodland over *A. citrinoviridis*, *A. inaequilatera, A. sclerosperma* open shrubland over *Triodia longiceps* hummock grassland	812.0
AanCcHlG	*Acacia aneura* var. *aneura*, *Corymbia candida* low open forest over *Hakea lorea* subsp. *lorea* tall open shrubland over a scattered grassland of mixed species	20.4
AanCAhERfoG	*Acacia* aff. *aneura* (narrow fine veined; site 1259) low open forest over *Cassia helmsii, Eremophila forrestii* subsp. *forrestii* low open shrubland over an open grassland of mixed species	54.1
	Total	1503.1

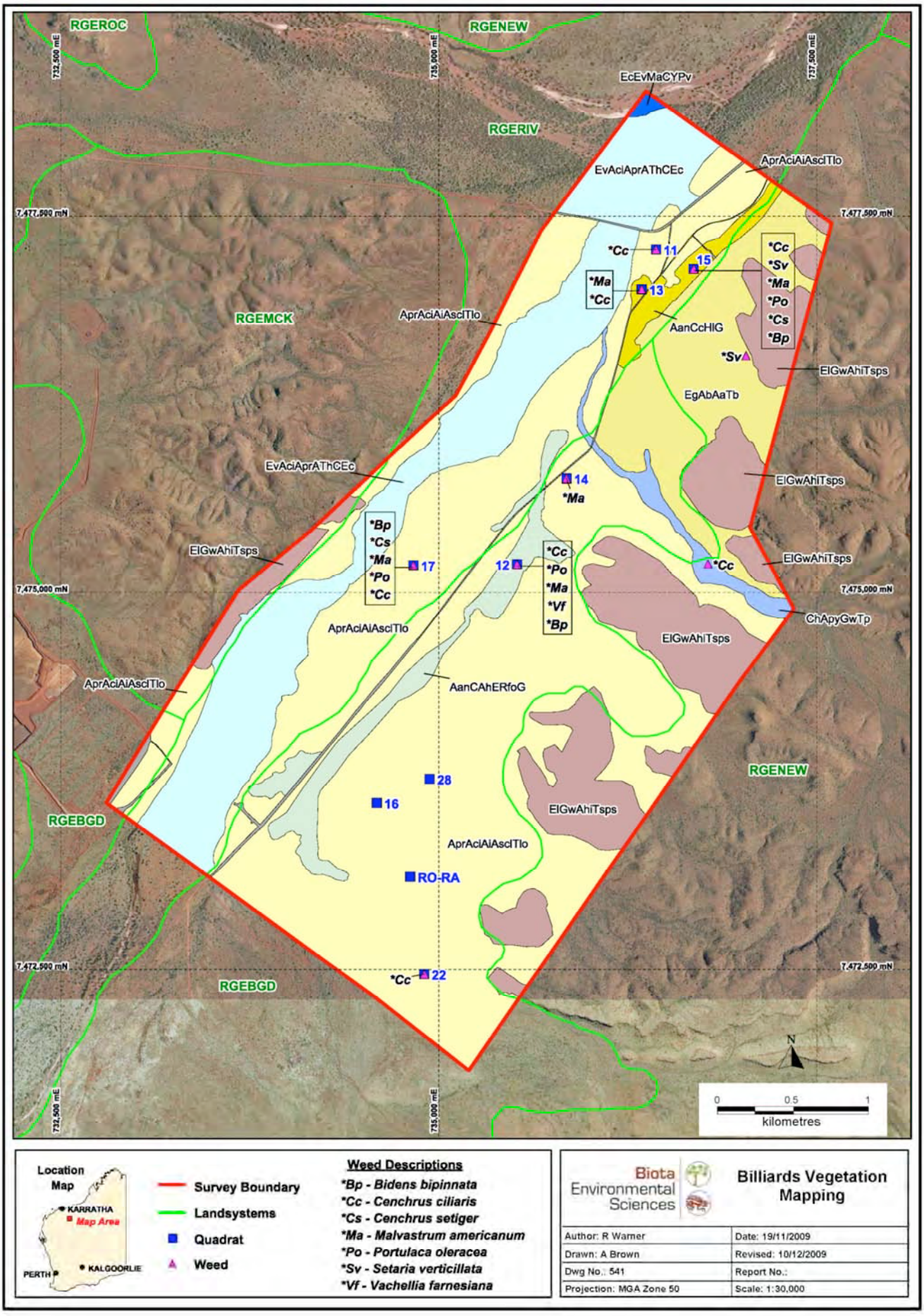

Figure 4.1: Vegetation of the Billiards study area, including locations of introduced (weed) species and distribution of land systems.

4.2 Conservation Significance of the Vegetation Types

4.2.1 Summary of Vegetation Condition

Overall, the Billiards study area was in Very Good to Excellent condition. The creeklines (EcEvMaCYPv and EvAciAprAThCEc) and Mulga vegetation (AanCcHlG and AanCAhERfoG) were degraded to some extent by cattle and weeds. It should be noted that the vegetation map does not indicate the exploration drill lines, which are fairly extensive between the main track and through the Mulga vegetation (extending southwest).

4.2.2 Threatened Ecological Communities Listed under the *EPBC Act 1999*

No vegetation communities listed as TECs under the Commonwealth *EPBC Act 1999* occur in the area or have been previously recorded from the Yandi locality.

4.2.3 Threatened Ecological Communities listed at State Level

No vegetation communities listed as TECs at the State level occur in the Billiards study area.

4.2.4 Priority Ecological Communities listed by DEC

No vegetation communities listed as PECs at the State level occur in the Billiards study area.

4.2.5 Groundwater-dependent Communities

Of the vegetation sub-associations identified for the Billiards study area, EcEvMaCYPv represents an ecosystem dependent on groundwater. The only truly phreatophytic[5] species in the area are *Eucalyptus camaldulensis* (River Red Gum) and *Melaleuca argentea* (Cadjeput). These species were recorded in vegetation unit EcEvMaCYPv, which occurs in Weeli Wolli Creek; a major, seasonally flowing creek in the Yandi area. *Eucalyptus victrix* (Coolibah) was also present here as a dominant species. This species is generally believed to be vadophytic[6], particularly when occurring as small trees, however larger trees (as present in Weeli Wolli Creek) may behave as phreatophytes. Species recorded from other vegetation units are predominantly xerophytic, sourcing their water requirements from the unsaturated zone of the soil profile.

4.2.6 Vegetation Sub-associations of Local Conservation Significance

High Conservation Significance

Vegetation unit EcEvMaCYPv is considered to be of High conservation significance: this unit occurs in the major seasonally flowing creekline in the study area (Weeli Wolli Creek), which would comprise an "ecosystem at risk" (see Kendrick 2001).

Moderate Conservation Significance

The vegetation of Marillana Creek (EvAciAprAThCEc) and the Mulga stands (AanCcHlG and AanCAhERfoG) are of Moderate conservation significance. Marillana Creek would also comprise an "ecosystem at risk" (see Kendrick 2001), but is somewhat degraded through the invasion of Buffel Grass (**Cenchrus ciliaris*). The Mulga stands support large numbers of flora species and are vulnerable to disturbance in the region, particularly from fire, grazing and weeds.

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[5] Phreatophytes are plants that are primarily or totally reliant on the saturated zone below the water table to meet their physiological water requirements.

[6] Vadophytes are plants that source their water requirements from the vadose zone of the soil profile above the water table; their water is usually derived from surface flows or direct rainfall infiltrating the soil profile.

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5.0 Flora

5.1 Overview of the Flora of the Study Area

5.1.1 Overall Species Richness

A total of 247 vascular flora species from 105 genera belonging to 42 families was recorded from the Billiards study area, along with seven introduced species and two fungi. A list of all the species recorded is provided in Appendix 4.

5.1.2 Dominant Taxa and Groups

The plant families and genera with the greatest number of native taxa within the project area are shown in Table 5.1 and Table 5.2 respectively. These families and genera are those that are predominant in the vegetation of the Pilbara, and that usually have most representatives on flora lists from this region, due to their prominence in the Eremaean flora. Some of the families (e.g. the Amaranthaceae, Malvaceae and Poaceae) are more species rich in the northern flora and poorer in the southern flora, while others (such as the Mimosaceae and Papilionaceae) are abundant in all three botanical provinces (i.e. the Northern, Eremaean and South-western provinces).

Table 5.1: Plant families with the greatest number of native species within the study area.

Family	Number of Native Taxa
Poaceae (grass family)	49
Mimosaceae (wattle family)	30
Malvaceae (hibiscus family)	19
Papilionaceae (pea family)	14
Caesalpiniaceae (cassia family)	13
Amaranthaceae (mulla-mulla family)	12

Table 5.2: Plant genera with the greatest number of native species within the study area.

Genus	Number of Native Taxa
Acacia (wattles)	30
Cassia (cassias, sennas)	12
Ptilotus (mulla-mullas)	10
Triodia (spinifex)	9
Corchorus (corchorus)	7
Sida (sidas)	7

5.2 Flora of Conservation Significance

The framework for assessing the conservation significance of flora species is presented in Appendix 1.

5.2.1 Threatened Flora Listed under the *EPBC Act 1999* Occurring in the Study Area

No Threatened Flora species under the Commonwealth *EPBC Act 1999* were recorded from the study area. One species, Hamersley Lepidium (*Lepidium catapycnon*), which is listed under the *EPBC Act 1999*, has previously been recorded from the Yandi locality (Biota, in prep. a).

5.2.2 Probability of Declared Rare Flora Occurring in the Study Area

Whilst there is suitable habitat for *Lepidium catapycnon* in the Billiards survey area, extensive searches did not locate this species. *Thryptomene wittweri* (Mountain Thryptomene) would not be expected to occur in the Billiard study area, as suitable habitat is absent (Section 3.6.2.1).

5.2.3 Priority Flora Recorded from the Study Area

No Priority flora were recorded from the Billiards study area.

5.2.4 Probability of Other Priority Flora Occurring in the Study Area

Of the five Priority flora that have been recorded from the locality (see Section 3.6.2.2):

- *Goodenia* sp. East Pilbara (A.A Mitchell PRP 727) is typically recorded from calcareous substrates, and would not be expected to occur in the Billiards study area;
- there is suitable habitat for the remaining species (i.e. *Stylidium weeliwolli* and *Fimbristylis sieberiana* could occur in Marillana or Weeli Wolli Creek; *Goodenia nuda* could occur in the vicinity of creeklines and floodplains, which extended across the western section of the study area; and *Tephrosia bidwillii* could occur on floodplains and gently undulating plains, which occupied the central section of the study area).

Tephrosia bidwillii is a moderate-sized perennial shrub, which would be expected to have been recorded during the surveys if present within the study area. Given that the conditions at the time of the 2008 and 2009 surveys were dry and not optimal for the collection of annual species, it may be that surveys in better seasons would detect the remaining three annual species which could occur in the study area.

5.2.5 Other Flora of Conservation Interest

Numerous plant groups in the Pilbara are poorly resolved and urgently require revision; these include the genera *Abutilon, Bonamia, Cassia, Corchorus, Eriachne, Euphorbia, Hibiscus, Indigofera, Polygala* and *Sida*. Undescribed taxa are frequently recorded from these groups during routine surveys.

Malcolm Trudgen (M.E. Trudgen & Associates) has indicated that the following taxa are likely to be separate entities:

- *Abutilon* aff. *lepidum* (1) (MET 15 352);
- *Acacia aneura* (grey bushy form; MET 15 732);
- *Acacia* aff. *aneura* (narrow fine veined; site 1259);
- *Acacia* aff. *ayersiana* (YBI08-01);
- *Acacia sibirica* (linear form);
- *Cassia* aff. *oligophylla* (thinly sericeous) x *glutinosa*;
- *Eriachne mucronata* (arid form) (MET 12 736);
- *Euphorbia australis* (mid-green form);
- *Euphorbia* sp. (site 1089);
- *Euphorbia tannensis* subsp. *eremophila* (Hamersley form);
- *Gossypium australe* (Burrup Peninsula form);
- *Hibiscus* aff. *coatesii* (MET 16,542);
- *Indigofera monophylla* (brown calyx form);
- *Melhania* sp. (CH15-39);

- *Sida* aff. *fibulifera* (FMG125-20);
- *Sida* aff. *fibulifera* (oblong; MET15 220);
- *Tephrosia* aff. *densa;*
- *Tephrosia* aff. *supina* (HD133-20);
- *Tephrosia* aff. *supina* (MET 12,357);
- *Tephrosia* aff. *supina* (WW23-22); and
- *Triodia* aff. *basedowii.*

None of these are expected to represent potential DRF or Priority species and all are relatively common in the Pilbara bioregion.

5.3 Introduced Flora (Weeds)

Seven introduced flora species were recorded from the study area, all of which are relatively common and widespread weeds of the Pilbara bioregion (for locations see Figure 4.1 and Appendix 5):

- **Bidens bipinnata* (Beggars Tick) is a common and widespread weed of Mulga vegetation and creeklines of the Pilbara. This annual daisy may occur in very high densities within suitable habitat and given appropriate conditions, but does not entirely exclude native annuals. **Bidens bipinnata* was recorded as scattered individuals from three locations in the study area, twice under Mulga (*Acacia aneura*) and once within floodplain habitat.
- **Cenchrus ciliaris* (Buffel Grass) was introduced by pastoralists as fodder species. This perennial grass has demonstrated allelopathic capacities, whereby it releases chemicals that inhibit the growth of other plants, and it is an aggressive and effective competitor with native flora. Buffel Grass forms dense tussock grasslands, particularly along creeklines, floodplains and in sandy coastal areas. It was recorded from seven locations from within the plains bordering Marillana Creek, the moderate creekline ChApyGwTp and from Mulga vegetation, providing up to 6% cover.
- **Cenchrus setiger* (Birdwood Grass) is an erect, stoloniferous grass that forms tussocks to 0.8 m high, with a compact, spike inflorescence. Originally a fodder plant, Birdwood Grass has become a serious weed of sand dunes, rangelands, plains, stony hillsides and floodplains from Geraldton to the Kimberley. **C. setiger* was recorded as scattered individuals from two locations within the study area, once under Mulga and once in floodplain habitat. It is likely to be more widespread in the study area, intermingled with **C. ciliaris.*
- **Malvastrum americanum* (Spiked Malvastrum) was recorded as scattered individuals from five locations in the study area. Three records were from Mulga vegetation and two were from floodplain vegetation. This low shrub/perennial herb is widely distributed in the Pilbara, Gascoyne, Carnarvon and Kimberley regions, typically occurring in Mulga vegetation, on stony ridges, hillsides, floodplains and along drainage lines.
- **Portulaca oleracea* (Purslane) is a small, prostrate, succulent and is widespread across the State, often occurring at disturbed sites on clayey loam and sand substrates. Three records were made, two from Mulga vegetation and one from floodplain habitat.
- **Setaria verticillata* (Whorled Pigeon Grass) is a common weed of creeklines and Mulga vegetation in the Pilbara, but rarely occurs in large numbers. It is a loosely tufted, annual grass species to 1.3 m high with a dense, spike-like inflorescence. Two records of scattered individuals were made, one in association with Mulga vegetation and the other from plain vegetation (EgAbAaTb).
- **Vachellia farnesiana* (Mimosa Bush) was recorded from one location as scattered individuals, in association with Mulga. This tall, thorny shrub species is widespread through the State from north of Perth to the Kimberley, and typically occurs in drainage habitats. It has dark grey bark, pinnate leaves and yellow flowers in winter.

None of these species are Declared Plants according to the *Agriculture and Related Resources Protection Act 1976*, however **Cenchrus* species and **Vachellia farnesiana* are considered to be serious environmental weeds (Department of Conservation and Land Management (CALM) 1999).

6.0 Assessment Against the Ten Clearing Principles

6.1 Overview

Rio Tinto seeks to expand its operations at the Yandi Mine and is considering mining the Billiards Deposit, which lies to the east of existing operations. It is considered that the proposed clearing is not at variance with the Ten Clearing Principles under Schedule 5 of the *Environmental Protection Act 1986*, each of which is addressed below.

6.2 Clearing Principles

6.2.1 Potential Impact on a High Level of Biological Diversity

Native vegetation should not be cleared if it comprises a high level of biological diversity.

A total of 247 native species was recorded from the Billiards study area, the majority of which are typical of such habitats in the locality. The total number of native species recorded from the study area is within the expected range for an area of this size in this locality, and overall, is not considered to represent high species richness (Section 5.1.1). Eight vegetation sub-associations were recorded, all of which are relatively typical for the area. The Billiards study area does not therefore contain any features of high biological diversity.

6.2.2 Potential Impact on a High Level of Biological Diversity

Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

This clearing principle will be addressed in a separate fauna report for the Billiards study area (Biota, in prep. b).

6.2.3 Potential Impact to any Rare Flora

Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

No Declared Rare Flora were recorded from the Billiards study area or are expected to occur.

No Priority flora were recorded from the study area, however further surveys undertaken in a suitable season may detect three annual Priority species. The Billiards study area is not considered necessary for the continued existence of these Priority flora.

6.2.4 Potential Impact on any Threatened Ecological Communities

Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

No TECs or PECs occur within the Billiard study area (Section 4.2).

6.2.5 Potential Impact on any Native Vegetation Remnant in an Area that has been Extensively Cleared

Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Most of the Pilbara bioregion has never been cleared, however a combination of weed invasions, hot frequent bushfires, feral predators and grazing by exotic herbivores is causing a loss of soil fertility and vegetation cover through some pastoral areas. Erosion from increased runoff velocities is also occluding drainage lines in places (McKenzie et al. 2002). While a small amount of historic clearing has taken place in the vicinity of the existing operations, this is negligible in comparison to the broader representation of the vegetation units mapped for the study area (see Section 4.1). The vegetation types identified within the project area thus do not represent remnant stands of extensively cleared vegetation units.

6.2.6 Potential Impact on any Watercourse and/or Wetland

Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

There are no permanent watercourses or wetlands in the project area, however two seasonally-flowing major creeklines are present; Weeli Wolli Creek and Marillana Creek (see Section 4.1.2). These creeklines have already been somewhat modified through dewatering from mine operations and through weed invasion, however the vegetation types occurring along these creeks (EcEvMaCYPv and EvAciAprAThCEc) are still considered to be of High and Moderate conservation significance respectively (see Section 4.2.6). In addition, small flowlines occur within the study area, supporting vegetation unit ChApyGwTp. Provided that clearance of these vegetation units (particularly those along Weeli Wolli and Marillana Creeks) is avoided, or minimised if unavoidable, there should be no substantial negative impact to these habitats.

6.2.7 Potential to Cause Appreciable Land Degradation

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

The main degrading influences observed within the Billiards study area comprise clearing for exploration tracks, grazing and trampling by cattle, and the presence of weeds along the major creek systems. Historical clearing in the vicinity of the study area has not caused appreciable land degradation beyond the immediate area of the tracks. The soils of the Billiards study area comprise generally stable stony soils or sandy loams, which are not overly susceptible to erosion. Clearing of some of the remaining intact native vegetation may exacerbate the spread of weeds, and strict weed hygiene measures should be implemented to ensure that the weeds present within the study area are not transferred to areas beyond.

6.2.8 Potential Impact on Adjacent or Nearby Conservation Areas

Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

The nearest conservation reserve to the study area is the Karijini National Park, located approximately 100 km west-northwest of the Billiards study area. The current clearing proposal will therefore have no impact on any conservation areas.

6.2.9 Potential Deterioration in Water Quality

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

The creeklines within the study area would only flow during seasonal flood events. Given the relatively small scale of clearing required for the proposed project, there is no reason to expect that surface or groundwater quality in the area would be affected. Where possible, clearing of the creekline vegetation should, however, be avoided.

6.2.10 Potential to Cause or Exacerbate Flooding

Native vegetation should not be cleared if clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Flooding of the creeklines and low-lying habitats in the Billiards study area may occur periodically as a result of heavy rainfall triggered by cyclonic activity and sporadic thunderstorms. Clearing within the study area would not be expected to exacerbate either the frequency or the intensity of flooding through these areas.

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7.0 Summary and Conclusions

7.1 Summary of Findings

7.1.1 Vegetation of Conservation Significance

Overall, the vegetation of the Billiards study area was in Very Good to Excellent condition. The creeklines and Mulga vegetation were degraded to some extent by cattle and weeds.

No TECs or PECs were recorded from the Billiard study area (Section 4.2). However, the vegetation of the major seasonally flowing creekline (Weeli Wolli Creek) is considered to be of High conservation significance, while the vegetation of Marillana Creek and the Mulga stands are of Moderate conservation significance (see Section 4.2.6 and Table 7.1). Disturbance to these vegetation types should be minimised. The rest of the vegetation units were considered to be of Low conservation significance, representing units that are relatively widespread and well-represented in the locality.

Table 7.1: Summary of vegetation units of High and Moderate conservation significance identified in the Billiards study area.

Code	Description	Habitat	Conservation Significance
EcEvMaCYPv	*Eucalyptus camaldulensis, E. victrix* low open woodland over *Melaleuca argentea* tall open shrubland over *Cyperus vaginatus* low open shrubland	Weeli Wolli Creek	High
EvAciAprAThCEc	*Eucalyptus victrix* open woodland over *Acacia citrinoviridis, A. pruinocarpa, Atalaya hemiglauca* low woodland over **Cenchrus ciliaris* tussock grassland	Marillana Creek	Moderate
AanCcHlG	*Acacia aneura* var. *aneura*, *Corymbia candida* low open forest over *Hakea lorea* subsp. *lorea* tall open shrubland over a scattered grassland of mixed species	Clayey plain with Mulga	Moderate
AanCAhERfoG	*Acacia* aff. aneura (narrow fine veined; site 1259) low open forest over *Cassia helmsii, Eremophila forrestii* subsp. *forrestii* low open shrubland over an open grassland of mixed species.	Clayey plain with Mulga	Moderate

7.1.2 Flora of Conservation Significance

No Declared Rare Flora or species listed under the *EPBC Act 1999* were recorded from the Billiards study area or are considered likely to occur. No Priority flora were recorded from the Billiard study area, however four Priority species could occur in the study area on the basis of the habitats present. One of these species, *Tephrosia bidwillii* is a moderate-sized perennial shrub; this species is not expected to occur as it was not recorded during the field surveys. Surveys carried out in a suitable season may detect the remaining three annual species; *Fimbristylis sieberiana, Goodenia nuda* and *Stylidium weeliwolli* (Section 5.2.4).

7.2 Potential Impacts

The primary impact arising from the proposed development at Billiards would comprise clearing of vegetation. Ground disturbance associated with construction and vehicle movement during the project may also provide an opportunity for the introduction and spread of weeds. Strict management measures should be implemented as part of the project to address these issues.

7.3 Management Recommendations

The following management recommendations arise from the flora and vegetation surveys of the Billiards study area:

- Infrastructure should preferably be located in existing disturbed areas.
- Clearing of vegetation of High conservation significance should be avoided. Where this is unavoidable, clearing should be strictly minimised.
- Clearing of vegetation of Moderate conservation significance should be avoided if possible, and otherwise minimised.
- Clearing of vegetation of Low conservation significance should be minimised.
- Strict weed hygiene measures should be implemented to minimise the introduction and/or spread of weed species.

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Appendix 1

Framework for Conservation Significance Ranking of Communities and Species

A. Definitions, Categories and Criteria for Threatened and Priority Ecological Communities

1. General Definitions

Ecological Community
A naturally occurring biological assemblage that occurs in a particular type of habitat.

Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A threatened ecological community (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Possible threatened ecological communities that do not meet survey criteria are added to DEC's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An assemblage is a defined group of biological entities.

Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (eg. substrate and topography), and the biotic factors.

Occurrence: a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres of a different ecological community, an artificial surface or a totally destroyed community.

By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.

Adequately Surveyed is defined as follows:
"An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts."

Community structure is defined as follows:
"The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage" (eg. Eucalyptus salmonophloia woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, eg. dominance by feeders on detritus as distinct from feeders on live plants).

Definitions of Modification and Destruction of an ecological community:

Modification: "changes to some or all of ecological processes (including abiotic processes such as hydrology), species composition and community structure as a direct or indirect result of human activities. The level of damage involved could be ameliorated naturally or by human intervention."

Destruction: "modification such that reestablishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention."

Note: Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Examples of modification and total destruction are cited below:

Modification of ecological processes: The hydrology of Toolibin Lake has been altered by clearing of the catchment such that death of some of the original flora has occurred due to dependence on fresh water. The system may be bought back to a semblance of the original state by redirecting saline runoff and pumping waters of the rising underground watertable away to restore the hydrological balance. Total destruction of downstream lakes has occurred due to hydrology being altered to the point that few of the original flora or fauna species are able to tolerate the level of salinity and/or water logging.

Modification of structure: The understorey of a plant community may be altered by weed invasion due to nutrient enrichment by addition of fertiliser. Should the additional nutrients be removed from the system the balance may be restored, and the original plant species better able to compete. Total destruction may occur if additional nutrients continue to be added to the system causing the understorey to be completely replaced by weed species, and death of overstorey species due to inability to tolerate high nutrient levels.

Modification of species composition: Pollution may cause alteration of the invertebrate species present in a freshwater lake. Removal of pollutants may allow the return of the original inhabitant species. Addition of residual highly toxic substances may cause permanent changes to water quality, and total destruction of the community.

Threatening processes are defined as follows:
"Any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community."

Examples of some of the continuing threatening processes in Western Australia include: general pollution; competition, predation and change induced in ecological communities as a result of introduced animals; competition and displacement of native plants by introduced species; hydrological changes; inappropriate fire regimes; diseases resulting from introduced micro-organisms; direct human exploitation and disturbance of ecological communities.

Restoration is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

Rehabilitation is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

2. Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities

ECOLOGICAL COMMUNITIES

Presumed Totally Destroyed (PD)
An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):

A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or

B) All occurrences recorded within the last 50 years have since been destroyed

Critically Endangered (CR)
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):

   i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);

   ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.

B) Current distribution is limited, and one or more of the following apply (i, ii or iii):

   i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);

   ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;

iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.

C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Endangered (EN)
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):

A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):

   i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);

   ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, and one or more of the following apply (i, ii or iii):

   i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);

   ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;

   iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.

C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Vulnerable (VU)
An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

3. Definitions and Criteria for Priority Ecological Communities

PRIORITY ECOLOGICAL COMMUNITY LIST
Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities
Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities
Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;

(iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

(c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities
Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Reference: Department of Environment and Conservation 2007.

B. Threatened Flora Statutory Framework

In Western Australia, all native flora species are protected under the *Wildlife Conservation Act 1950-1979,* making it an offence to remove or harm native flora species without approval. In addition to this basic level of statutory protection, a number of plant species are assigned an additional level of conservation significance based on the fact that there are a limited number of known populations, some of which may be under threat.

Species of the highest conservation significance are designated Declared Rare Flora (DRF), either extant or presumed extinct:

- X: Declared Rare Flora - Presumed Extinct: taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee;
- R: Declared Rare Flora - Extant: 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, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee (Atkins 2008). *(= Threatened Flora = Endangered + Vulnerable)*

Species that appear to be rare or threatened, but for which there is insufficient information to properly evaluate their conservation significance, are assigned to one of four Priority flora categories:

- P1: Priority One - Poorly Known: 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., or the plants are under threat, e.g. from disease, grazing by feral animals, 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 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 which are known from several 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 need of further survey.
- P4: Priority Four - Rare: 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.

Note that of the above classifications, only 'Declared Rare Flora' has statutory standing. The Priority Flora classifications are employed by the Department of Environment and Conservation to manage and classify their database of species considered potentially rare or at risk, but these categories have no legislative status. Note also that proposals that appear likely to affect DRF require formal written approval from the Minister for the Environment under Section 23(f) of the *Wildlife Conservation Act 1950-1979* in addition to the requirements of the *Environmental Protection (Native Vegetation Clearing) Regulations 2004*.

References:

Atkins, K.J. (2008). Declared Rare and Priority Flora List for Western Australia. Prepared by the Department of Environment and Conservation, 26 February 2008.

Appendix 2

Vegetation Structural Classes and Condition Scale Used for the Study

Vegetation Structural Classes*

Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland	Scattered tall trees
Trees 10-30 m	Closed forest	Open forest	Woodland	Open woodland	Scattered trees
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Shrubs over 2 m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland	Scattered tall shrubs
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland	Scattered shrubs
Shrubs under 1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland	Scattered low shrubs
Hummock grasses	Closed hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland	Scattered hummock grasses
Grasses, Sedges, Herbs	Closed tussock grassland / bunch grassland / sedgeland / herbland	Tussock grassland / bunch grassland / sedgeland / herbland	Open tussock grassland / bunch grassland / sedgeland / herbland	Very open tussock grassland / bunch grassland / sedgeland / herbland	Scattered tussock grasses / bunch grasses / sedges / herbs

* Based on Muir (1977), and Aplin's (1979) modification of the vegetation classification system of Specht (1970): Aplin T.E.H. (1979). The Flora. Chapter 3 *In* O'Brien, B.J. (ed.) (1979). *Environment and Science.* University of Western Australia Press; Muir B.G. (1977). Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve. *Records of the Western Australian Museum, Suppl.* No. 3; Specht R.L. (1970). Vegetation. *In The Australian Environment.* 4th edn (Ed. G.W. Leeper). Melbourne.

Vegetation Condition Scale*

E = Excellent (=Pristine of BushForever) Pristine or nearly so; no obvious signs of damage caused by the activities of European man.
VG = Very Good (= Excellent of BushForever) Some relatively slight signs of damage caused by the activities of European man. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds such as **Ursinia anthemoides* or **Briza* spp., or occasional vehicle tracks.
G = Good (= Very Good of BushForever) More obvious signs of damage caused by the activities of European man, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones such as **Ehrharta* spp.
P = Poor (= Good of BushForever) Still retains basic vegetation structure or ability to regenerate to it after very obvious impacts of activities of European man, such as grazing, partial clearing (chaining) or frequent fires. Weeds as above, probably plus some more aggressive ones such as **Ehrharta* spp.
VP = Very Poor (= Degraded of BushForever) Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species including very aggressive species.
D = Completely Degraded (= Completely Degraded of BushForever) Areas that are completely or almost completely without native species in the structure of their vegetation; ie. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

* Based on Trudgen M.E. (1988). A Report on the Flora and Vegetation of the Port Kennedy Area. Unpublished report prepared for Bowman Bishaw and Associates, West Perth.

Appendix 3

Raw Data from Quadrats and Relevés

Site YBI11
Described by : RB/RO; Date15/06/2007; TypeQ 50x50m
MGA Zone 50 736414 mE; 7477306 mN

Habitat	Mildly/gently sloping alluvial plain. Sloping towards creek bed and floodplain area.
Soil	Red-brown, alluvial clayey-loam.
Rock Type	Calcareous/ calcrete with small amount of ironstone
Vegetation	*Acacia pruinocarpa* low open woodland over *Cassia oligophylla* open shrubland over *Triodia longiceps* hummock grassland
Veg Condition	Very good.
Fire Age	>7-10 years

Species	Cover (%)	Height
Abutilon otocarpum	+	30cm
Acacia citrinoviridis	+	
Acacia coriacea subsp. pendens	+	
Acacia inaequilatera	1	
Acacia pruinocarpa	4	
Acacia sclerosperma subsp. *sclerosperma*	1	400cm
Acacia tenuissima	+	
Amyema hilliana	+	
Aristida contorta	+	20cm
Aristida holathera var. *holathera*	1	30-40cm
Cassia helmsii	<1	125cm
Cassia oligophylla	3	100-120cm
**Cenchrus ciliaris*		
Cleome viscosa	+	
Corchorus tectus	<1	60cm
Corymbia hamersleyana	<1	450cm
Corymbia hamersleyana	+	
Duperreya commixta	<1	climber
Enneapogon caerulescens	1	25cm
Enneapogon polyphyllus	+	25cm
Enteropogon ramosus	+	100cm
Eragrostis eriopoda	1	50cm
Eremophila forrestii subsp. *forrestii*	+	120cm
Eremophila jucunda subsp. *pulcherrima*	+	
Eremophila longifolia	+	200cm
Eriachne aristidea	+	30cm
Evolvulus alsinoides var. *villosicalyx*	+	25cm
Goodenia microptera	+	30cm
Hakea lorea subsp. lorea	+	400cm
Hibiscus burtonii	+	60cm
Hibiscus sturtii var. platychlamys	+	
Maireana planifolia	+	45cm
Maireana villosa	+	20cm
Melhania oblongifolia	+	30cm
Paraneurachne muelleri	+	
Polycarpaea longiflora	+	30cm
Pterocaulon sphacelatum	+	15cm
Ptilotus astrolasius var. *astrolasius*	<1	35-40cm
Ptilotus obovatus	+	90cm
Ptilotus rotundifolius	+	
Rhagodia eremaea	+	190cm
Rhynchosia minima	1	
Sclerolaena cornishiana	+	
Sida aff. *fibulifera* (oblong; MET 15 220)	+	
Sida cardiophylla	+	50cm
Solanum horridum	+	40cm
Solanum lasiophyllum	+	
Tephrosia aff. *supina* (MET 12,357)	+	40cm
Triodia basedowii		50cm
Triodia longiceps	60-65	100cm
Triodia wiseana	1	50cm
Zygophyllum eichleri	+	2-3cm

Site YBI12
Described by; RB/RO; Date; 16/06/2007; TypeQ50x50m
MGA Zone 50; 735505 mE; 7475221 mN

Habitat	Flat alluvial clay plain. Hills to the North-East of quadrat. Quadrat may be in a drainage
Soil	Deep red-brown clay (alluvial).
Rock Type	Some quartz present (very small amounts). Probably ironstone underneath.
Vegetation	*Acacia aneura* aff. *aneura* (narrow fine veined) low open forest over *Eremophila lanceolata, E. forrestii* subsp. forrestii, **Malvastrum americanum* low shrubland over mixed tussock grasses
Veg Condition	Very good due to lack of weed species present, but obvious signs of cattle disturbance to the vegetation.
Fire Age	<8-10 years
Notes	Quadrat started on the 16/06 and finished on the 17/06. Fire age unchanged since 2007.

Species	Cover (%)	Height
Abutilon aff. *lepidum* (1) (MET 15 352)	+	25-30cm
Abutilon macrum	+	30-40cm
Abutilon otocarpum	+	40cm
Acacia aff. *aneura* (narrow fine veined; site 1259)	40-45	
Acacia aneura var. *intermedia*		650cm
Acacia bivenosa	+	145cm
Acacia coriacea subsp. *pendens*	+	350cm
Acacia pruinocarpa	2	1000cm
Acacia tumida var. *pilbarensis*	+	170cm
Alternanthera nana	+	25cm
Anthobolus leptomerioides		90cm
Aristida contorta	2	30cm
Aristida holathera var. *holathera*	+	
Aristida inaequiglumis	1	
Aristida sp.	<1	100cm
Atalaya hemiglauca	+	50cm
**Bidens bipinnata*	+	30cm
Blumea tenella	+	30cm
Bulbostylis barbata	+	12cm
Calandrinia ptychosperma	+	3cm
Cassia helmsii		
Cassia oligophylla x helmsii	+	65cm
**Cenchrus ciliaris*	+	
Chrysocephalum pterochaetum	+	20cm
Chrysopogon fallax	+	15cm
Cleome viscosa	+	70cm
Convolvulus angustissimus subsp. *angustissimus*	+	climber
Corchorus crozophorifolius	+	100cm
Corchorus sidoides subsp. *sidoides*	+	45cm
Corymbia hamersleyana	+	160cm
Cucumis maderaspatanus	+	
Cullen leucochaites	+	120cm
Cymbopogon ambiguus	+	60cm
Dichanthium sericeum subsp. *humilius*	+	25cm
Digitaria brownii	+	75cm
Digitaria ctenantha	+	18cm
Duperreya commixta	+	
Dysphania melanocarpa	+	20cm
Dysphania rhadinostachya	+	6cm
Enchylaena tomentosa var. *tomentosa*	+	
Enneapogon lindleyanus	+	
Enneapogon polyphyllus	2	40cm
Enneapogon robustissimus	<1	60cm
Eragrostis cumingii	1	10cm
Eremophila forrestii subsp. *forrestii*		50cm
Eremophila lanceolata	+	60cm
Eremophila longifolia	+	220cm

Species	Cover (%)	Height
Evolvulus alsinoides var. *villosicalyx*	1	
Glycine canescens	+	
Glycine canescens	<1	climber
Gomphrena cunninghamii	+	10cm
Goodenia prostrata	+	12cm
Gossypium australe (Burrup Peninsula form)		65cm
Hakea chordophylla	+	65cm
Hybanthus aurantiacus	+	10-15cm
Iseilema membranaceum	+	12cm
Maireana planifolia	+	
Maireana villosa	+	
**Malvastrum americanum*	+	
Melhania oblongifolia	+	20cm
Nicotiana occidentalis subsp. *occidentalis*	+	35cm
Nicotiana rosulata	<1	70cm
Paraneurachne muelleri	+	90cm
Paspalidium clementii	+	15cm
Perotis rara	+	10cm
Phyllanthus erwinii	+	10cm
Pluchea ferdinandi-muelleri	+	
**Portulaca oleracea*	+	5cm
Psydrax latifolia	+	50cm
Psydrax suaveolens	+	80cm
Pterocaulon sphacelatum	+	
Ptilotus aervoides	+	6cm
Ptilotus astrolasius var. *astrolasius*	+	8cm
Ptilotus exaltatus var. *exaltatus*	+	6cm
Ptilotus gaudichaudii var. *gaudichaudii*	<1	20cm
Ptilotus helipteroides	+	10cm
Ptilotus obovatus	+	25cm
Rhagodia eremaea	+	70cm
Rhynchosia minima	+	45cm
Schizachyrium fragile	+	10cm
Sclerolaena cornishiana	+	35cm
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	+	90cm
Sida sp. verrucose glands (F.H. Mollemans 2423)	+	
Solanum lasiophyllum	<1	60cm
Solanum sturtianum	+	
Spermacoce brachystema	+	20cm
Sporobolus australasicus	+	10cm
Streptoglossa bubakii	+	40cm
Streptoglossa decurrens	+	65cm
Themeda triandra	+	85cm
Trachymene oleracea subsp. *oleracea*	+	75cm
Tribulus macrocarpus	+	5cm
Trichodesma zeylanicum var. *zeylanicum*	+	110cm
Triodia basedowii	+	40cm
Triodia wiseana	+	45cm
**Vachellia farnesiana*	+	
Waltheria indica	+	

Site YBI13
Described by RW/PH; Date16/06/2007; Type Q 50x50m
MGA Zone 50; 736335 mE; 7477046 mN

Habitat	Broad plain
Soil	Sandy clay; red-brown
Vegetation	*Acacia* aff. *aneura* (narrow fine veined) low open forest over *Cassia helmsii*, *Eremophila forrestii* subsp. *forrestii* open shrubland over *Triodia longiceps* hummock grassland and **Cenchrus ciliaris* very open tussock grassland
Veg Condition	Good. Weeds present and evidence of cattle (grazing and tracks).
Fire Age	no sign of recent fire

Notes Remains unburnt in 2008. Noticeable cattle grazing and a track to the east. Conditions extremely dry and dusty.

Species	Cover (%)	Height
Abutilon lepidum	+	40cm
Abutilon otocarpum	+	
Acacia aff. *aneura* (narrow fine veined; site 1259)	40	
Acacia citrinoviridis	+	1.5m
Acacia inaequilatera	+	
Acacia pruinocarpa	+	200cm
Aristida contorta	+	30cm
Aristida inaequiglumis	+	30cm
Cassia helmsii	+	
Cassia oligophylla x helmsii	+	1.5m
**Cenchrus ciliaris*	6	
Cleome viscosa	+	30cm
Corchorus crozophorifolius	+	50cm
Corymbia candida	+	40cm
Corymbia hamersleyana	1	
Duperreya commixta	+	
Enchylaena tomentosa var. *tomentosa*	+	
Enneapogon caerulescens	+	30cm
Eragrostis eriopoda	+	30cm
Eremophila forrestii subsp. forrestii	1	150cm
Eremophila jucunda subsp. *pulcherrima*	1	1.5m
Euphorbia tannensis subsp. *eremophila*	+	
Euphorbia tannensis subsp. *eremophila (*Hamersley form)	+	40cm
Evolvulus alsinoides var. *villosicalyx*	+	
Hibiscus burtonii	+	60cm
Hibiscus sturtii var. *platychlamys*	+	
Maireana planifolia	+	110cm
**Malvastrum americanum*	+	40cm
Melhania oblongifolia	+	20cm
Paraneurachne muelleri	+	
Peripleura arida	+	30cm
Pterocaulon sphaeranthoides	+	70cm
Ptilotus exaltatus var. *exaltatus*	+	25cm
Rhynchosia minima	+	
Sclerolaena cornishiana	+	
Sida aff. *fibulifera* (oblong; MET 15 220)	+	15cm
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	+	1.7m
Solanum horridum	+	20cm
Solanum lasiophyllum	+	40cm
Themeda triandra	+	1m
Triodia basedowii	+	25-35cm
Triodia longiceps	60	
Triraphis mollis	+	35cm
Zygophyllum eichleri	+	3cm

Site YBI14
Described by BB; Date 16/06/2007; Type Q50x50m
MGA Zone 50; 735843 mE; 7475792 mN

Habitat Very gentle west-facing slope of plain.
Soil Red-brown loamy sand.
Rock Type Ironstone
Vegetation *Acacia pruinocarpa, Petalostylis cassioides* scattered tall shrubs over *Cassia* aff. *oligophylla* (thinly sericeous), (*Solanum sturtianum, Cassia helmsii*) shrubland over *Corchorus sidoides* subsp. *vermicularis*, *Sida cardiophylla* scattered low shrubs over *Aristida holathera*, *Paraneurachne muelleri*, *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) tussock grassland/hummock grassland
Veg Condition Excellent (no weeds, no sign of physical disturbance). 2008: cattle have been here
Fire Age >5 years
Notes Poor seasonal condition for recording quadrat--dry and annuals degraded/deteriorated.

Acacia pruinocarpa is in shrub form--probably not old enough to be low tree. 2008: Same conditions, dry, lots of shrubs have died

Species	Cover (%)	Height
Acacia citrinoviridis	+	
Acacia coriacea subsp. *pendens*	+	70cm
Acacia dictyophleba	+	1.8m
Acacia pachyacra	+	30cm
Acacia pruinocarpa	<1	2.5-3.5m
Aristida contorta	+	30cm
Aristida holathera var. holathera	20-25	
Aristida inaequiglumis	+	80cm
Cassia aff. *oligophylla* (thinly sericeous) *x glutinosa*		80cm-1.6m
Cassia helmsii	+	
Cassia oligophylla x helmsii	+	40cm
Cleome viscosa	+	40cm
Corchorus sidoides subsp. *vermicularis*	+	
Corymbia hamersleyana	+	1.5m
Cymbopogon ambiguus	+	90cm
Digitaria brownii	+	50cm
Dodonaea coriacea	+	35cm
Enneapogon polyphyllus		30cm
Eragrostis eriopoda	+	30cm
Eremophila forrestii subsp. *forrestii*	+	
Eremophila forrestii subsp. *foresstii*	+	90cm
Eremophila longifolia	+	1.6m
Eriachne aristidea	+	30cm
Evolvulus alsinoides var. *villosicalyx*	+	15cm
Hakea lorea subsp. *lorea*	+	1.8m
Hibiscus burtonii	+	
Hibiscus sturtii var. *platychlamys*	+	
**Malvastrum americanum*	+	2cm
Paraneurachne muelleri	+	
Petalostylis cassioides	1	
Polycarpaea corymbosa var. *corymbosa*	+	20cm
Ptilotus astrolasius var. *astrolasius*	+	35cm
Ptilotus exaltatus var. *exaltatus*	+	
Ptilotus helipteroides	+	
Ptilotus obovatus	+	55cm
Sclerolaena cornishiana	+	
Sida cardiophylla	+	
Sida sp. verrucose glands (F.H. Mollemans 2423)	+	20cm
Solanum lasiophyllum	+	45cm
Solanum sturtianum	1	
Trichodesma zeylanicum var. *zeylanicum*	+	
Triodia aff. *basedowii*	+	50cm

Described by RW/PH; Date 17/06/2007; Type Q 50x50m
MGA Zone 50; 736653 mE 7477156 mN

Habitat	Depression of wide open valley.
Soil	red-brown sandy clay.
Vegetation	*Acacia aneura* var. *aneura, Corymbia candida, A. pruinocarpa* low open forest over *Hakea lorea* tall open shrubland over *Eulalia aurea* very open tussock grassland
Veg Condition	Good. Some **Malvastrum americanum* and **Cenchrus ciliaris* present.
Fire Age	>10 years
Notes	2008: Extremely dry conditions, many annuals too far gone to discern

Species	Cover (%)	Height
Abutilon lepidum	+	25cm
Abutilon macrum	+	
Abutilon otocarpum	+	4cm
Acacia aff. *ayersiana* (YBl08-01)	+	2m
Acacia aneura var. *aneura*	40	8m
Acacia citrinoviridis	+	

Species	Cover (%)	Height
Acacia coriacea subsp. *pendens*	+	90cm
Acacia pruinocarpa	3	8m
Alternanthera nana	+	
Aristida contorta	+	25cm
Atalaya hemiglauca	1	
**Bidens bipinnata*	+	20cm
Boerhavia coccinea	+	10cm
Bothriochloa ewartiana	+	130cm
Calandrinia ptychosperma	+	3cm
Cassia helmsii	+	
Cassia oligophylla x helmsii	+	60cm
**Cenchrus ciliaris*	+	
**Cenchrus setiger*	+	
Cheilanthes sieberi subsp. *sieberi*	+	15cm
Chrysopogon fallax	+	
Cleome viscosa	+	
Corchorus tridens	+	5cm
Corymbia candida	30	6m
Corymbia hamersleyana	+	3.5m
Digitaria ctenantha	+	5cm
Duperreya commixta	+	2m
Dysphania melanocarpa	+	15cm
Enchylaena tomentosa var. *tomentosa*	+	150cm
Enneapogon polyphyllus	1	
Eragrostis cumingii	+	10cm
Eragrostis eriopoda	+	
Eragrostis tenellula	+	20cm
Eragrostis xerophila	+	35cm
Eremophila lanceolata	+	50cm
Eremophila longifolia	+	
Eriachne mucronata (typical form)	+	40cm
Eulalia aurea	4	1.5m
Evolvulus alsinoides var. *villosicalyx*	+	
Glycine canescens	+	climber
Goodenia prostrata	+	3cm
Goodenia triodiophila	+	25cm
Hakea lorea subsp. *lorea*	2	
Hibiscus sturtii var. *aff. grandiflorus*	+	
Hibiscus sturtii var. *campylochlamys*	+	20cm
Iseilema membranaceum	+	8cm
Lysiana sp.	+	3m
Maireana planifolia	+	40cm
**Malvastrum americanum*	1	40cm
**Malvastrum americanum*	1	
Melhania sp. (CH15-39)	+	20cm
Nicotiana simulans	+	7cm
Perotis rara	+	5cm
**Portulaca oleracea*	+	2cm
Portulaca pilosa	+	8cm
Pterocaulon sphaeranthoides	+	60cm
Ptilotus exaltatus var. *exaltatus*	+	20cm
Ptilotus gaudichaudii var *gaudichaudii*	+	25cm
Ptilotus helipteroides	+	8cm
Ptilotus obovatus	+	
Rhagodia eremaea	+	60cm
Rhynchosia minima	+	30cm
Sclerolaena cornishiana	+	
**Setaria verticillata*	+	1m
Sida aff. *fibulifera*	+	
Sida aff. *fibulifera* (FMG125-20)	+	
Sida aff. *fibulifera* (oblong; MET 15 220)	+	40cm
Sida sp. verrucose glands (F.H. Mollemans 2423)	+	30cm
Triodia basedowii	+	40cm

Species	Cover (%)	Height
Triodia epactia	+	
Triodia longiceps	+	
Triodia wiseana	+	30cm

Site YBI16
Described by RB/RO; Date 17/06/2007; Type Q 50x50m
MGA Zone 50; 734575 mE; 7473636 mN

Habitat	Flat plain, very gently sloping to the west boundary.
Soil	Red-brown sandy loam.
Rock Type	Ironstone.
Vegetation	*Eucalyptus gamophylla* low open woodland over *Acacia bivenosa, A. ancistrocarpa* open shrubland over *Triodia basedowii* hummock grassland to closed hummock grassland
Veg Condition	Excellent
Fire Age	~5 years
Notes	Elevation at south-east corner is 503m.

Species	Cover (%)	Height
Acacia ancistrocarpa	2	
Acacia bivenosa	2	
Acacia pruinocarpa	+	300cm
Acacia sibirica	+	
Acacia sibirica (linear form)	+	30cm
Acacia tenuissima	+	50cm
Acacia tumida var. *pilbarensis*	+	240cm
Amphipogon caricinus	+	
Aristida contorta	+	30cm
Aristida holathera var. *holathera*	<1	30cm
Bonamia rosea	+	55cm
Cassia glutinosa	+	
Cassia helmsii	+	
Cassia luerssenii	+	85cm
Cassia oligophylla x helmsii	1	
Cassia pruinosa		40cm
Codonocarpus cotinifolius	+	
Codonocarpus cotinifolius	<1	700cm
Corchorus tectus	+	40cm
Cymbopogon ambiguus	+	65cm
Digitaria brownii	1	50cm
Duperreya commixta	+	climber
Eremophila forrestii subsp. *forrestii*	+	
Eremophila longifolia	+	75cm
Eucalyptus gamophylla		350cm
Hibiscus burtonii	+	160cm
Hibiscus sturtii var. *platychlamys*	+	25cm
Indigofera monophylla (brown calyx form)	+	25cm
Keraudrenia velutina subsp. *elliptica*	1	
Paraneurachne muelleri	+	
Polycarpaea longiflora	+	45cm
Ptilotus astrolasius var. *astrolasius*	<1	35cm
Ptilotus calostachyus	+	110cm
Ptilotus exaltatus var. *exaltatus*	+	70cm
Ptilotus obovatus	+	50cm
Sclerolaena cornishiana	+	35cm
Sida cardiophylla	<1	185cm
Solanum lasiophyllum	+	100cm
Solanum sturtianum	+	65cm
Streptoglossa decurrens	+	60cm
Themeda triandra	+	100cm
Trianthema glossostigma	+	3-5cm
Triodia basedowii	70-75	40-50cm

Site YBI17
Described by RB/RO Date 17/06/2007 Type Q 50x50m
MGA Zone 50; 734841 mE; 7475215 mN

Habitat	Flat plain just beyond river flood banks.
Soil	Pebbly red-brown sandy loam.
Rock Type	
Vegetation	*Acacia pruinocarpa, A. citrinoviridis* scattered low trees over *Acacia bivenosa* tall open shrubland over *Ptilotus obovatus* scattered low shrubs over *Triodia longiceps* closed hummock grassland
Veg Condition	Very good. Two small patches of **Cenchrus ciliaris* grassland.
Fire Age	>7-10 years
Notes	*Triodia longiceps* veg continuous to 60m to NW towards river before Buffel invasion

Species	Cover (%)	Height
Abutilon lepidum	+	15cm
Abutilon macrum	+	20cm
Abutilon otocarpum	+	20cm
Acacia bivenosa		
Acacia citrinoviridis	<1	300cm
Acacia pruinocarpa	+	
Acacia pyrifolia		350cm
Aristida contorta	+	30cm
Atalaya hemiglauca	+	
**Bidens bipinnata*	+	15cm
Boerhavia coccinea	+	30cm
Capparis spinosa var. *nummularia*	+	1m
Cassia oligophylla x helmsii	+	30cm
**Cenchrus ciliaris*		45cm
**Cenchrus setiger*	+	40cm
Cleome viscosa	+	50cm
Codonocarpus cotinifolius	+	180cm
Corchorus crozophorifolius	+	
Corchorus sidoides subsp. *sidoides*	+	45cm
Corymbia hamersleyana	+	140cm
Dicladanthera forrestii	+	40cm
Duperreya commixta	+	
Enneapogon caerulescens	+	
Enneapogon polyphyllus	+	20cm
Eragrostis eriopoda	+	30cm
Eragrostis tenellula	+	20cm
Eremophila longifolia	+	1.8-2m
Eriachne mucronata (typical form)	+	35cm
Eulalia aurea	+	35 cm
Euphorbia biconvexa	+	15cm
Euphorbia sp.	+	15cm
Euphorbia sp. (site 1089)	+	4cm
Evolvulus alsinoides var. *villosicalyx*	+	30 cm
Glycine canescens	+	
Hakea lorea subsp. lorea	1	500cm
Heliotropium inexplicitum	+	5cm
Heliotropium pachyphyllum	+	20cm
Indigofera georgei	<1	65cm
Lepidium phlebopetalum	+	10cm
**Malvastrum americanum*	+	
Melhania oblongifolia	+	
Peripleura arida	+	20cm
Perotis rara	+	5 cm
Pluchea dunlopii	+	30cm
Polymeria ambigua	+	20cm
**Portulaca oleracea*	+	5cm
Pterocaulon sphaeranthoides	<1	45cm
Ptilotus obovatus		
Rhagodia eremaea	+	1.8m
Rhynchosia minima	+	30cm

Species	Cover (%)	Height
Schizachyrium fragile	+	4cm
Sclerolaena cornishiana	+	30cm
Setaria sp.	+	20cm
Sida aff. *fibulifera* (oblong; MET 15 220)	+	20cm
Stemodia grossa	+	40cm
Streptoglossa decurrens	+	35cm
Stylobasium spathulatum	+	2-2.5m
Themeda triandra	+	
Trichodesma zeylanicum var. *zeylanicum*	+	40cm
Triodia longiceps	80-90	90cm-1m
Zygophyllum eichleri	+	12cm

Site YBI22
Described by RB/B Date 18/06/2007 Type Q63m*65m
MGA Zone 50734881mE 7472495 mN
Habitat Lower part of colluvial spur slopes with edge of shallow depression included
Soil
Rock Type ironstone
Vegetation *Eucalyptus gamophylla* low open woodland over *Acacia inaequilatera* scattered tall shrubs over *Indigofera monophylla*, *Corchorus tectus* scattered low shrubs over *Triodia basedowii*, (*Aristida holathera, Amphipogon sericeus, Eragrostis eriopoda*) Hummock (tussock) grassland
Veg Condition Excellent
Fire Age burnt greater than 5-6 years ago
Notes Poor quadrat. Difficult vegetation to sample. Narrow colluvial spurs with very shallow flow lines/depressions between/amongst them. Mostly Eucalyptus gamophylla in depressions. Irregular shape to quadrat.
2008: very dry

Species	Cover (%)	Height
Acacia ancistrocarpa	+	
Acacia aneura var. ?	+	35 cm
Acacia dictyophleba	+	
Acacia elachantha	+	2 m
Acacia inaequilatera	+	2.5-4 m
Acacia pachyacra	+	2.5-3 m
Acacia pruinocarpa	+	
Acacia tenuissima	+	
Amphipogon sericeus	+	
Aristida contorta	+	30 cm
Aristida holathera var. *holathera*		20 cm
Aristida pruinosa	+	70 cm
Bonamia rosea	+	30cm
Cassia glutinosa	+	90 cm
Cassia helmsii	+	100cm
Cassia luerssenii	+	70cm
Cassia oligophylla x helmsii	+	30-80 cm
**Cenchrus ciliaris*	+	25cm
Corchorus tectus	+	20 cm
Cullen leucochaites	+	15 cm
Cymbopogon ambiguus	+	
Dampiera candicans	+	45 cm
Dicrastylis cordifolia	+	50 cm
Digitaria brownii	+	45 cm
Duperreya commixta	+	
Eragrostis eriopoda	1	30 cm
Eriachne aristidea	+	20 cm
Eucalyptus gamophylla		
Goodenia stobbsiana	+	20 cm
Gossypium australe (Burrup Peninsula form)	+	30 cm
Grevillea wickhamii	+	2.1 m
Hakea lorea subsp. lorea	+	
Heliotropium pachyphyllum	+	20cm
Hibiscus burtonii	+	45cm-1.1 m

Hibiscus leptocladus	+	30 cm
Hibiscus sturtii var. platychlamys	+	
Hybanthus aurantiacus	+	30 cm
Indigofera monophylla (brown calyx form)	+	
Mollugo molluginea	+	20 cm
Paraneurachne muelleri	+	
Polycarpaea longiflora	+	
Ptilotus astrolasius var. *astrolasius*	+	
Ptilotus calostachyus	+	
Ptilotus exaltatus var. *exaltatus*	+	50 cm
Ptilotus exaltatus var. *exaltatus*	+	
Ptilotus obovatus	+	70 cm
Scaevola parvifolia subsp. *pilbarae*	+	
Sida cardiophylla	+	40 cm
Solanum lasiophyllum	+	
Solanum phlomoides	+	90 cm
Solanum sturtianum	+	
Streptoglossa decurrens	+	35cm
Tephrosia rosea var. *glabrior*	+	
Trachymene oleracea subsp. *oleracea*	+	50 cm
Trichodesma zeylanicum var. *zeylanicum*	+	1 m
Triodia basedowii		50cm
Triodia pungens	+	70cm

Site YBI28
Described by RW/PH; Date 20/06/2007; Type Q50m*50m
MGA Zone 50734936 mE; 7473803 mN

Habitat	broad plain
Soil	red-brown sandy loam
Rock Type	ironstone and jasper
Vegetation	*Petalostylis cassioides* (*Acacia ancistrocarpa*) shrubland over *Dicrastylis cordifolia* scattered low shrubs over *Triodia basedowii* very open hummock grassland over *Amphipogon sericeus, Aristida holathera* tussock grassland
Veg Condition	Excellent
Fire Age	burnt greater than 5 years ago
Notes	2008: Cattle have walked through

Species	Cover (%)	Height
Acacia ancistrocarpa	1	
Acacia dictyophleba	+	2 m
Acacia inaequilatera	+	1.6 m
Acacia pachyacra	+	150cm
Acacia pruinocarpa	+	
Amphipogon sericeus	20	40 cm
Aristida contorta	4	
Aristida holathera var. *holathera*	10	
Bonamia sp.	+	
Cassia glutinosa x luerssenii	+	
Cassia luerssenii	+	1 m
Cassia oligophylla x helmsii	+	
Corchorus sidoides subsp. sidoides	+	40cm
Corchorus tectus	+	15 cm
Cymbopogon ambiguus	+	1.6 m
Cymbopogon obtectus	+	60cm
Dicrastylis cordifolia	+	
Dodonaea sp.	+	
Eragrostis eriopoda	+	
Eremophila latrobei subsp. filiformis	+	
Evolvulus alsinoides var. *villosicalyx*	+	25cm
Hakea lorea subsp. *lorea*	+	60cm
Hybanthus aurantiacus	+	
Indigofera monophylla (brown calyx form)		
Maireana villosa	+	20 cm
Mollugo molluginea	+	15 cm

Species	Cover (%)	Height
Paraneurachne muelleri	1	40 cm
Petalostylis cassioides	30	1.3-2 m
Ptilotus astrolasius var. *astrolasius*	+	30 cm
Ptilotus calostachyus	+	
Ptilotus exaltatus var. *exaltatus*	+	
Scaevola parvifolia subsp. *pilbarae*	+	
Sida arenicola	+	6cm
Sida cardiophylla	+	25 cm
Solanum lasiophyllum	+	15cm
Solanum sturtianum	+	40 cm- 1 m
Tephrosia aff. *supina* (WW23-22)	+	25 cm
Trichodesma zeylanicum var. *zeylanicum*	+	50cm
Triodia basedowii		35-60 cm
Acacia ancistrocarpa	1	
Acacia dictyophleba	+	2 m
Acacia inaequilatera	+	1.6 m
Acacia pachyacra	+	150cm
Acacia pruinocarpa	+	
Amphipogon sericeus	20	40 cm
Aristida contorta	4	
Aristida holathera var. *holathera*	10	
Bonamia sp.	+	
Cassia glutinosa x luerssenii	+	
Cassia luerssenii	+	1 m
Cassia oligophylla x helmsii	+	
Corchorus sidoides subsp. *sidoides*	+	40cm
Corchorus tectus	+	15 cm
Cymbopogon ambiguus	+	1.6 m
Cymbopogon obtectus	+	60cm
Dicrastylis cordifolia	+	
Dodonaea sp.	+	
Eragrostis eriopoda	+	
Eremophila latrobei subsp. *filiformis*	+	
Evolvulus alsinoides var. *villosicalyx*	+	25cm
Hakea lorea subsp. *lorea*	+	60cm
Hybanthus aurantiacus	+	
Indigofera monophylla (brown calyx form)		
Maireana villosa	+	20 cm
Mollugo molluginea	+	15 cm
Paraneurachne muelleri	1	40 cm
Petalostylis cassioides	30	1.3-2 m
Ptilotus astrolasius var. *astrolasius*	+	30 cm
Ptilotus calostachyus	+	
Ptilotus exaltatus var. *exaltatus*	+	
Scaevola parvifolia subsp. *pilbarae*	+	
Sida arenicola	+	6cm
Sida cardiophylla	+	25 cm
Solanum lasiophyllum	+	15cm
Solanum sturtianum	+	40 cm- 1 m
Tephrosia aff. *supina* (WW23-22)	+	25 cm
Trichodesma zeylanicum var. *zeylanicum*	+	50cm
Triodia basedowii		35-60 cm

SiteYBI31S
Described by JA/RB Date 5/08/2008; Type Q50x50m
MGA Zone 50735808; mE; 7473443 mN

Habitat	Moderately steep north facing rocky slope at large hill/ spur.
Soil	Skeletal red brown loam, surface outcropping, cobbles and pebbles on surface.
Rock Type	Ironstone.
Vegetation	*Eucalyptus leucophloia* scattered low trees over *Grevillea wickhamii* subsp. *hispidula* tall open shrubland over *Acacia hilliana* low shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia wiseana* hummock grassland.

June 09: *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Grevillea wickhamii* subsp. *hispidula* scattered tall shrubs and *Acacia hilliana* low shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) (Triodia wiseana) hummock grassland

Veg Condition
Fire Age < 3 years ago
Notes

Species	Cover (%)	Height
Acacia adoxa var. *adoxa*	+	60cm
Acacia arida	+	90cm
Acacia arida x hilliana	+	60cm
Acacia bivenosa	+	170cm
Acacia hilliana	30%	50-100cm
Acacia tenuissima	+	1.5m
Cassia glutinosa	+	1m
Cassia luerssenii	+	150cm
Eriachne mucronata (typical form)	+	30cm
Eucalyptus leucophloia subsp. *leucophloia*	2%	600-800cm
Fimbristylis dichotoma	+	4cm
Fimbristylis simulans	+	6cm
Goodenia stobbsiana	+	15cm
Goodenia triodiophila	+	40cm
Grevillea wickhamii subsp. *hispidula*	2%	100-300cm
Jasminum didymum subsp. *lineare*	+	60cm
Polycarpaea holtzei	+	2cm
Schizachyrium fragile	+	5cm
Solanum horridum	+	2cm
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	40%	40cm
Triodia wiseana	10%	45cm

Site YBI32S
Described by RO/PC; Date 5/08/2008; Type Q
MGA Zone 50; 735553 mE; 7472936 mN
Habitat Low, stony hill/rise, east of broader plain area.
Soil Skeletal, red brown clay; with some loam content.
Rock Type Ironstone.
Vegetation *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia bivenosa* open shrubland over *Acacia hilliana* scattered low shrubs over *Triodia wiseana Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) closed hummock grassland
June 09: *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia bivenosa* (*Acacia spondylophylla, Acacia hilliana*) scattered shrubs over *Triodia wiseana* (*Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835)) hummock grassland
Veg Condition Excellent- no signs of disturbance.
Fire Age Unburnt for 7 years
Notes

Species	Cover (%)	Height
Acacia ancistrocarpa	+	150cm
Acacia aneura var. *pilbarana*	<1%	4.2m
Acacia bivenosa	8-10%	2m
Acacia hilliana	1%	60cm
Acacia spondylophylla	1-2%	1.4m
Acacia synchronicia	+	1.7m
Acacia tenuissima	+	1.9m
Aristida contorta	+	20cm
Aristida holathera var. *holathera*	+	40cm
Bulbostylis barbata	+	15cm
Cassia glutinosa	+	1.5m
Cassia glutinosa x luerssenii	+	100cm
Cassia luerssenii	+	70cm
Cassia oligophylla x helmsii	+	1.2m
Cassia pruinosa	+	45cm
Cassia sericea	+	50cm
Cassia sp. Meekatharra (E. Bailey 1-26)	+	2m

Species	Cover (%)	Height
Cymbopogon obtectus	+	80cm
Dicrastylis cordifolia	+	50cm
Duperreya commixta	+	climber
Eriachne pulchella subsp. *dominii*	+	15cm
Eucalyptus gamophylla	+	200cm
Eucalyptus gamophylla	+	1.7m
Eucalyptus leucophloia subsp. *leucophloia*	2%	9m
Fimbristylis simulans	+	10cm
Gompholobium sp. Pilbara (N.F. Norris 908)	+	60cm
Goodenia triodiophila	+	25cm
Grevillea wickhamii	+	1.5m
Hakea lorea subsp. *lorea*	+	45cm
Paraneurachne muelleri	+	35cm
Polycarpaea corymbosa var. *corymbosa*	+	15cm
Ptilotus obovatus	+	100cm
Sclerolaena cornishiana	+	30cm
Solanum horridum	+	30cm
Solanum lasiophyllum	+	60cm
Solanum sturtianum	+	40cm
Tribulus suberosus	+	50cm
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	20%	25cm
Triodia wiseana	40%	35-40cm

SiteYBI33S
Described by JA/RB; Date 5/08/2008; Type Q
MGA Zone50; 736928 mE; 7476077 mN

Habitat	Medium sized rocky hill crest/spur colluvial.
Soil	Red brown loam.
Rock Type	Iron and quartz- brittle
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Grevillea wickhamii* subsp. *hispidula* tall open shrubland over *Acacia hilliana*, *Gompholobium karijini* low open heath over *Triodia wiseana*, (*Triodia pungens*) very open hummock grassland
June 09:	*Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Grevillia wickhamii* subsp. *hispidula* (*Acacia hilliana*) tall open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) (*Triodia epactia*) open hummock grassland
Veg Condition	Excellent
Fire Age	>3 years
Notes	Dry conditions, annual dead.

Species	Cover (%)	Height
Acacia adoxa var. *adoxa*	+	40cm
Acacia ayersiana	+	160cm
Acacia hilliana	40%	70cm
Acacia pruinocarpa	+	1.2m
Aristida holathera var. *holathera*	+	20cm
Bonamia media var. *villosa*	+	5cm
Cassia luerssenii	+	2m
Cassia oligophylla x helmsii	+	40cm
Corchorus lasiocarpus subsp. *lasiocarpus*	+	
Corchorus lasiocarpus subsp. *parvus*	+	40cm
Eriachne mucronata	+	45cm
Eriachne mucronata (arid form) (MET 12 736)	+	35cm
Eriachne pulchella subsp. *dominii*	+	3cm
Eucalyptus leucophloia subsp. *leucophloia*	3-4%	300-600cm
Fimbristylis simulans	+	20cm
Gompholobium sp. Pilbara (N.F. Norris 908)	3%	70cm
Goodenia stobbsiana	+	20cm
Goodenia triodiophila	+	50cm
Grevillea wickhamii subsp. *hispidula*	5-10%	200-300cm
Petalostylis cassioides	+	1.4m
Polycarpaea longiflora	+	40cm
Ptilotus calostachyus	+	25-100cm
Solanum lasiophyllum	+	40-50cm

Species	Cover (%)	Height
Triodia pungens	1%	90cm
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	25%	30cm
Triodia wiseana	5%	

Site YBI34S
Described by RO/PC Date 5/08/2008 Type Q50x50m
MGA Zone 50737003 mE; 7476593 mN

Habitat	Plain at foot slope area of surrounding hills.
Soil	Very fine loam with medium to high clay content; colluvial and alluvial deposition.
Rock Type	Ironstone.
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Eucalyptus gamophylla* tall open shrubland *Acacia bivenosa, A. ancistrocarpa, Petalostylis cassioides* open heath over *Triodia wiseana* (*Triodia pungens*) hummock grassland
June 09:	*Eucalyptus gamophylla* scattered low trees over *Acacia bivenosa, Acacia ancistrocarpa, Petalostylis cassioides* scattered tall shrubs over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) (*Triodia pungens, Triodia wiseana*) open hummock grassland
Veg Condition	Excellent: no weeds or cattle grazing disturbance.
Fire Age	> 5 years
Notes	

Species	Cover (%)	Height
Acacia adoxa var. *adoxa*	<1%	65cm
Acacia adsurgens	1%	75cm
Acacia aff. *aneura* (narrow fine veined; site 1259)	+	120cm
Acacia ancistrocarpa	1%	300cm
Acacia bivenosa	3%	250cm
Acacia citrinoviridis	+	165cm
Acacia dictyophleba	+	150cm
Acacia hilliana	+	60cm
Acacia tenuissima	+	170cm
Acacia tumida var. *pilbarensis*	+	15cm
Aristida contorta	+	25cm
Aristida holathera var. *holathera*	<1%	30cm
Bonamia media var *villosa*	<1%	30cm
Bonamia rosea	+	40cm
Cassia glutinosa x luerssenii	+	100cm
Cassia luerssenii	+	1m
Cassia notabilis	+	10cm
Cassia oligophylla x helmsii	<1%	65cm
Corchorus lasiocarpus subsp. *lasiocarpus*	+	80cm
Crotalaria medicaginea	+	35cm
Cucumis maderaspatanus	+	15cm
Cymbopogon obtectus	<1%	55cm
Dicrastylis cordifolia	+	30cm
Digitaria brownii	+	60cm
Dodonaea coriacea	+	110cm
Duperreya commixta	+	climber
Enneapogon polyphyllus	+	35cm
Eragrostis eriopoda	+	40cm
Eriachne aristidea	+	30cm
Eriachne pulchella subsp. *pulchella*	+	15cm
Eucalyptus gamophylla	1%	350cm
Eucalyptus leucophloia subsp. *leucophloia*	1%	6.5m
Euphorbia australis (mid-green form)	+	20cm
Evolvulus alsinoides var. *villosicalyx*	+	15cm
Goodenia microptera	+	35cm
Goodenia muelleriana	+	40cm
Goodenia stobbsiana	+	40cm
Grevillea wickhamii	<1%	2.6m
Grevillea wickhamii subsp. *hispidula*	+	350cm
Hakea chordophylla	+	250cm
Haloragis gossei	+	15cm
Heliotropium pachyphyllum	+	15cm

Species	Cover (%)	Height
Hibiscus aff. *coatesii* (MET 16,542)	+	165cm
Hibiscus sturtii var. *campylochlamys*	+	8-10cm
Hybanthus aurantiacus	+	20cm
Indigofera monophylla (brown calyx form)	+	30cm
Isotropis atropurpurea	+	40cm
Keraudrenia nephrosperma	+	150cm
Keraudrenia velutina subsp. *elliptica*	+	1m
Mollugo molluginea	+	15cm
Paraneurachne muelleri	1-2%	40cm
Petalostylis cassioides	20%	1.7m
Petalostylis cassioides	1%	130cm
Phyllanthus erwinii	+	15cm
Polycarpaea longiflora	+	30cm
Pterocaulon sphaeranthoides	+	60cm
Ptilotus astrolasius var. *astrolasius*	+	40cm
Ptilotus auriculifolius	+	25cm
Ptilotus calostachyus	+	85cm
Ptilotus exaltatus var. *exaltatus*	+	4cm
Ptilotus obovatus	+	60cm
Scaevola parvifolia subsp. *pilbarae*	+	30cm
Schizachyrium fragile	+	40cm
Sclerolaena cornishiana	+	50cm
**Setaria verticillata*	+	35cm
Sida arenicola	+	20cm
Sida cardiophylla	+	55cm
Solanum lasiophyllum	+	60cm
Streptoglossa decurrens	+	20cm
Tephrosia aff. *densa*	+	10cm
Tephrosia aff. *supina* (HD133-20)	+	10cm
Tephrosia supina	+	15cm
Trachymene oleracea subsp. *oleracea*	+	40cm
Trichodesma zeylanicum var. *zeylanicum*	+	35cm
Triodia aff. *basedowii*	1-2%	50cm
Triodia basedowii	20%	25cm
Triodia pungens	4%	100cm
Triodia wiseana	6%	30cm

Site YBI35S
Described by RB/RO Date 5/08/2008 Type Q50m x 50m
MGA Zone 50; 736744 mE; 7475197 mN

Habitat	Low foothills/plain area. Broad drainage area.
Soil	Fine red loam
Rock Type	Banded ironstone formation: creek loamy. Stony on higher ground.
Vegetation	*Corymbia hamersleyana* scattered low trees over *Acacia pyrifolia, A. tumida var. pilbarensis, A. pachyacra* tall shrubland over *Triodia pungens* hummock grassland
June 09:	*Corymbia hamersleyana* low open woodland over *Acacia pyrifolia* (*Grevillea wickhamii, Cassia oligophylla x helmsii*) tall open shrubland over *Triodia pungens* (*Triodia brizoides*) open hummock grassland
Veg Condition	Excellent, but dry season. Annuals all finished.
Fire Age	No evidence of fire
Notes	Accuracy at NW corner = 4m. Drainage line vegetation on southern edge of quadrat is the same as rest of vegetation in the quadrat, except there are more tall shrubs (higher density) and the substrate is sandy loam and less rocky.

Species	Cover (%)	Height
Abutilon otocarpum	+	3cm
Acacia bivenosa	+	160cm
Acacia pachyacra	+	200cm
Acacia pruinocarpa	+	60cm
Acacia pyrifolia	15%	100-350cm
Acacia tumida var. *pilbarensis*	+	170cm
Alternanthera nana	+	10cm
Aristida holathera var. *holathera*	+	10cm

Species	Cover (%)	Height
Boerhavia coccinea	+	25cm
Bonamia rosea	+	30cm
Bulbostylis barbata	+	15cm
Cassia helmsii	+	150cm
Cassia notabilis	+	20cm
Cassia oligophylla x helmsii	1%	100cm
**Cenchrus ciliaris*	+	15cm
Cleome viscosa	+	100cm
Corymbia hamersleyana	2%	800cm
Crotalaria medicaginea	+	30cm
Cucumis maderaspatanus	+	climber
Dicrastylis cordifolia	+	100cm
Duperreya commixta	+	climber
Enneapogon caerulescens	+	25cm
Enneapogon polyphyllus	+	25cm
Eragrostis cumingii	+	15cm
Eragrostis eriopoda	+	40-50cm
Eucalyptus gamophylla	+	350cm
Euphorbia australis (mid-green form)	+	30cm
Euphorbia tannensis subsp. eremophila (Hamersley form)	+	30cm
Evolvulus alsinoides var. *villosicalyx*	+	20cm
Gomphrena cunninghamii	+	5cm
Goodenia microptera	+	20cm
Gossypium robinsonii	+	120cm
Grevillea wickhamii	1%	300cm
Heliotropium cunninghamii	+	20cm
Hibiscus sturtii var. *platychlamys*	+	8cm
Hybanthus aurantiacus	+	30cm
Indigofera georgei	1%	60-100cm
Jasminum didymum subsp. *lineare*	+	6cm
Paspalidium basicladium	+	20cm
Perotis rara	+	4cm
Petalostylis cassioides	+	100cm
Phyllanthus erwinii	+	30cm
Polycarpaea longiflora	+	20cm
Pterocaulon sphaeranthoides	+	30cm
Ptilotus astrolasius var. *astrolasius*	+	10cm
Ptilotus exaltatus var. *exaltatus*	+	75cm
Ptilotus polystachyus var. *polystachyus*	+	25cm
Scaevola parvifolia subsp. *pilbarae*	+	20cm
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	+	30cm
Solanum lasiophyllum	+	40cm
Tephrosia rosea var. *glabrior*	+	20cm
Themeda triandra		to 75cm
Trachymene oleracea subsp. *oleracea*	+	30cm
Trianthema pilosa	+	10cm
Trichodesma zeylanicum var. *zeylanicum*	+	120cm
Triodia brizoides	+	40cm
Triodia lanigera	1-2%	50cm
Triodia pungens	20%	50cm
Waltheria indica	+	12cm

Site YBI-RO-RA
Described by RO Date 17/06/2007 Type R
MGA Zone50; 734811 mE; 7473115 mN

Habitat	alluvial clay patch in a localised drainage feature in a broad plain
Soil	alluvial, red-brown clay to loamy clay
Rock Type	ironstone
Vegetation	*Acacia aneura* (grey bushy form), *Eucalyptus leucophloia* subsp. *leucophloia* low open forest over *Psydrax latifolia* open shrubland over *Triodia brizoides* open hummock grassland and *Digitaria brownii* very open tussock grassland and scattered herbs
Veg Condition	Excellent

Fire Age	burnt greater than 8-10 years
Notes	Relevé in a Mulga drainage grove/patch. Surrounded by *Acacia* shrubland plain of mixed tall shrub species over a hummock grassland of *Triodia* sp.

Species	Cover (%)	Height
Abutilon lepidum	+	40-45 cm
Acacia adsurgens	+	190 cm
Acacia aneura (grey bushy form; MET 15 732)	45-55	6 m
Acacia aneura var. aneura	+	550 cm
Acacia pruinocarpa	+	7 m
Anthobolus leptomerioides	+	150 cm
Aristida contorta	+	25-30 cm
Aristida holathera var. holathera	+	50 cm
Cassia helmsii	+	65 cm
Cassia luerssenii	1	180 cm
Cassia oligophylla	+	1 m
Cucumis maderaspatanus	+	
Cymbopogon ambiguus	+	70 cm
Digitaria brownii		45 cm
Duperreya commixta		
Enchylaena tomentosa var. *tomentosa*	1	50 cm
Enneapogon caerulescens	+	50 cm
Enneapogon polyphyllus	+	20 cm
Eremophila latrobei subsp. *filiformis*	1	90 cm
Eucalyptus leucophloia subsp. *leucophloia*		7 m
Hakea chordophylla		25 cm
Hibiscus burtonii	+	40 cm
Paraneurachne muelleri	1	40 cm
Polycarpaea longiflora	+	25 cm
Psydrax latifolia		160 cm
Pterocaulon sphacelatum	+	25 cm
Ptilotus exaltatus var. *exaltatus*	+	90 cm
Sclerolaena cornishiana	+	50 cm
Solanum lasiophyllum	+	1 m
Streptoglossa decurrens	+	75-80 cm
Tribulus suberosus		100 cm
Triodia basedowii		
Triodia brizoides	25-30	40 cm

Appendix 4

Vascular Flora Species List

Note: * denotes introduced species (weeds)

Comparison of *Cassia* vs. *Senna* nomenclature:

Cassia ferraria	=	*Senna ferraria*
Cassia glutinosa	=	*Senna glutinosa* subsp. *glutinosa*
Cassia helmsii	=	*Senna artemisioides* subsp. *helmsii*
Cassia luerssenii	=	*Senna glutinosa* subsp. x *luerssenii*
Cassia notabilis	=	*Senna notabilis*
Cassia oligophylla	=	*Senna artemisioides* subsp. *oligophylla*
Cassia pruinosa	=	*Senna artemisioides* subsp. *pruinosa*
Cassia sericea	=	*Senna sericea*
Cassia sp. Meekatharra (E Bailey 1-26)	=	*Senna* sp. Meekatharra (E Bailey 1-26)

Family: Acanthaceae (325)

Dicladanthera forrestii

Family: Adiantaceae (7)

Cheilanthes sieberi subsp. *sieberi*

Family: Aizoaceae (110)

Trianthema glossostigma
Trianthema pilosa

Family: Amaranthaceae (106)

Alternanthera nana
Gomphrena cunninghamii
Ptilotus aervoides
Ptilotus astrolasius var. *astrolasius*
Ptilotus auriculifolius
Ptilotus calostachyus
Ptilotus exaltatus var. *exaltatus*
Ptilotus gaudichaudii var. *gaudichaudii*
Ptilotus helipteroides
Ptilotus obovatus
Ptilotus polystachyus var. *polystachyus*
Ptilotus rotundifolius

Family: Apiaceae (281)

Trachymene oleracea subsp. *oleracea*

Family: Asteraceae (345)

**Bidens bipinnata*
Blumea tenella
Chrysocephalum pterochaetum
Peripleura arida
Pluchea dunlopii
Pluchea ferdinandi-muelleri
Pterocaulon sphacelatum
Pterocaulon sphaeranthoides
Streptoglossa bubakii
Streptoglossa decurrens

Family: Boraginaceae (310)

Heliotropium cunninghamii
Heliotropium inexplicitum
Heliotropium pachyphyllum
Trichodesma zeylanicum var. *zeylanicum*

Family: Brassicaceae (138)

Lepidium phlebopetalum

Family: Caesalpiniaceae (164)

Cassia aff. *oligophylla* (thinly sericeous) *x glutinosa*
Cassia ferraria
Cassia glutinosa
Cassia glutinosa x luerssenii
Cassia helmsii
Cassia luerssenii

Cassia notabilis
Cassia oligophylla
Cassia oligophylla x helmsii
Cassia pruinosa
Cassia sericea
Cassia sp. Meekatharra (E. Bailey 1-26)
Petalostylis cassioides

Family: Capparaceae (137A)

Capparis spinosa var. *nummularia*
Cleome viscosa

Family: Caryophyllaceae (113)

Polycarpaea corymbosa var. *corymbosa*
Polycarpaea holtzei
Polycarpaea longiflora

Family: Chenopodiaceae (105)

Dysphania melanocarpa
Dysphania rhadinostachya
Enchylaena tomentosa var. *tomentosa*
Maireana planifolia
Maireana villosa
Rhagodia eremaea
Sclerolaena cornishiana

Family: Convolvulaceae (307)

Bonamia media var. *villosa*
Bonamia rosea
Bonamia sp.
Convolvulus angustissimus subsp. *angustissimus*
Duperreya commixta
Evolvulus alsinoides var. *villosicalyx*
Polymeria ambigua

Family: Cucurbitaceae (337)

Cucumis maderaspatanus

Family: Cyperaceae (32)

Bulbostylis barbata
Fimbristylis dichotoma
Fimbristylis simulans

Family: Euphorbiaceae (185)

Euphorbia australis (mid-green form)
Euphorbia biconvexa
Euphorbia sp.
Euphorbia sp. (site 1089)
Euphorbia tannensis subsp. *eremophila* (Hamersley form)
Phyllanthus erwinii

Family: Goodeniaceae (341)

Dampiera candicans
Goodenia microptera
Goodenia muelleriana
Goodenia prostrata
Goodenia stobbsiana
Goodenia triodiophila
Scaevola parvifolia subsp. *pilbarae*

Family: Gyrostemonaceae (108)

Codonocarpus cotinifolius

Family: Haloragaceae (276)

Haloragis gossei

Family: Lamiaceae (313)

Dicrastylis cordifolia

Family: Loranthaceae (97)

Amyema hilliana
Lysiana sp.

Family: Malvaceae (221)

Abutilon aff. *lepidum* (1) (MET 15 352)
Abutilon lepidum
Abutilon macrum
Abutilon otocarpum
Gossypium australe (Burrup Peninsula form)
Gossypium robinsonii
Hibiscus aff. *coatesii* (MET 16,542)
Hibiscus burtonii
Hibiscus leptocladus
Hibiscus sturtii var. aff. *grandiflorus*
Hibiscus sturtii var. *campylochlamys*
Hibiscus sturtii var. *platychlamys*
**Malvastrum americanum*
Sida aff. *fibulifera*
Sida aff. *fibulifera* (FMG125-20)
Sida aff. *fibulifera* (oblong; MET 15 220)
Sida arenicola
Sida cardiophylla
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)
Sida sp. verrucose glands (F.H. Mollemans 2423)

Family: Mimosaceae (163)

Acacia adoxa var. *adoxa*
Acacia adsurgens
Acacia aff. *aneura* (narrow fine veined; site 1259)
Acacia aff. *ayersiana* (YBI08-01)
Acacia ancistrocarpa
Acacia aneura (grey bushy form; MET 15 732)
Acacia aneura var. ?
Acacia aneura var. *aneura*
Acacia aneura var. *intermedia*
Acacia aneura var. *pilbarana*
Acacia arida
Acacia arida x hilliana
Acacia ayersiana
Acacia bivenosa
Acacia citrinoviridis
Acacia coriacea subsp. *pendens*
Acacia dictyophleba
Acacia elachantha
Acacia hilliana
Acacia inaequilatera
Acacia pachyacra
Acacia pruinocarpa
Acacia pyrifolia
Acacia sclerosperma subsp. *sclerosperma*
Acacia sibirica
Acacia sibirica (linear form)
Acacia spondylophylla
Acacia synchronicia
Acacia tenuissima
Acacia tumida var. *pilbarensis*
**Vachellia farnesiana*

Family: Molluginaceae (110A)

Mollugo molluginea

Family: Myoporaceae (326)

Eremophila forrestii subsp. *forrestii*
Eremophila jucunda subsp. *pulcherrima*
Eremophila lanceolata
Eremophila latrobei subsp. *filiformis*
Eremophila longifolia

Family: Myrtaceae (273)

Corymbia candida
Corymbia hamersleyana
Eucalyptus gamophylla
Eucalyptus leucophloia subsp. *leucophloia*

Family: Nyctaginaceae (107)

Boerhavia coccinea

Family: Oleaceae (301)

Jasminum didymum subsp. *lineare*

Family: Papilionaceae (165)

Crotalaria medicaginea
Cullen leucochaites
Glycine canescens
Gompholobium sp. Pilbara (N.F. Norris 908)
Indigofera georgei
Indigofera monophylla (brown calyx form)
Isotropis atropurpurea
Rhynchosia minima
Tephrosia aff. *densa*
Tephrosia aff. *supina* (HD133-20)
Tephrosia aff. *supina* (MET 12,357)
Tephrosia aff. *supina* (WW23-22)
Tephrosia rosea var. *glabrior*
Tephrosia supina

Family: Poaceae (31)

Amphipogon caricinus
Amphipogon sericeus
Aristida contorta
Aristida holathera var. *holathera*
Aristida inaequiglumis
Aristida pruinosa
Aristida sp.
Bothriochloa ewartiana
**Cenchrus ciliaris*
**Cenchrus setiger*
Chrysopogon fallax
Cymbopogon ambiguus
Cymbopogon obtectus
Dichanthium sericeum subsp. *humilius*
Digitaria brownii
Digitaria ctenantha
Enneapogon caerulescens
Enneapogon lindleyanus
Enneapogon polyphyllus
Enneapogon robustissimus
Enteropogon ramosus
Eragrostis cumingii
Eragrostis eriopoda
Eragrostis tenellula
Eragrostis xerophila
Eriachne aristidea
Eriachne mucronata
Eriachne mucronata (arid form) (MET 12 736)

Eriachne mucronata (typical form)
Eriachne pulchella subsp. *dominii*
Eriachne pulchella subsp. *pulchella*
Eulalia aurea
Iseilema membranaceum
Paraneurachne muelleri
Paspalidium basicladium
Paspalidium clementii
Perotis rara
Schizachyrium fragile
Setaria sp.
**Setaria verticillata*
Sporobolus australasicus
Themeda triandra
Triodia aff. *basedowii*
Triodia basedowii
Triodia brizoides
Triodia epactia
Triodia lanigera
Triodia longiceps
Triodia pungens
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)
Triodia wiseana
Triraphis mollis

Family: Portulacaceae (111)

Calandrinia ptychosperma
**Portulaca oleracea*
Portulaca pilosa

Family: Proteaceae (90)

Grevillea wickhamii
Grevillea wickhamii subsp. *hispidula*
Hakea chordophylla
Hakea lorea subsp. *lorea*

Family: Rubiaceae (331)

Psydrax latifolia
Psydrax suaveolens
Spermacoce brachystema

Family: Santalaceae (92)

Anthobolus leptomerioides

Family: Sapindaceae (207)

Atalaya hemiglauca
Dodonaea coriacea
Dodonaea sp.

Family: Scrophulariaceae (316)

Stemodia grossa

Family: Solanaceae (315)

Nicotiana occidentalis subsp. *occidentalis*
Nicotiana rosulata
Nicotiana simulans
Solanum horridum
Solanum lasiophyllum
Solanum phlomoides
Solanum sturtianum

Family: Sterculiaceae (223)

Keraudrenia nephrosperma
Keraudrenia velutina subsp. *elliptica*
Melhania oblongifolia
Melhania sp. (CH15-39)

	Waltheria indica
Family: Surianaceae (160)	
	Stylobasium spathulatum
Family: Tiliaceae (220)	
	Corchorus crozophorifolius
	Corchorus lasiocarpus subsp. *lasiocarpus*
	Corchorus lasiocarpus subsp. *parvus*
	Corchorus sidoides subsp. *sidoides*
	Corchorus sidoides subsp. *vermicularis*
	Corchorus tectus
	Corchorus tridens
Family: Violaceae (243)	
	Hybanthus aurantiacus
Family: Zygophyllaceae (173)	
	Tribulus macrocarpus
	Tribulus suberosus
	Zygophyllum eichleri

Fungi

Family: Coriolaceae (1105)	
	Pycnoporus coccineus
Family: Podaxaceae (1061)	
	Podaxis pistillaris

Appendix 5

Weed Records from the Billiards Study Area

Species	Location		No. of Individuals / Percent Cover
	Easting (GDA 94)	Northing (GDA 94)	
**Bidens bipinnata*	735518	7475188	Scattered
	736687	7477149	Scattered
	734832	7475182	Scattered
**Cenchrus ciliaris*	736437	7477279	2 – 3 %
	735518	7475188	Scattered
	736342	7477013	6 %
	736687	7477149	Scattered
	734832	7475182	3 – 5 %
	734904	7472469	Scattered
	736781	7475190	Scattered
**Cenchrus setiger*	736687	7477149	Scattered
	734832	7475182	Scattered
**Malvastrum americanum*	735518	7475188	2 – 3 %
	736342	7477013	Scattered
	735845	7475759	Scattered
	736687	7477149	1 %
	734832	7475182	Scattered
**Portulaca oleracea*	735518	7475188	Scattered
	736687	7477149	Scattered
	734832	7475182	Scattered
**Setaria verticillata*	736687	7477149	Scattered
	737033	7476575	Scattered
**Vachellia farnesiana*	735518	7475188	Scattered