Northern Minerals

Browns Range Project

Level 2 Vegetation and Flora Survey and Impact Assessment

June 2014

Final Report

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Level 2 Vegetation and Flora Survey and Impact Assessment

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Executive Summary

Northern Minerals commissioned Outback Ecology to undertake a Level 2 flora and vegetation baseline and impact assessment of the proposed Browns Range (the Project), which is located approximately 150 km southeast of Halls Creek in the Tanami bioregion of Western Australia.

The Study Area considered by this Assessment consisted of 16,294 ha containing a Development Envelope of 2590 ha. Northern Minerals have committed to locating the Project within the Development Envelope and clearing no more than 711 ha. Calculations of impacts to flora and vegetation have been made using this footprint to provide scale and context to the impact assessment.

The specific objectives of this flora and vegetation assessment were to:

- produce a list of vascular flora occurring within the Study Area;
- identify any conservation significant flora (including Threatened Flora, Priority Flora) known or potentially occurring within the Study Area and surrounds;
- identify any conservation significant ecological communities (Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) known or potentially occurring within the Study Area and surrounds;
- delineate, characterise and map vegetation associations across the Study Area;
- assess and map vegetation condition across the Study Area;
- identify and specify locations of any introduced species including any exotic or declared weeds; and
- discuss the potential impacts of the Project on flora and vegetation within the Study Area.

The first phase of the Level 2 survey was conducted during excellent seasonal conditions in May 2012 and the second survey was conducted in May 2013, during very good seasonal conditions. A total of 59 quadrats, 82 relevés and numerous mapping notes were recorded throughout the Study Area.

A total of 392 vascular flora species were recorded in the Study Area including 56% of the species previously recorded in the Tanami bioregion. In addition a further 170 species were identified that were not previously listed for the Tanami bioregion on FloraBase, however 143 of these are mapped as occurring there in the Atlas of Living Australia.

No Threatened Flora (TF) (Declared Rare Flora) listed under the *Wildlife Conservation Act 1950* (WA), or Threatened Flora species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) were recorded in the Study Area and none are currently listed for the Tanami subregion.

Four Western Australian Priority Flora species were recorded within the Study Area during the 2012 and 2013 surveys:

- *Eleocharis ochrostachys* (Priority 3);
- *Goodenia crenata* (Priority 3);
- *Heliotropium uniflorum* (Priority 1); and
- *Trachymene villosa* (Priority 1)

Of these Priority Flora species, three populations of *Goodenia crenata* comprising a total of 270 individuals and one population of one individual *Trachymene villosa* are located within the Development Footprint. Clearing for the Disturbance Footprint will impact 4.2% of the *Goodenia crenata* and 2% of the *Trachymene villosa* individuals recorded within the Study Area and thus is highly unlikely to change the conservation status of these species either in the local area, region or in Western Australia.

Seventeen flora species were considered to be of 'Other Conservation Significance' based on criteria including whether they were being considered by DPaW for Priority Flora status and how significant a range extension they represented. Of these, only one species *Brachychiton multicaulis* was located within the Development Footprint. Nine populations comprising 70 individuals of this species are likely to be impacted by the Project and represent an estimated 26% of the total number of individuals within the Study Area. This is relatively high, however given that there are likely to be many additional populations in the Study Area and adjacent vegetation, this is unlikely to have a significant impact on the status of this species. This species occurs in usually very small numbers scattered across the plains. An additional 44 populations representing 196 individuals are known outside of the Development Footprint and of these 44 populations; 12 populations and 53 individuals are outside of the Development Envelope. None of the other species of 'Other Conservation Significance' are within the Development Footprint.

Twenty three vegetation associations and mosaic associations were recorded throughout the Study Area. None of the vegetation associations were analogous to any listed TEC or PEC, consistent with a lack of TEC or PEC listings for the Tanami bioregion. The vegetation in the Study Area was typical of that broadly described for the Tanami, with rocky hills associations (VA1 and VA2) covering 19% and plains, including broad floodplains (VA10, VA6, VA12) covering 67%. The other 18 vegetation associations each comprised between 1 and 5% of the Study Area. However associations VA5, VA7, VA11, VA14, VA16, VA17, VA18, VA19 and VA20 were all intercepted by either corridors or were on the edge of the Study Area and extended outside to varying degrees. Impacts to these associations from proposed clearing activities would be considered low or negligible at a regional scale. Vegetation associations VA3, VA4 and VA13 however, were considered to be of local significance not only as they were limited within the Study Area but also lacked representation in the surrounding landscape. Vegetation Association VA3 has been excluded from the Project for this reason and that it supports two species of Short Range Endemic invertebrates. Vegetation Association 4 does extend

outside of the Study Area but their regional extant is undetermined and thus where possible it should be avoided during construction of the haul road.

No highly reliant Groundwater Dependent Ecosystems (GDEs) were recorded in the Study Area. However some species and vegetation associations appeared to be reliant on surface water flows, including the common and widespread *Eucalyptus victrix* and its associated communities; *Melaleuca* flats vegetation (VA 14); two Priority Flora species (*Eleocharis ochrostachys* and *Goodenia crenata);* and three species of 'Other Conservation Significance' *(Cyperus haspan* subsp. *?juncoides, Fimbristylis pauciflora* and *Goodenia goodeniacea*). However none of the vascular flora species recorded in the Study Area is currently recognised as an obligate phreatophtye groundwater dependent species. Should Project activities substantially modify surface water flows then some vegetation associations may be impacted. These impacts would be considered low or moderate on a local scale and low or negligible on a regional scale. It appears from the footprint provided that the primary impact to surface water flows, and thus surface water dependent vegetation, would be from linear infrastructure such as roads. Conventional surface water control measures that maintain surface flows are likely to ameliorate any potential risks to the vegetation and flora.

The vegetation across the Study Area is largely in Excellent condition other than in sections of the haul road where prior disturbance, including possibly clearing for laydown areas and road works, have introduced *Cenchrus setiger* and *Stylosanthes hamata*. Given the highly invasive nature of these species it is recommended that machinery used in infested areas is cleaned prior to entry to the mining and infrastructure areas. Treatment of minor weed infestations within the Project areas would minimise the risk of spreading these species.

Six introduced species were recorded in the Study Area; with *Cenchrus setiger* (Birdwood Grass) and *Stylosanthes hamata* (Verano Stylo) recorded in large populations along the access road in the vicinity of Ringer Soak and isolated individuals of *Malvastrum americanum* (Spiked Malvastrum), *Panicum antidotale* (Giant Panic Grass), *Echinochloa colona* (Awnless Barnyard Grass) and *Portulaca oleracea* (Purslane) recorded within the broader Study Area. No Declared Pests were recorded as listed under the *Biosecurity and Agriculture Management Act 2007.*

The potential impacts of the proposed Browns Range project were evaluated taking into consideration the vegetation and flora values of the Study Area. The main impacts are considered to be from clearing and changes to surface water flows. Other potential impacts are from the introduction of weeds and dust emissions. Recommended management and mitigation activities include:

- Clearing protocols to minimise unnecessary clearing or accidental clearing of higher-value areas;
- Minimisation of off-road vehicle use;
- Weed hygiene practices, particularly for earthwork machinery and particularly targeting *Cenchrus setiger* and *Stylosanthes hamata* in the haul road area. These two species could

significantly impact biological diversity in the Study Area if spread further into the broad drainage lines and floodplains;

- Control of small infestations of weed species within the Project Area;
- Placement of major infrastructure outside floodplains and broad drainage lines;
- Maintenance of surface water flows using engineering solutions where necessary to ensure that the flows are neither impeded nor enhanced, and their erosive potential is minimised; and
- Enforcing road speed limits and carrying out dust suppression in all areas with unsealed surfaces.

If conventional management practices are applied during construction, operation and rehabilitation activities, then impacts from clearing, changes to surface water and ground water plus weeds and dust emissions, are unlikely to be significant.

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1. INTRODUCTION

Northern Minerals commissioned Outback Ecology (a division of MWH Australia Pty Ltd) to undertake a Level 2 flora and vegetation assessment of the proposed Northern Minerals Project (the Project) and an impact assessment of proposed activities for development of rare earth prospects with associated infrastructure including borefields in the Browns Range area (the Study Area). This information will be used to identify areas that support flora and vegetation of conservation significance and provide context regarding the potential impacts of the project.

1.1. Project Location And Description

The Project is located approximately 150 kilometres (km) southeast of Halls Creek in the Tanami region of Western Australia (WA) on Gordon Downs Station within the Shire of Halls Creek, adjacent to the Western Australia/Northern Territory border (**Figure 1**).

The Project includes mining infrastructure and the haul road. The mining infrastructure is to overlie four tenements E80/3547, E80/3548, E80/4393 and E80/4479 (**Figure 2**), and will likely include pits, waste rock landforms, an ore processing facility, tailings storage facility, access roads, borefield, pipelines, magazine, ROM pad, gravel pit, evaporation pond, parking and laydown areas, a workshop, fuel and water storage, accommodation village, airstrip and administration buildings (Figure 3). The area considered during this Assessment (the Study Area) consists of 16,294 hectares (ha) of land, containing areas within which disturbance is proposed (the Development Envelope) of 2590ha (**Figure 3**). The proposed Development Footprint in which the Project will be developed has a total area of 711 ha. Mining activities will consist of open pit mining, with crushing, grinding and separation being conducted on site. The construction of the haul road will require a combination of new road construction and upgrades to existing roads. Concentrate will be transported from the Project to a distribution point via the haul road and then on public roads.

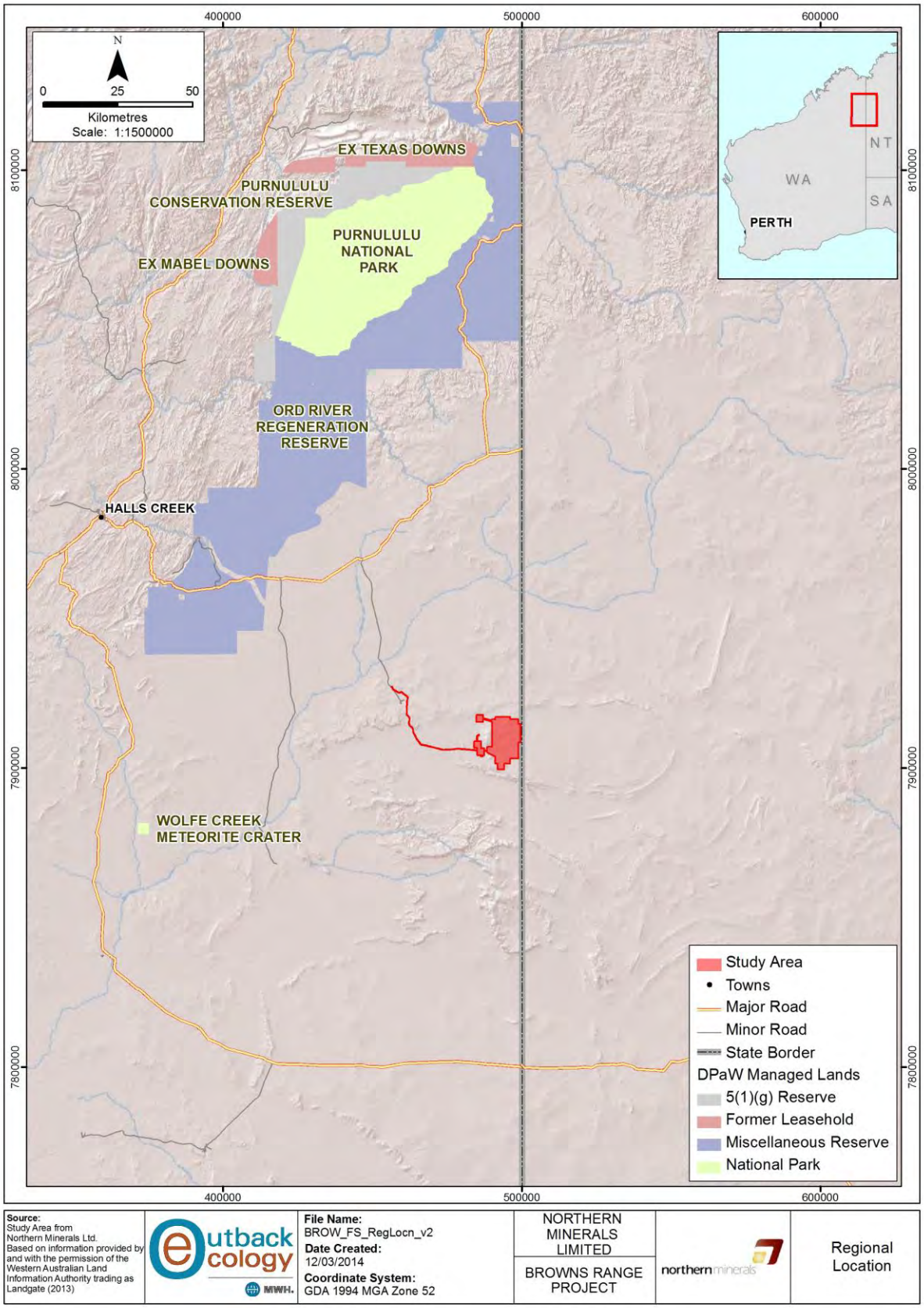


Figure 1: Regional Location of the Browns Range Study Area

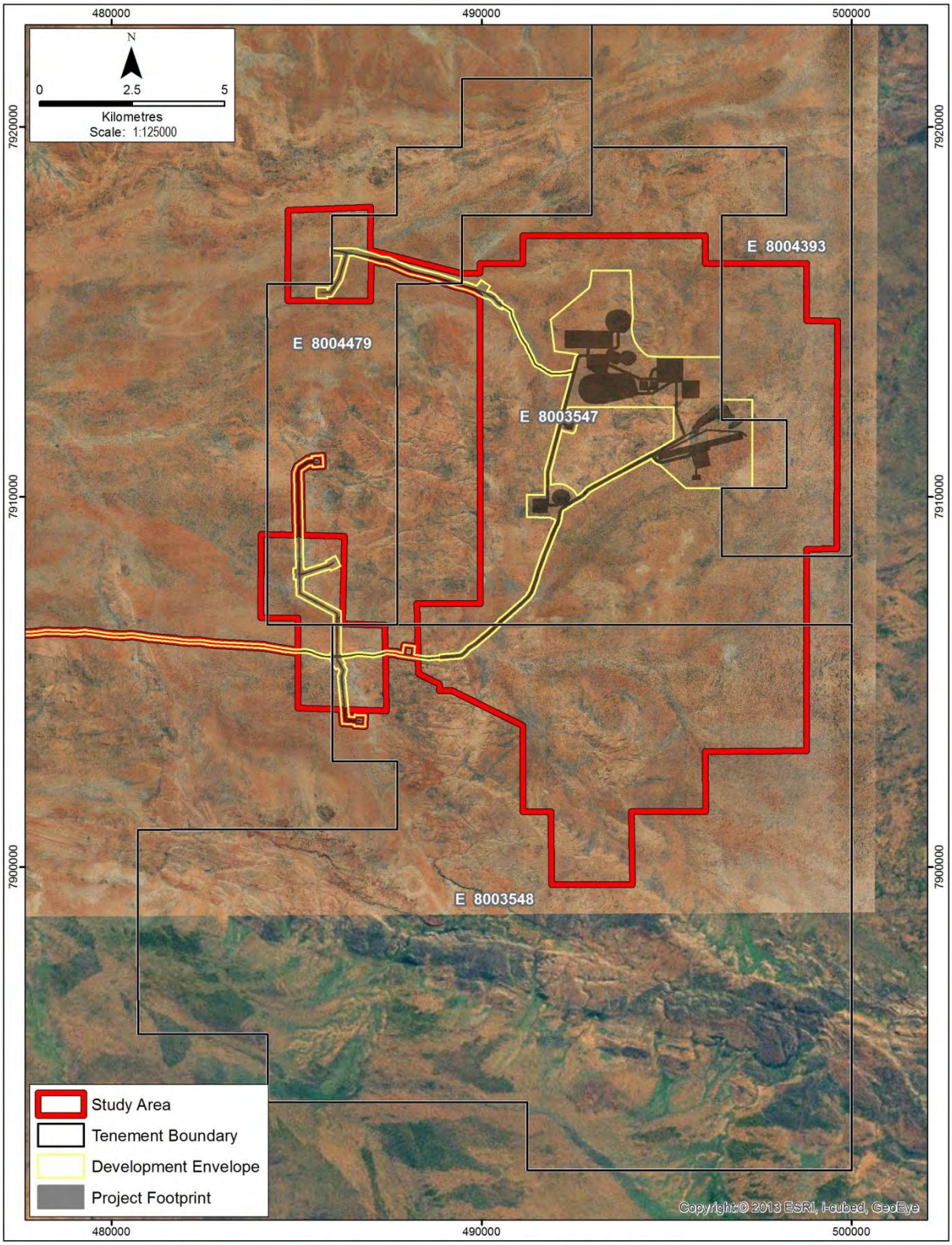


Figure 2: Northern Minerals Project Mining Tenements

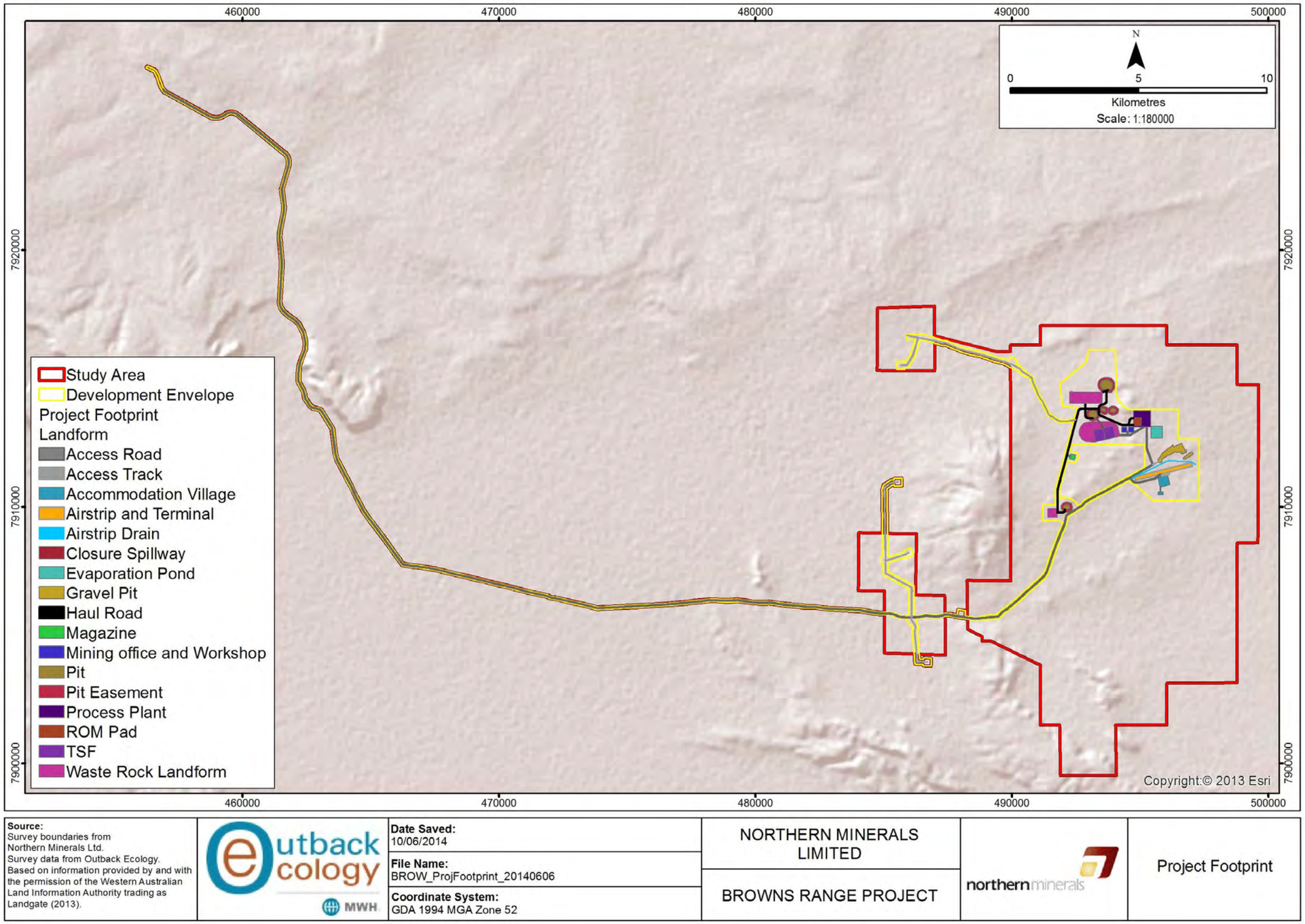


Figure 3: The Browns Range Study Area and Proposed Project Layout

1.2. Report Scope And Objectives

This report documents the results of a desktop assessment and two Level 2 flora and vegetation field surveys of the Study Area conducted by Outback Ecology botanists in May 2013 and May 2014. The specific objectives of this assessment were to:

- develop an inventory of the terrestrial vascular flora occurring within the Study Area (**Figure 3**);
- quantify the extent of populations of conservation significant species and any ground water dependent flora species within the Study Area;
- identify any known or potentially occurring conservation significant flora (including Threatened Flora, Priority Flora) occurring within the Study Area and surrounds;
- identify any known or potentially occurring conservation significant ecological communities (Threatened Ecological Communities [TECs] and Priority Ecological Communities [PECs]) occurring within the Study Area and surrounds;
- delineate, characterise and map vegetation associations across the Study Area;
- assess and map vegetation condition across the Study Area;
- identify and specify locations of any introduced species including any exotic or declared weeds; and
- assess the potential impacts of the Project on flora and vegetation within the Study Area.

The objectives and methods adopted for this survey and assessment are aligned with:

- EPA Position Statement No. 3, Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002); and
- EPA Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004).

1.3. Regulatory Requirements

Guidance Statement No 51 (EPA 2004) provides guidance on what is required under the *Environmental Protection Act 1986* in relation to terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia. A Level 1 or a Level 2 Survey is required, depending on the scale and nature of the impacts of any proposed developments.

The Tanami Bioregion, in which the current Study Area is located, is considered to be a Group 4 bioregion. Table 3 in Guidance Statement No. 51 (EPA 2004) indicates that a Level 2 survey is required for the proposed activity given that the total clearing is likely to be greater than 75 ha and that Priority Flora species are likely to be present in the Study Area.

Level 2 surveys require background research (a desktop study), a reconnaissance survey and comprehensive follow-up survey. The Guidance Statement stipulates that the Background Research requires a search of “all sources of literature, data and map-based information”. The purpose of the

Reconnaissance Survey is to verify the accuracy of the background study, further delineate and characterise the flora and range of vegetation units (vegetation communities) present in the target area; and identify potential impacts.

The present study provides the Background Research and Reconnaissance Survey as defined by Guidance Statement No 51. It is adequate as a Level 2 Survey as it involves: one or more visit(s) in the main flowering season and one or more visit(s) in other seasons, replication of plots in vegetation units and greater coverage and displacement of plots over the target area. Level 2 surveys may also require subregional surveys to enhance the level of knowledge at the locality scale, and the context at the local survey. Subregional surveys were not conducted for this assessment.

2. BACKGROUND INFORMATION

2.1. Biogeographic Region

The Study Area is located in an area of rocky outcrops at the northern edge of the Tanami Desert. It lies within the Tanami bioregion, as defined by the Interim Bioregions of Australia (IBRA) classification system (Graham 2001) (**Figure 4**). The majority of the Tanami bioregion extends eastward into the central Northern Territory, but a small portion of the bioregion extends westward into Western Australia. The Tanami bioregion is composed of three sub-bioregions: Tanami 1, Tanami 2 and Tanami 3. The Study Area occurs in Tanami 1, which is the largest of the three sub-bioregions (**Figure 4**).

The Tanami 1 sub-bioregion is 3,214,599 ha and consists of red desert sand plains that support mixed shrub steppes and hummock grasslands, as well as hills and ranges that support wattle scrub and hummock grasslands (Graham 2001). Drainage occurs via Sturt Creek (the largest river system in the Tanami bioregion) and other ephemeral watercourses such as the Lander and Hanson Rivers and Winnecke Creek (ANRA 2011a). The Tanami 1 sub-bioregion incorporates large areas of relatively untouched desert ecological communities and is an important refuge area for biodiversity (ANRA 2011a). The sub-bioregion supports a number of threatened fauna species and contains two wetlands of national significance: the Lake Gregory system in Western Australia and Lake Surprise in the Northern Territory (ANRA 2011a, DSEWPaC 2009).

While the sub-bioregion is generally in good ecological condition, significant threatening processes include feral predators, changing fire regimes and weeds (ANRA 2011a, Graham 2001). Apart from some vertebrate fauna sampling conducted in the Northern Territory portion of the Tanami 1 sub-bioregion more than 15 years ago, there has been no systematic review of biodiversity within the sub-bioregion (ANRA 2011a, Graham 2001). Consequently, little baseline information is available to land managers. In particular, there are notable gaps in information relating to the distribution and status of native flora and fauna, the distribution, status and impact of weed species, and the identification of appropriate fire regimes (ANRA 2011a, Graham 2001). The flora and fauna (vertebrate, short range endemic and subterranean) studies conducted by Outback Ecology (2012a, b, c and 2013) have greatly increased biological knowledge of the Study Area.

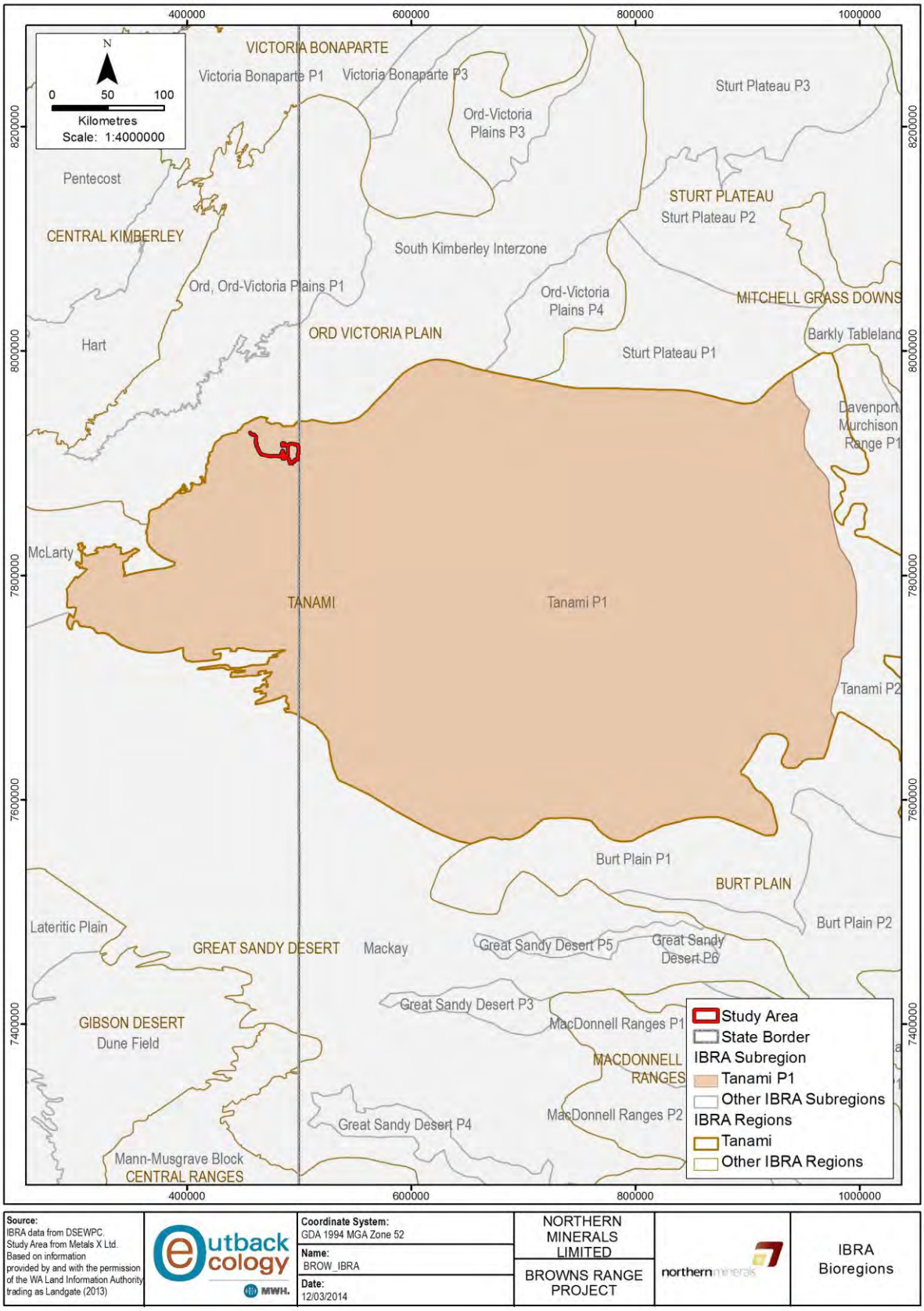


Figure 4: Location of the Browns Range Study Area Relative to the Tanami 1 subregion.

2.2. Climate

The Study Area experiences an arid-tropical climate with mainly summer rainfall due to a monsoonal influence (Graham 2001). The Bureau of Meteorology (BOM) weather station at Halls Creek Airport, which is located approximately 150 km north-west of the Study Area, is the closest locality with comprehensive climate data representative to the Study Area (**Figure 5**). The mean maximum temperatures at Halls Creek Airport range from 27.2°C in July to 38.4°C in November, with peak temperatures recorded from September to April. The mean minimum temperature in winter months (May – July) ranges from 12.6°C to 14.8°C. Halls Creek Airport has a mean annual rainfall of 635.8 mm and an average of 49 rain days per year (BOM 2013). The majority of rainfall consistently occurs between November and March (the 'wet season'), whereas very little rainfall is typically recorded in winter months (the 'dry season'). However, rainfall in the region can be highly localised and unpredictable, with substantial fluctuations occurring spatially and temporally (BOM 2013).

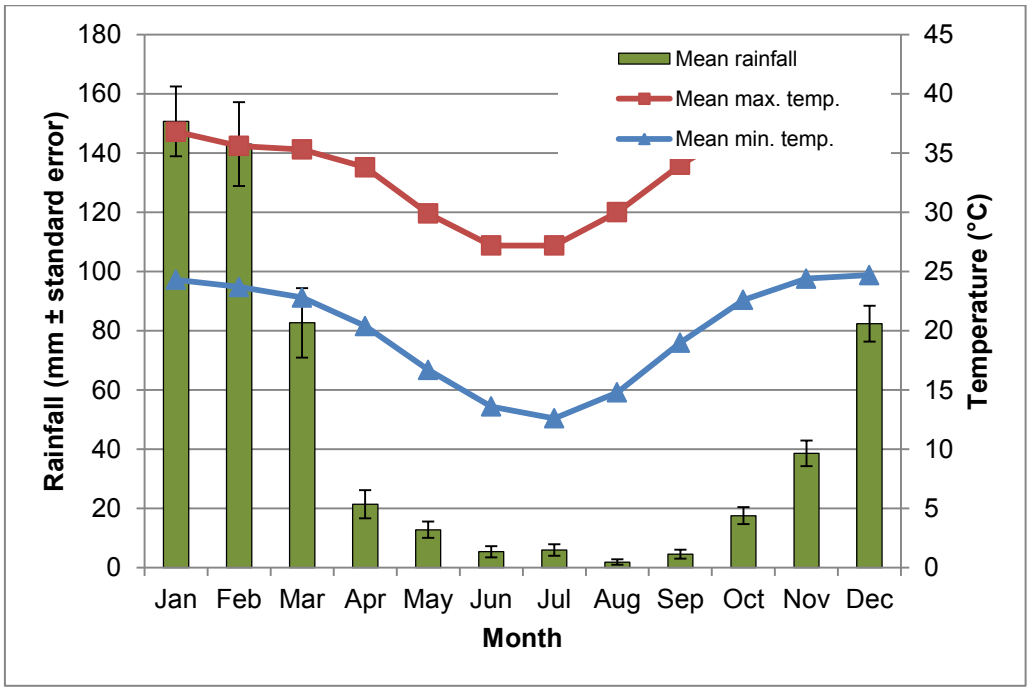


Figure 5: Mean Climate Data for Halls Creek Airport

Source data: BOM (2014), weather station 002012, 1944 to 2013

2.3. Land Systems

The Study Area has been mapped as part of the Kimberley land region of Western Australia (Payne and Schoknecht 2011) from numerous rangeland resource surveys conducted since the 1940s. These have contributed to a comprehensive description of biophysical resources present within the Kimberley region, including the condition of soil and vegetation (Payne and Schoknecht 2011). This information has been used to classify and map the land systems of the Kimberley region based on landforms, soils, vegetation, geology and geomorphology. An assessment of these land systems

provides an indication of the occurrence and distribution of relevant natural resources present within and surrounding the Study Area. The Study Area contains two land systems: Coolindie and Winnecke (**Table 1**). Of these, the Coolindie land system occupies the majority of the Study Area (**Figure 6**).

Table 1: Land Systems within the Browns Range Project Study Area

Land System Description	Proposed Development Footprint		Development Envelope		Study Area	
	Area (hectares)	(%)	Area (hectares)	(%)	Area (hectares)	(%)
Coolindie Land System Gently undulating red desert sandplains and dunes supporting *Acacia* shrublands, *Eucalyptus* woodlands and soft spinifex (*Triodia pungens*) grasslands. These grasslands are subject to frequent fires that cause short-term changes in floristic composition and abundance. Drainage lines are shallow, widely spaced and infrequent, and erosion is minimal.	577.99	81.29	2201.85	85.01	13,275.96	81.5
Winnecke Land System Stony hills and lowlands associated with red desert sands that support *Acacia* and *Eucalyptus* woodlands and soft spinifex (*Triodia pungens*) grasslands. These grasslands are subject to frequent fires that cause short-term changes in floristic composition and abundance. Intensive parallel drainage lines occur on upper slopes, while widely spaced angular drainage lines occur on lower slopes and terminate at the base of hills. Erosion is generally minimal, though some drainage floors are moderately susceptible.	133.08	18.71	388.11	14.99	3,017.88	18.5
Total	**711.07**	**100**	**2589.96**	**100**	**16,293.84**	**100**

Source: Payne and Schoknecht (2011)

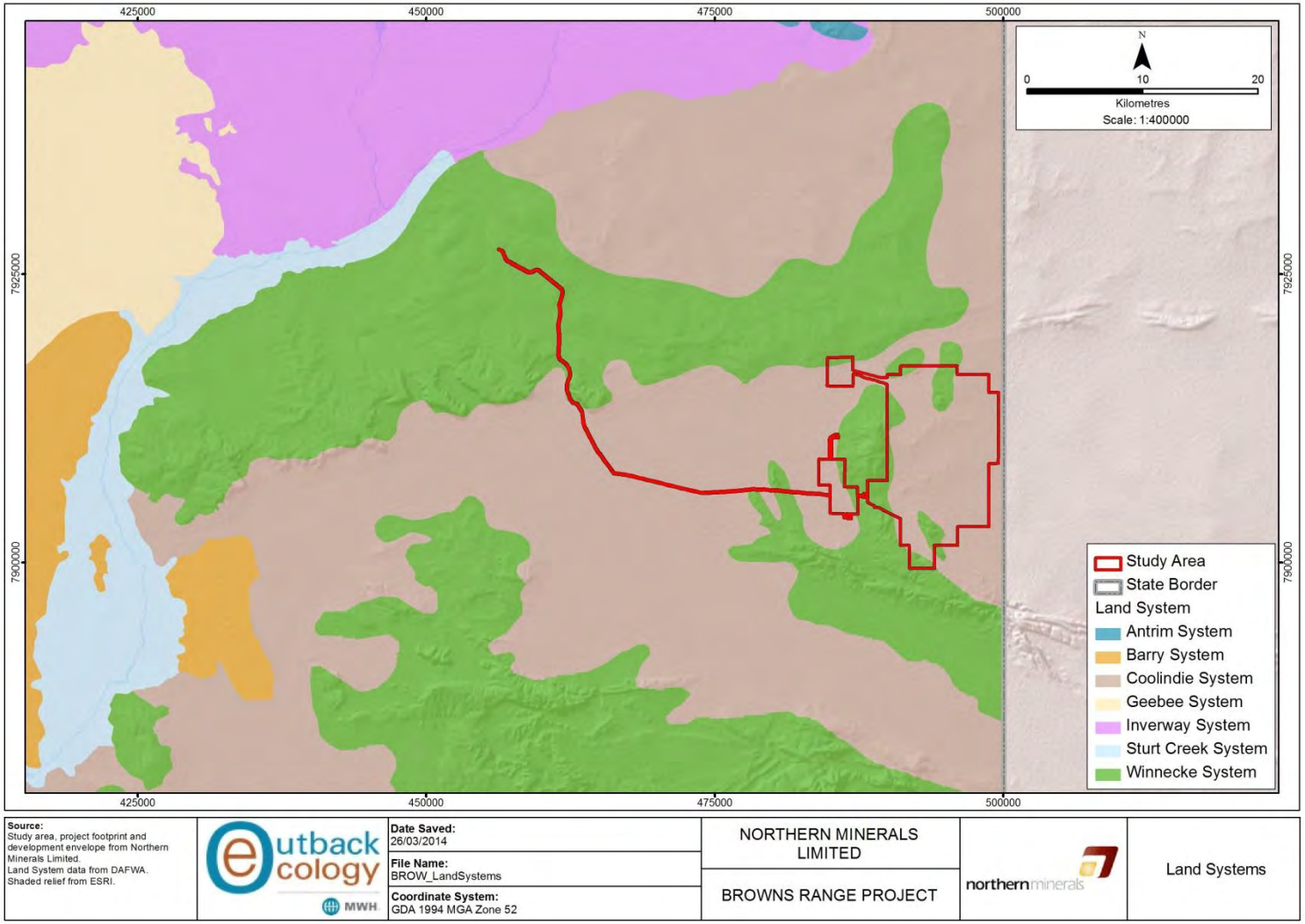


Figure 6: Land Systems Within and Surrounding the Browns Range Study Area

2.4. Beard Vegetation Mapping

The Study Area is entirely located within the Mueller Botanical District of the Eremaean Botanical Province as defined by Beard (1974), who further divided the botanical district into physiographic units (also called vegetation supergroups) in which he mapped vegetation associations.

Three vegetation associations within the Browns Range Study Area are described below and mapped (**Figure 7**):

- 91 Hummock grasslands, sparse tree steppe; snappy gum over soft spinifex;
- 218 Hummock grasslands, shrub steppe; corkwood (*Hakea suberea* – now *Hakea lorea* subsp. *lorea*) and *Acacia* species over soft spinifex; and
- 895 Hummock grasslands, shrub steppe; mixed *Acacia* over soft spinifex.

The majority of the Study Area consists of vegetation association 895 with localised areas of vegetation association 91 and 218. The areas of each within the Tanami bioregion; Western Australia and the Study Area are presented (in **Table 2)**.

Table 2: Beard Vegetation Units within the Browns Range Project Development Footprint, Development Envelope, Study Area, the Tanami bioregion and Western Australia (Pre-European Extent)

Beard Vegetation Associations	Proposed Development Footprint		Development Envelope		Study Area		Tanami Bioregion		Percentage of Western Australian extent
Code	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	
91	193.58	27.22	543.37.	20.98	2,036.3	12.5	269,458	9	61%
218	86.37	12.15	308.94	11.93	861.8	5.3	700,449	23	97%
895	431.13	60.63	1737.65	67.09	13,395.7	82.2	1,157,725	38	99%
Total	**711.07**	**100**	**2589.96**	**100**	**16,293.84**	**100**	**3,016,138**	**70**	

Source: Beard (1974) and Government of Western Australia (2013)

While 99.16% (99.37% within the Tanami region) of the pre-European extent of vegetation association 895 is extant in WA, none is conserved in any IUCN reserves (Government of Western Australia 2013). By comparison vegetation association 91, of which 99.85 % remaining (99.82% within the Tanami region) has 11% of its original extent conserved in IUCN 1-4 reserves in WA, although none of these reserves are located within the Mueller Botanical District (Government of Western Australia 2013). It is estimated that 100% of vegetation association 218 is still extant; however none is protected within any IUCN 1-4 reserves in WA.

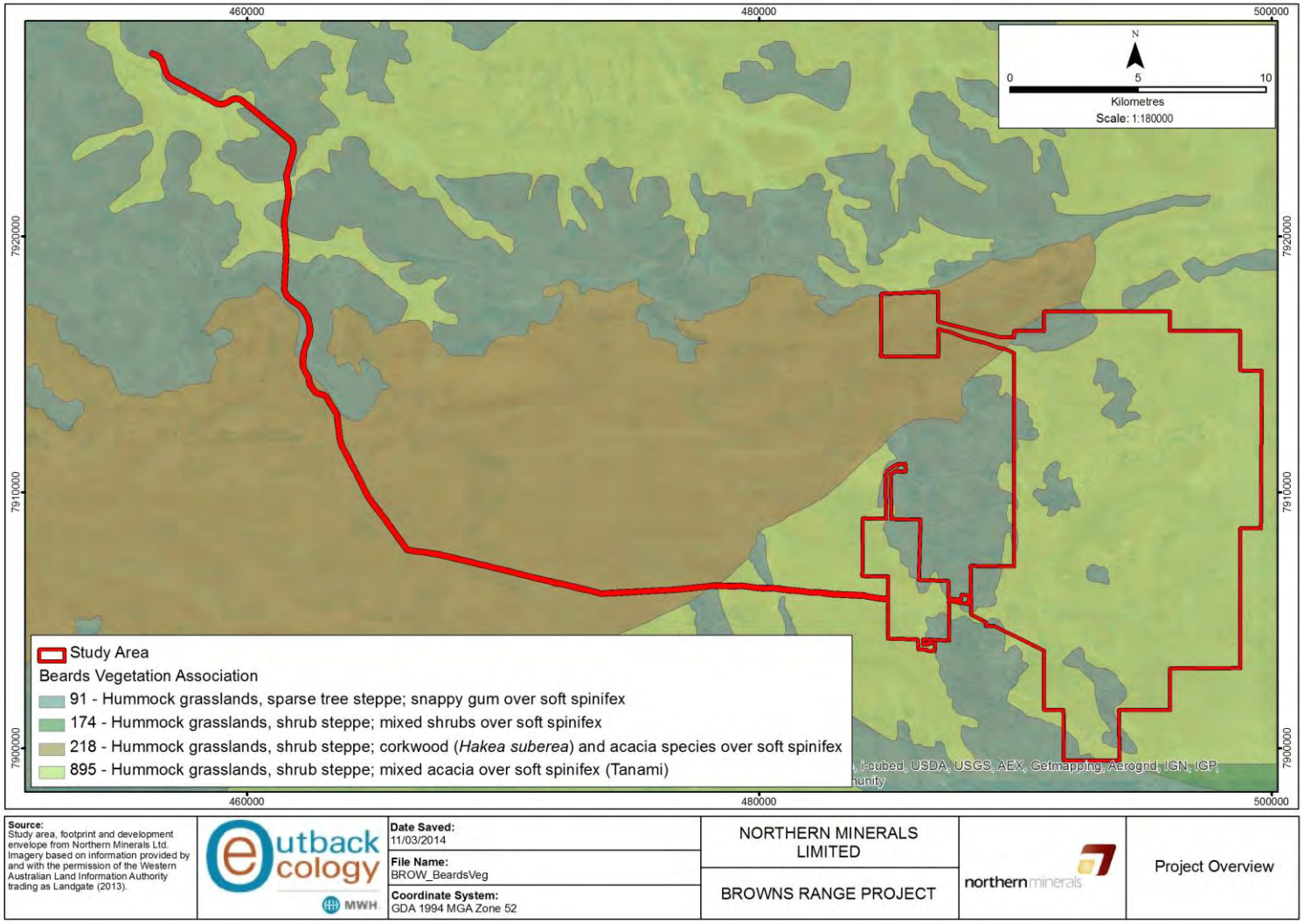


Figure 7: Beard Vegetation Mapping Units within the Browns Range Study Area

2.5. Other Vegetation Mapping

Wilson *et al.* (1990) mapped vegetation of the Northern Territory at a scale of 1:1,000,000 using available vegetation and land system data together with Landsat imagery and data from three years of extensive field work. Mapping units were characterised from survey plots (20 m x 20 m).

Only two vegetation units (38 and 76) were mapped to the east of the Browns Range Study Area, on and in the vicinity of the Southern Browns Range (Wilson e*t al.* 1990). Vegetation Unit 38 was mapped on well drained rises, dissected plateaux and rocky low hills; and was described as *Eucalyptus brevifolia* Low Open Woodland over *Triodia pungens* Hummock Grassland. The vegetation on the surrounding gently undulating plains was mapped as Unit 76 and described as *Triodia pungens* and *T. schinzii* Hummock Grassland with an *Acacia* Tall Sparse Shrubland overstorey.

Some of the species recorded in association with Vegetation Unit 38 that also have been recorded in the Tanami subregion of Western Australia include: *Acacia lysiphloia, Capparis umbonata, Grevillea wickhamii, Carissa lanceolata, Gossypium australe, Aristida holathera, Chrysopogon fallax, Eulalia aurea, Aristida inaequiglumis, Eriachne mucronata, Themeda triandra, Paraneurachne muelleri, Eriachne ciliata and Fimbristylis dichotoma.*

Vegetation Unit 76 is described as *Triodia pungens* open hummock grassland with *Acacia* tall sparse shrubland overstorey (Wilson *et al.* 1990). The following additional species have been recorded: *Acacia stipuligera, A. coriacea, A. hilliana, A. tenuissima, Androcalva loxophylla, Crotalaria novae-hollandiae, Eragrostis eriopoda, Eremophila latrobei, Eucalyptus odontocarpa, E. opaca, Euphorbia tannensis, Gyrocarpus americanus, Grevillea eriostachya, Hakea chordophylla, H. macrocarpa, Heliotropium tenuifolium, Petalostylis cassiodies, Scaevola parvifolia, Stylobasium spathulatum, Tinospora smilacina* and *Trianthema pilosa.*

Despite the extensive data set collected for these Northern Territory surveys the vegetation units described are very broad scale and thus only indicative of the vegetation associations within the Study Area, other than providing a checklist of some of the likely flora species.

Numerous gold and other mining operations have been investigated or established in the Tanami region, however floristic and vegetation data that can be meaningfully compared to the data from this study is relatively limited. Further afield, approximately 250 km north northwest of the Study Area, Dames and Moore (1980) established 39 ten by ten metre sites in the Upper Smoke Creek deposit and described two vegetation communities that had some affinities with those recorded in the Study Area. These comprised a 'Hills complex' *Eucalyptus brevifolia* and occasional *E. dichromophloia* (now a *Corymbia*) over *Triodia pungens, Sehima nervosum* and *Eriachne obtusa* with occasional thickets of *Acacia acradenia* and *A. retinervis;* and 'Thickets': *Acacia* (eg: *lysiphloia*) and *Calytrix extipulosa* with *Eucalyptus brevifolia* and *E. pruinosa.*

2.6. Groundwater And Surface Water Dependent Ecosystems

Ground and surface water dependent species and vegetation communities may be adversely affected by clearing and other factors such as groundwater abstraction, re-directing or restriction of flow in watercourses, pollution and excavations. Some species and vegetation communities may be dependent on the maintenance of both groundwater and/or surface water flows.

A range of vascular flora species and vegetation communities in Australia are considered to be groundwater dependent. These include phreatophytic plant species that require access to water in shallow water tables and wetland vegetation. Groundwater dependent species and ecosystems (GDEs) may rely on surface expressions and subsurface bodies of groundwater, particularly in periods of limited water supply (i.e low rainfall). The Groundwater Dependent Ecosystems Atlas (Atlas) (BOM 2012b) provides ecological and hydrogeological maps of GDEs across Australia using a range of sensing data and literature. The Study Area is located in the Mackay drainage basin in the Western Plateau. The groundwater flow systems in the drainage basin are localised within Precambrian rocks and the only GDE shown in the vicinity is Sturt Creek which runs north and west of the Study Area (BOM 2012b). Sturt Creek is described as a GDE "reliant on the surface expression of groundwater (rivers, springs, wetlands)" (BOM 2012b). The Atlas is limited to 30 metre Landsat pixels, therefore many of the smaller GDEs may have not been identified by the Atlas or are not known, particularly in relatively poorly-studied bioregions such as the Tanami.

2.7. Land Use

The majority of the land within the Tanami bioregion is Aboriginal freehold. This land continues to be used by traditional Aboriginal landowners for the hunting and gathering of food, and the practice of cultural ceremonies associated with the land (Stoll *et al.* 2005). The remaining land within the bioregion is Unallocated Crown Land or Crown leasehold used for pastoral leases and conservation reserves (ANRA 2011b). Grazing occurs throughout one quarter of the bioregion, and mining (predominantly for gold) and tourism are also important industries (ANRA 2011b).

The Study Area is located within the Gordon Downs pastoral lease in the Shire of Halls Creek (**Figure 8**). While the land is zoned for cattle grazing, no pastoral activity occurs within the Study Area. More suitable soils for pastoral activity are found north of the Study Area.

The existing road to Browns Range, which is to be upgraded for use as a haul road, crosses one corner of the Gardner Range proposed conservation estate (**Figure 8**). There have been limited studies within the Gardner Range, which contains permanent springs that are a source of water for Lake Wilson, an important refuge for wildlife during drought (Graham 2001a).

Department of Parks and Wildlife (DPaW) managed lands nearby include the Ord River Regeneration Reserve, approximately 100 km north-west of the Study Area, and the Wolfe Creek Crater National Park, approximately 120 km west-southwest. The Ord River Regeneration Reserve has been

rehabilitated since the 1960s to combat erosion and high sediment load in the Ord River, which occurs from overgrazing and can limit the opportunity for irrigated agriculture within the region (Novelly and Watson 2007). The Wolfe Creek Crater National Park is a significant tourist attraction as it contains a well-preserved meteorite impact crater. The closest Aboriginal reserves are Kundjat Djaru (Ringer Soak), located 40 km west of the Study Area, and the Northern Tanami Indigenous Protected Area, approximately 50 km east in the Northern Territory.

2.8. Geology

The Study Area is located on the western side of the Browns Range Dome, a Paleoproterozoic dome formed by a granitic core intruding the Paleoproterozoic "Browns Range Metamorphics" (meta-arkoses, feldspathic metasandstones and schists) and an Archaean orthogneiss and schist unit to the south. The dome and its aureole of metamorphics are surrounded by the Paleoproterozoic (1,735-1,640 Ma) Gardiner Sandstone (Birrindudu Group). Middle-Devonian to (likely) Ordovician sandstones from the Eastern Canning Basin margin (Billiluna Shelf) of uncertain age have also been interpreted to occur over the Gardiner Sandstone to the south-west of the dome (Das 2012).

The dominant geological unit throughout the Project area consists of arkose and meta-arkose outcrops. Other rock types include quartz mica schists, banded iron formation/quartz pebble conglomerate, dolerite and calc-silicate rocks. Minor occurrences of quartzite, silcrete, ferricrete and ironstone have also been identified. The Gardiner Sandstone flanks the western margins of the Project area and unconformably overlies the older Browns Range metamorphic rocks (Das 2012).

Mapping has identified both mineralised and non-mineralised occurrences of quartz veins, and quartz breccia veins occur as elongated discontinuous bodies, up to several metres wide and tens of metres long, and intruding along possible shear or faults trending 320˚ (north-west) and 270˚ (east-west) (Das 2012).

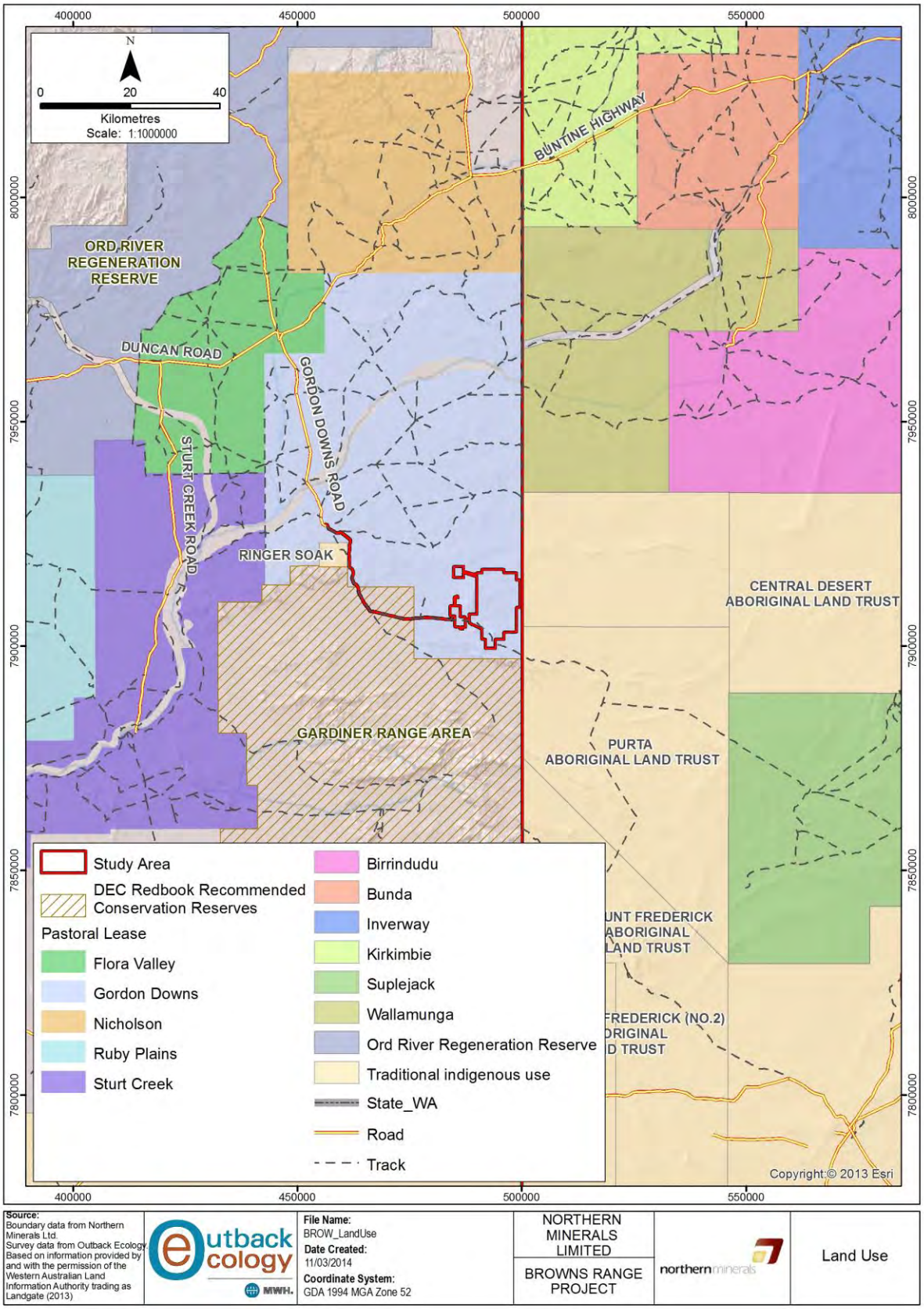


Figure 8: Land Use Within and Surrounding the Browns Range Study Area

2.9. Review Of Existing Reports

Several reports were reviewed to identify flora species and vegetation communities likely to occur in the Study Area, particularly those of conservation significance. No comprehensive, Level 2 surveys either have been completed or were accessible for within the WA Tanami bioregion area and thus no systematic floristic data and complete vegetation descriptions were available to help contextualise the flora and vegetation data in the Study Area.

Ecotec (WA) Pty Ltd (2010) *Threatened Flora and Fauna of the Brown's Range Project Area*. Unpublished report for Northern Uranium Limited.

This desktop report was completed in May 2010 and covered the area surrounding the Browns Range Project within Exploration Licence E80/3547. Six Priority Flora species had previously been recorded near the Study Area: *Atriplex flabelliformis* (P3), *Eragrostis confertiflora* (P1), *Goodenia crenata* (P3), *Iotasperma sessilifolium* (P3), *Isotropis parviflora* (P2) and *Trachymene villosa (*P1). Additionally, the report listed seven Priority Flora species known to occur in the greater Tanami desert region that may occur within the Study Area: *Goodenia strangfordii* (P1), *G. suffrutescens* (P1), *Teucrium* sp. Sturt Creek (A.A. Mitchell 5536) (P1), *Eragrostis crateriformis* (P3) and *Goodenia modesta* (P3).

Ecotec (2008a) *Vegetation and Fauna Assessment: Proposed Areas of Exploration Tenements E80/3404, E80/3405 and E80/3414: The Alfmeco Project*.

This report describes a field based Level 1 survey by Ecotec of exploration tenements in the Gardner Range, to the south of Browns Range. Two Priority Flora species were located during the survey: *Trachymene villosa* (P1) and *Goodenia crenata* (P3). In most cases *Goodenia crenata* was found in recently burnt or previously disturbed areas. No Threatened (DRF) Flora species were recorded.

Ecotec (2008b) *Vegetation and Fauna Assessment: Proposed Areas of Exploration on E80/1735 and E80/3275: Uranio Project*.

This report describes a field-based Level 1 survey by Ecotec of exploration tenements in the Gardner Range, to the south of Browns Range. A total of 140 flora species were recorded from more than 40 families and two main vegetation types were recognized Hummock Grassland and *Acacia* shrubland. No Threatened Flora and only one Priority Flora species, *Goodenia crenata* (P3), were recorded during this survey. This species was collected in several locations on the banks of creek lines in red/brown alluvial sands where there had been evidence of water ponding.

Ecotec (2007) *Annual Environmental Report (AER) – Coyote Project*. Unpublished report for Tanami Gold NL.

Ten monitoring sites are presented in Appendix 4 of the AER with associated species counts within quadrats. This data provides an indication of vegetation types however the monitoring sites are very small and exclude a description of cover by tree and shrub species that are clearing evident in the photographs:

- *Corymbia opaca* Scattered Low Trees over *Solanum diversifolium* and *Melhania oblongifolia* Scattered Low Shrubs over *Triodia basedowii* and *T. pungens* Hummock Grassland and *Eragrostis eriopoda* and *E. setifolia* Scattered Tussock Grassland;
- *Heliotropium tenuifolium, Halgania solanaceae* and *Indigofera linifolia* Scattered Low Shrubs over *Triodia pungens* Hummock Grassland;

Ecotec (2006) *Vegetation and Fauna Assessment – Ranges of the Western Desert Proposed Nature Reserve*. Unpublished report for Tanami Gold NL.

A reconnaissance survey was completed for potential exploration in this area approximately 120 km south of Browns Range. A total of 66 species were recorded, no conservation significant species and the vegetation was very broadly described as either Hummock Grassland *or Acacia hilliana* low shrubland over grassland. Introduced species (*Cenchrus biflorus, C. ciliaris* and *Trianthema portulacastrum*), were recorded associated with pre-existing disturbance.

MBS Environmental (2004). *Coyote and Larranganni Project Areas. Vegetation and Fauna Assessment*. Prepared for Tanami Gold NL.

This report describes the results of a survey conducted in June 2004, approximately 100 km south of the Browns Range Study Area. Five vegetation associations were recorded across dune, sandplain, laterite, calcrete and rocky hill habitats. A total of 119 species from 38 families and 69 genera were recorded during the survey with the most common families Mimosaceae and Poaceae.

Outback Ecology (2003). *Wet Season Biological Survey of the Sally Malay Mining Leases. Vegetation Survey*. Unpublished report for Sally Malay Mining Limited.

This report describes a wet season flora and vegetation survey of the Sally Malay Mining Leases. Both the plains and the riverine vegetation units were re-defined into three separate communities each. The flora species list was increased by 37 taxa following excellent seasonal conditions during the field survey. A total of 109 taxa were recorded, including seven introduced taxa.

Outback Ecology (2002). *Baseline Environmental Studies - Sally Malay Mining Ltd*. Report prepared for Sally Malay Mining Ltd.

This report provided supporting documentation to surveys conducted in 1992. The vegetation was described in relation to land units. No Threatened or Priority Flora were recorded during the survey, however seasonal conditions were sub-optimal.

Graham, G. (2001). *Tanami Desert 1 (TAN1 – Tanami 1 subregion). A biodiversity audit of Western Australia's 53 Biogeographical Subregions in 2002*. J. E. May and N. L. McKenzie. Kensington, WA, Department of Conservation and Land Management now Department of Environment and Conservation: 624-628.

This report provides an overview of biodiversity values in the Tanami 1 Subregion in which Browns Range occurs. It lists one wetland of significance in the sub region, the Lake Gregory System which

is approximately 200 km to the southwest of the Study Area. While the report lists no TECs, it describes permanent/ephemeral wetlands, damplands, and riparian habitat of the southern Kimberley region as at-risk ecosystems. The report lists a number of Beard vegetation associations as not being reserved in the conservation estate of the bioregion, including 15 associations dominated by *Triodia* species; three claypan or saltpan associations; one dominated by sedges and two dominated by other grass species such as *Themeda* and *Astrebla.*

Dames and Moore (1992). *Baseline Vegetation and Habitat Survey - Sally Malay Project (included in the Sally Malay Project, Notice of Intent to Mine 2002).* Unpublished report prepared for Normandy Poseidon Limited, May 1992.

This report describes a desktop assessment and rapid field assessment of the Sally Malay Project area, approximately 200 km to the northwest of the Browns Range Study Area. No Threatened or Priority Flora was recorded in that Study Area. Only three plant communities were described and these were aligned with the upland, plain and riverine land units.

2.10. Legislative Context

All flora species native to Western Australia are protected under the *Wildlife Conservation Act 1950*, however species of flora that are considered to be in danger of extinction, rare or otherwise in need of special protection are provided additional legal protection via listing as Threatened (Declared Rare) Flora species in either Schedule 1 (Threatened Flora) or 2 (Extinct Flora) of the Wildlife Conservation (Rare Flora) Notice issued annually after a review of the status of these species.

A supplementary conservation list of species (Priority Flora) and vegetation communities (Priority Ecological Communities) which are poorly known is also released annually by the DPaW. These flora species and vegetation communities do not have legislative protection other than that afforded to more common species; however proponents are strongly encouraged to avoid these species and communities when present in their proposed development area*s.* The Commonwealth *EPBC Act 1999* also lists conservation significant, Threatened Flora species and Ecological Communities and states that “activities that may result in killing, injuring, taking, keeping or moving a member of a listed threatened species or ecological community….are illegal without a permit.”

Guidance Statement 51 provides information to facilitate the assessment of environmental impacts on flora and vegetation in WA. Assessment of the presence of and potential likelihood of Threatened and Priority species and vegetation communities within any area subject to proposed development is paramount to this process. In addition, flora species may be considered of ‘Other Conservation Significance’ if they:

- have a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species;
- have relic status;
- have anomalous features that indicate a potential new discovery;

- represent of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- represent restricted subspecies, varieties, or naturally occurring hybrids;
- are local endemic or have a restricted distribution; and
- are poorly reserved.

3. METHODS

The Level 2 flora and vegetation assessment comprised a desktop review and two field surveys. The methods for each component are described in the following.

3.1. Desktop Review

A review of databases and publicly available information was conducted prior to the field survey to determine flora species and vegetation types of conservation significance known, or likely to occur, within the Study Area and surrounds. Databases searched included the:

- Department of Environment and Conservation (DEC) TECs and Priority Ecological Communities (PEC) database (DEC 2012a) (note that in 2013 DEC has been split into two agencies – DPaW and Department of Environmental Regulation, DER);
- DEC Threatened Flora database (DEC 2012b);
- Threatened (Declared Rare Flora) and Priority Flora List (DEC 2013);
- Western Australian Herbarium (WAH) Specimen database for Threatened (DRF and Priority) Flora species (WAH 2012);
- NatureMap database for all flora species records occurring within the Study Area (DEC 2013); and
- Protected Matters Database Search Tool for Threatened Species and Threatened Ecological Communities (TEC) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DSEWPaC 2013).

Searches of the databases were undertaken for a 100 km radius surrounding the centroid 128°56' 07" E and 18°54' 51" S. It was considered necessary to search a 100 km radius given the paucity of previous surveys in the region and vicinity of the Study Area. The only exception was for the NatureMap database which only allows a search for a distance of 40 km surrounding a point.

Prior to both field surveys, reviews of relevant supporting information were untaken. This included information from database searches and previous vegetation surveys/mapping in the general area (**Section 2.9**); topography and soil landscape mapping (Tille 2006). Using this information and remote sensing imagery, preliminary mapping of vegetation communities was undertaken to determine where quadrats and relevés (sites) should be located to adequately sample all vegetation communities. These were refined following the May 2012 survey to identify areas that required greater survey effort, particularly habitats that were identified as supporting conservation significant flora species.

3.2. Field Surveys

3.2.1. Vegetation Associations

Sites selected using aerial imagery, land system and geological mapping were ground-truthed to identify, describe and map all vegetation communities in the Study Area. Quadrats (50 m x 50 m) or

unbounded relevés were established at each indicative site and alternative sites were selected if these sites had been recently burnt or were significantly disturbed.

The following information was recorded for each quadrat and relevé:

- GPS location (recorded in GDA94 UTM);
- a photograph of the vegetation association;
- landform description, including aspect and slope;
- soil texture and colour;
- structure of, and dominant species in, each vegetation stratum (**Appendix A**);
- size, type and nature of any rocks, stones or gravel;
- vegetation condition and descriptions of any observed disturbances (**Appendix A**); and
- estimated time since last fire based on fire scars on trees, dead and burnt shrubs and regenerating tussock or hummock grassland.

At least one labelled and uniquely numbered voucher was collected for each species in the quadrats and relevés. Where identification was difficult, multiple collections were made. The vegetation was described in each quadrat and relevé to vegetation association (NVIS 2012) using the vegetation structural classes of Specht (1970) as modified by Aplin (1979) (**Appendix A**).

Vegetation boundaries were also recorded in the field when traversing the Study Area, describing the species composition, cover, richness and habitat in mapping notes. Voucher specimens for any flora that could not be positively named in the field were collected.

Floristic and structural data from quadrats, relevés and mapping notes were compared and statistically analysed where possible to identify vegetation associations present in the Study Area. The clustering of quadrats, relevés and mapping notes into vegetation associations enabled the refinement of vegetation boundaries using aerial photographs and topographic data.

Whenever possible at least two quadrats were established in each vegetation association. The haul road and borefield areas were surveyed only in 2013 and thus the majority of vegetation descriptions within these areas were recorded from relevés and mapping notes.

3.2.2. Conservation Significant Flora Searches

Particular effort was taken to search within quadrats, relevés and habitat identified as potentially supporting Threatened Flora and Priority Flora (**Appendix B)**. Comprehensive targeted searches for Threatened Flora, DRF and Priority Flora species were not undertaken across the entire Study Area; however, if found, data suitable for Rare Flora reporting was collected for these species. Whilst traversing the Study Area any species not previously recorded in quadrats and relevés were opportunistically recorded and collected. These records were entered into Outback Ecology's Site Species Database as opportunistic records.

Any populations of Threatened Flora, DRF and Priority Flora located in the field were photographed and described. This included the recording of coordinates using a GPS, estimates of population size where species were widespread and counts in the case of smaller populations; and description of potential direct and indirect threats from the project and other factors. Rare flora report forms were completed where applicable following positive identifications of voucher specimens.

The locations of species that were identified following the Phase 1 survey as being of conservation significance or which represented significant range extensions or new records for the State were re-visited during the Phase 2 survey. These were recollected where possible and their population sizes estimated. In some instances this was not possible if the locations had been burnt in the October 2012 fire.

3.2.3. Identification Of Flora Specimens

Voucher specimens were collected and pressed for verification and identification. Over 1,000 specimens were vouchered and identified from the two field surveys. Voucher specimens were identified and verified by Outback Ecology botanists using taxonomic guides and the reference herbarium at the WA Herbarium. Dr Russell Barrett, a northern region flora and particularly sedge expert, also completed a large number of identifications. Assistance with difficult specimens and in confirming the identity of suspected Priority Flora was obtained from experts in the Western Australian Herbarium.

3.2.3.1. Statistical Analysis

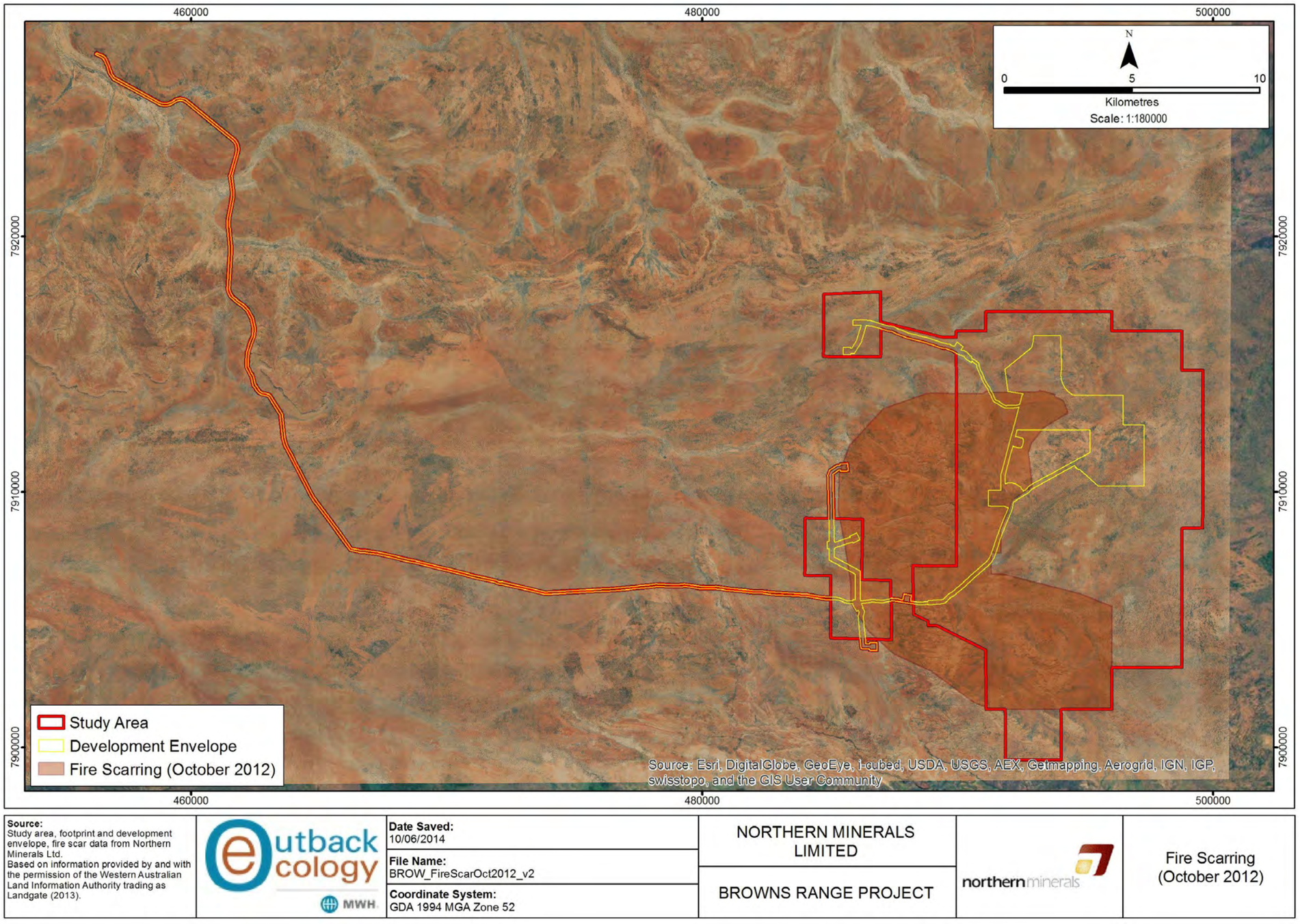
In order to quantify the similarity between sites and corresponding vegetation associations, a site by species matrix with presence / absence of each species was prepared for subsequent statistical analysis, (multivariate analysis) using Primer-E version 6.1.5 (Clarke & Gorley 2006 and Clarke 1993). A matrix with a subset of 48 survey sites which included 29 quadrats that had been resampled in 2013 and 19 quadrats surveyed in 2013 was produced and a similarity matrix based on Bray-Curtis similarities was calculated. Several quadrats were omitted from the analysis to ensure that missing values for dominants did not affect the outcome of the analysis. A dendrogram was computed, using hierarchical agglomerative cluster analysis. The strength of the analysis was checked using multidimensional scaling (MDS) (with Kruskal fit 1 and 1000 restarts), resulting in a cluster diagram that quantifies stress. Stress of less than 0.2 represents a good fit (Clarke & Gorley 2006).

The completeness of the surveys was tested by calculating a species accumulation curve, using the following five indices: Chao1, Chao2, Jacknife1, Jacknife2 and Michaelis Menten (MM). Species accumulation curves can be used to estimate the sampling adequacy of systematic observation techniques for a survey. When a curve approaches an asymptote it suggests that sampling effort has been sufficient to adequately collect the species comprising the floristic assemblage at the location(s)

sampled. The value at which the curve asymptotes also represents an approximate measure of the total size of the suite of flora species at that location.

3.2.4. Vegetation Condition

The vegetation condition was described for all quadrats and relevés using the Keighery Condition Scale (**Appendix A**). Vegetation condition rating does not take into account the effects of fire, only the vegetative condition and particularly any disturbance such as clearing, grazing and weeds. The vegetation condition of recently burnt areas general cannot be accurately assessed. A large proportion of the Study Area was burnt in October 2012 (**Figure 9**).



Source: Study area, footprint and development envelope, fire scar data from Northern Minerals Ltd. Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2013).	Outback Ecology MWH	**Date Saved:** 10/06/2014 **File Name:** BROW_FireScarOct2012_v2 **Coordinate System:** GDA 1994 MGA Zone 52	NORTHERN MINERALS LIMITED BROWNS RANGE PROJECT	northern minerals	Fire Scarring (October 2012)

Figure 9: Area Burnt in October 2012

4. RESULTS AND DISCUSSION

4.1. Survey Personnel, Timing And Survey Effort

Phase 1 of the Level 2 survey was conducted by Outback Ecology botanists Jeni Alford, Rick Davies, Aruni Jayasekera and Adele Scarfone between the 10th and 16th of May 2012. Survey effort for Phase 1 comprised a total of 336 field survey hours.

Phase 2 of the Level 2 survey was completed by Outback Ecology botanists Jeni Alford, Vanessa Yeomans and Alex Sleep between 15th and 23rd May 2013 with assistance from Dr. Russell Barrett between the 15th and 22nd May 2013. Survey effort comprised a total of 402 field survey hours.

Guideline 51 (EPA 2004) stipulates that surveys should be conducted following the season which contributes the most rainfall in the bioregion to capture the flowering of the majority of flora, and for this reason this survey was conducted in May in both 2012 and 2013, following the regional wet seasons. The Study Area becomes inaccessible to vehicles during and following good seasonal rainfall and thus survey timing was reliant on adequate drying of the soils to maximise access to all parts of the Study Area. Seasonal conditions preceding the 2012 survey were Excellent in 2012 and large expanses of standing water were intercepted on the access road. Seasonal conditions, although still Very Good, were somewhat drier in 2013 with less than mean rainfall in April 2013. Rainfall at Halls Creek was higher (559.4 mm) than average rainfall (570.2 mm) for the six months prior to the 2012 survey providing optimal survey conditions and less than mean (360.8 mm) for the six months preceding the 2013 (BOM 2013) (**Figure 10**).

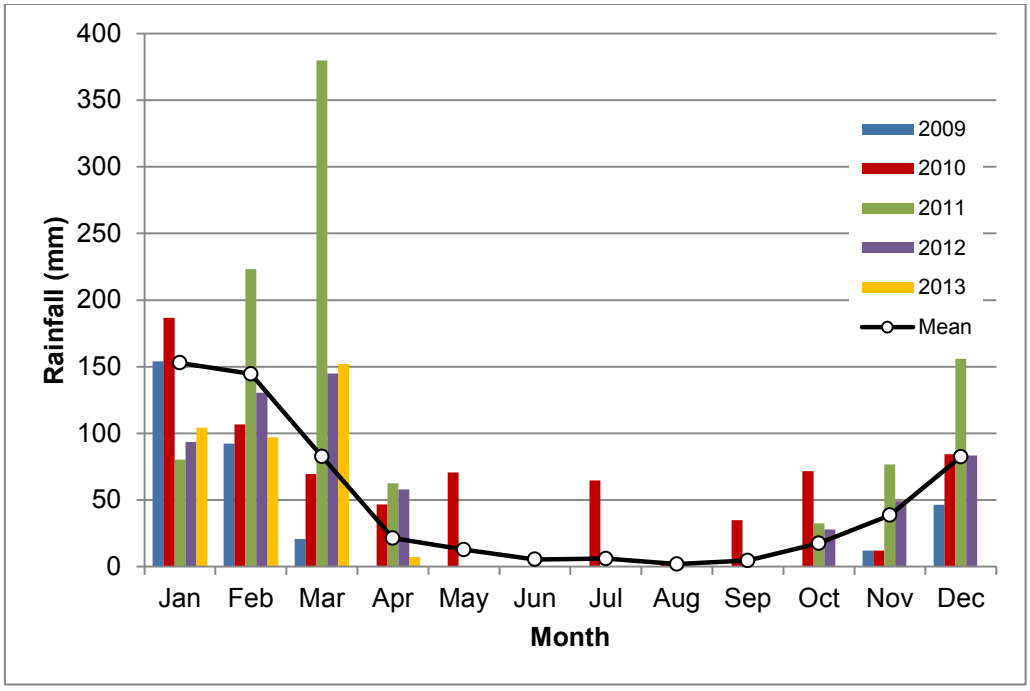


Figure 10: Rainfall Data for Halls Creek Airport between 2009 and April 2013

Source data: BOM (2014), weather station 002012, 1944 to 2013

4.2. Desktop Review

Flora species and vegetation associations, particularly those of conservation significance likely to be present in the Study Area were identified during the desktop review and provided focus for the field assessment.

4.2.1. EPBC Protected Matters Database Search

The EPBC Protected Matters Database contained no records of Threatened plant species or Threatened Ecological Communities (TECs) as defined under the *EPBC Act* (DSEWPaC 1999) occurring within 100 km of the Study Area (DSEWPaC 2013).

4.2.2. DEC Database Search - Threatened and Priority Ecological Communities

A search of the DEC TEC-PEC database (DEC 2011a) for an area of 100 km radius surrounding the centroid 128°56' 07" E, 18°54' 51" identified no TECs or Priority Ecological Communities (PECs). In addition, no TECs or PECs are listed for the Tanami bioregion. Definitions of these are provided (**Appendix C**). The status of TECs and PECs in the subregion was checked on the DEC website prior to the 2013 survey and no communities had been added.

4.2.3. Database And Literature Searches - Threatened and Priority Flora

Definitions of conservation codes for Threatened and Priority Flora are provided (**Appendix B**). A total of ten taxa currently assigned a conservation code in WA have been recorded or collected within the Tanami 1 sub-bioregion and nine of these within a 100 km radius of the Study Area (128°56' 07" E,18°54' 51" S) according to databases and literature searched. None of these taxa (**Table 3**) are considered Threatened Flora (previous referred to as Declared Rare Flora), as defined under the *Wildlife Conservation Act 1950* (WA). Based upon the habitat preferences of these species as described on herbarium records (WAH 2011; DEC2011e) it is likely that there is potentially suitable habitat for eight of these species in the Study Area (**Table 3**).

The optimal time to conduct most flora surveys is considered to be six to eight weeks after significant rainfall events. Mean rainfall in the Study Area peaks in January and February based on records from the Halls Creek meteorological station (BOM Station #002012). Peak flowering occurs between April and August with flowering of the ten conservation significant flora in the bioregion spread throughout the year (**Figure 11**). Six of the ten conservation significant species in the region have been recorded flowering in May (**Table 3**).

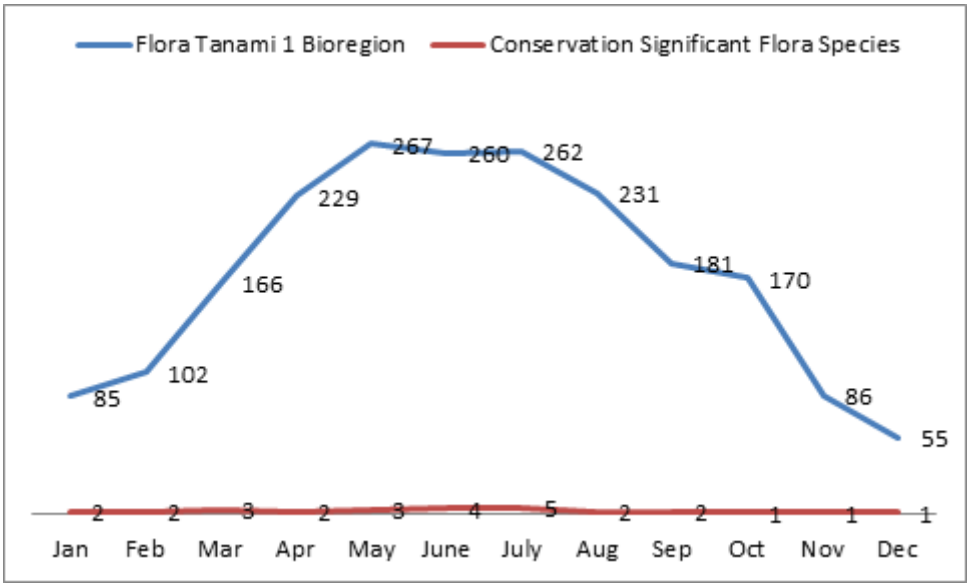


Figure 11: Numbers of Tanami bioregion flora species and conservation significant flora recorded flowering by month (Florabase, 2014)

4.2.4. Database And Literature Searches – Floristics of the Tanami Bioregion

A total of 376 vascular flora species are currently listed on the FloraBase database (2014) for the Tanami subregion. The dominant families in the subregion are Fabaceae represented by 81 taxa, Poaceae with 44 taxa, Malvaceae with 19 taxa and Asteraceae with 15 taxa.

Ten species of conservation significance had previously been recorded within the vicinity of the Study Area and Tanami bioregion. Of these only two were considered unlikely to occur in the Study Area based of the proximity of other records and their preferred habitat (**Table 3**). These data was utilised to provide target reference material for the species considered potentially occurring in the Study Area.

Twelve introduced species are listed on FloraBase (2014) for the Tanami bioregion: *Aerva javanica, Gomphrena celosioides, Tridax procumbens, Citrillus colocynthis, Euphorbia hirta, Ocimum tenuiflorum, Gossypium hirsutum, Cenchrus ciliaris, Echinochloa colona, Physalis angulata, Phyla nodiflora* and *Tribulus terrestris.*

Table 3: Flora of Conservation Significance Previously Collected within the Tanami Bioregion based on FloraBase Records

Scientific Name	Status	Flowering period	Habit/Habitat	Possibility of occurrence
Atriplex flabelliformis	P3	May-July, Sep.	Perennial herb or woody shrub, to 0.35 m high. Clay loam or loam. Semi saline alluvial plains, flats and marshes. With *Halosarcia* or *Eucalyptus microtheca,* or in grassland.	Unlikely. No habitat present in Study Area.
Crotalaria smithiana	P3	June	Annual herb to 0.4 m high. Floodplains.	Unlikely as the known population is more than 100 km from the Study Area, however floodplain habitat is present.
Eragrostis crateriformis	P3	Jan.-May or July	Annual, grass-like or herb, 0.17-0.42 m high growing in clayey loam or clay on creek banks and depressions.	Possible.
Goodenia crenata	P3	May-Aug.	Prostrate, rosetted herb, to 0.1 m high. Red loamy sand, fine red earth, red clay. Flat sandplains, sandstone outcrops	Possible. Habitat is present, previously recorded 22 km and 30 km south of the Study Area. Six other populations recorded between 100 and 350 km north of the Study Area in the Central Kimberley and Ord Victoria Plain bioregions.
Goodenia modesta	P3	Jan.-Dec.	Herb to 0.5 m high with yellow flowers. Red loam, sand.	Possible.
Goodenia suffrutescens	P1	Jun.-Aug.	Perennial, herb or shrub, to 1 m high with blue flowers on lateritic pavement. Decumbent with thick woody stems.	Possible. Only four collections in the WA Herbarium.
Indigofera sp. Gilesii (M. E. Trudgen 15869)	P3	May- Aug, Oct.	Shrub, to 1.5 m high. Pebbly loam amongst boulders & outcrops. Hills	Possible. Habitat present in Study Area but only one collection from region.
Isotropis parviflora	P2	Feb.-Mar., May	Shrub to 0.1 m high. Valley slope of ironstone plateau	Possible. Habitat present in Study Area but only one collection from region
Teucrium sp. Sturt Creek (A. A. Mitchell 5536)	P1	Not known	Rhizomatous, perennial herb to 0.2 m high growing in black soil and large crab holes.	Possible. Small amount of this habitat is present in the Study Area.
Trachymene villosa	P1	Jul.	Annual, herb, to 1 m high. Skeletal soils over quartzite	Possible. Habitat is present and two historical collections from the region, 13 km and 45 km from the Study Area.

4.3. Flora Survey Results

FloraBase (DPaW 2014) provides a general guide to the floristic diversity and dominant plant families in the Tanami bioregion and lists 376 vascular flora taxa of which ten are conservation significant species and 12 introduced species.

A total of 392 taxa (including subspecies, variants and species considered indeterminate) (listed in **Appendix D**) from 58 families (**Table 4**) and 172 genera were recorded from within the Study Area during the field surveys. Plant families with the greatest number of taxa within the Study Area are shown (in **Table 4**). Species from ten families not currently recorded on the FloraBase database were collected from the Study Area; however nine of these families are represented in the ALA database. Only one family Hemerocallidaceae, represented by *Corynotheca micrantha* var. *gracilis* was not recorded in the Tanami on either database. Representatives from 77% of the 75 families listed on FloraBase for the Tanami bioregion were recorded during the surveys.

The most species rich family within the Study Area was Fabaceae with 93 taxa, of which the genus *Acacia* contributed 38 taxa. Poaceae was second most common, represented by 61 taxa of which *Triodia* and *Eragrostis* were the most common genera, contributing 10 and nine species respectively. The third most common family was Malvaceae with 33 taxa. The relative proportion of these dominant families (Fabaceae 24%, Poaceae 15% and Malvaceae 8%) is quite consistent with bioregional statistics derived from FloraBase for the Tanami bioregion. Twenty five genera are represented by only one species in the Study Area.

A total of 179 of the 376 taxa currently listed on FloraBase (2014) for the Tanami 1 bioregion were recorded during the survey (**Appendix D**). A further 171 species were not listed on FloraBase (vouchered specimens) but were listed in the Atlas of Living Australia (ALA) and 43 species were recorded that were not listed on either database in the Tanami bioregion. The majority of the flora specimens were identified or confirmed by Kimberley regional specialist botanist Dr R. Barrett, and thus are considered to be determined with a high degree of certainty.

This large number of species not currently vouchered in the WA Herbarium (FloraBase) is indicative of how poorly surveyed the WA side of the Tanami bioregion is and how this survey has contributed to the knowledge of the Study Area as part of this bioregion. The 43 species not previous recorded in the Tanami bioregion were assessed to determine whether they represented significant range extensions and thus may be species of 'Other Conservation Significance' (in Section 4.4.3).

Table 4: Flora Families and Genera Recorded in the Browns Range Study Area Compared with the Tanami Bioregion

Family	TN	BR	Family	TN	BR	Family	TN	BR
	No. species			No. species			No. species	
Fabaceae	81	93	Nyctaginaceae	1	2	Surianaceae	1	1
Poaceae	44	61	Santalaceae	1	2	Violaceae	1	1
Malvaceae	19	33	Cleomaceae	2	2	Combretaceae	2	1
Cyperaceae	10	20	Polygalaceae	2	2	Picrodendraceae	2	1
Myrtaceae	20	19	Lythraceae	3	2	Elatinaceae	3	1
Goodeniaceae	15	16	Plantaginaceae	3	2	Zygophyllaceae	3	1
Euphorbiaceae	7	15	Droseraceae	5	2	Molluginaceae	4	1
Asteraceae	15	11	Loranthaceae	7	2	Stylidaceae	8	1
Amaranthaceae	14	10	Bignoniaceae	0	1	Acanthaceae	1	0
Convolvulaceae	6	9	Campanulaceae	0	1	Asparagaceae	1	0
Chenopodiaceae	15	9	Hemerocallidaceae	0	1	Cannabaceae	1	0
Proteaceae	6	8	Hypericaceae	0	1	Collemataceae	1	0
Boraginaceae	14	8	Lauraceae	0	1	Eriocaulaceae	1	0
Rubiaceae	2	5	Menispermaceae	0	1	Frankeniaceae	1	0
Scrophulariceae	6	5	Phyllanthaceae	0	1	Haloragaceae	1	0
Sapindaceae	2	4	Rhamnaceae	0	1	Hydrocharitaceae	1	0
Solanaceae	7	4	Araliaceae	1	1	Lentibulariaceae	1	0
Lamiaceae	8	4	Byblidaceae	1	1	Lindsaaeceae	1	0
Apocynaceae	0	3	Caryophyllaceae	1	1	Meesiaceae	1	0
Aizoaceae	4	3	Celastraceae	1	1	Onagraceae	1	0
Portulaceae	4	3	Commelinaceae	1	1	Orchidaceae	1	0
Orobanchaceae	0	2	Marsiliaceae	1	1	Phrymaceae	1	0
Capparaceae	1	2	Meliaceae	1	1	Polygonaceae	1	0
Cucurbitaceae	1	2	Menyanthaceae	1	1	Thymeleaceae	1	0
Gyrostemonaceae	1	2	Pteridaceae	1	1	Verbenaceae	1	0
TOTAL							**376**	**392**

TN = Tanami Bioregion (FloraBase 2014) BR = Browns Range

4.3.1. Threatened Flora

No Threatened Flora (DRF) listed under the *Wildlife Conservation Act 1950*, or Threatened Flora species listed under the *EPBC Act* were recorded in the Study Area and none are currently listed for the Tanami bioregion.

4.3.2. Priority Flora

Four Western Australian Priority Flora species, *Eleocharis ochrostachys* (Priority 3), *Goodenia crenata* (Priority 3), *Heliotropium uniflorum* (Priority 1) and *Trachymene villosa* (Priority 1) were recorded within the Study Area during the 2012 and 2013 surveys. The number of populations and individuals recorded within the Study Area and Development Footprint are shown (in **Table 5)** against the number of records from FloraBase and the ALA (2014). The locations of Priority Flora recorded in the Study Area are listed (**Appendix E**) and illustrated **(Figures 32-37**). The known distributions of these species are based on records in the WA Herbarium and in the ALA database. These species and potential impacts of the proposed development on their status are also discussed in the following sections. The number of populations of Priority Flora species recorded in the Study Area has significantly improved their conservation status and indicates; particularly as they are disjunct from other known populations that their distributions and total population sizes are likely to be larger than currently known.

Table 5: Summary of Status of Priority Flora Recorded in the Browns Range Study Area

Taxon (Status)	Study Area	Development Envelope	Development Footprint	FloraBase (2014)	ALA (2014)
	No. of Populations (individuals)			No. of Locality Records	
Eleocharis ochrostachys	1 (6)	1 (6)	0	2	158
Goodenia crenata	51 (6,200)	7 (400)	2 (70)	8	11
Heliotropium uniflorum	1 (1)	0	0	6	46
Trachymene villosa	10 (46)	2 (26)	0	3	40

Eleocharis ochrostachys

The Priority 3 species *Eleocharis ochrostachys* (confirmed by Dr. R. Barrett) was recorded at one location (52K 461570 m E, 7922257 m S) on the Browns Range Haul Road in *Eucalyptus victrix* low lying floodplain vegetation (VA15) where pools of water persisted. Six individuals were recorded in this location which is within the Development Envelope but not the Development Footprint.

This record represents a significant range extension from the other two known populations on FloraBase (2014) which are located in the Northern Kimberley, one in Drysdale River Station in a mound spring and the other near Kalumburu in a drainage line at the foot of a slope. However, this species also occurs across northern Australia extending as far south as Brisbane on the east coast and to Papua New Guinea (**Figure 12**). It is not recognised as of conservation significance in the

Northern Territory or Queensland. The ALA database (2014) lists 158 records for this species including five in Western Australia, 104 in the Northern Territory and 40 in Queensland.

Figure 12: Known distribution of *Eleocharis ochrostachys* (ALA 2014)

Goodenia crenata

Goodenia crenata is described as a prostrate, rosette herb (**Plate 1**) growing to 0.15 m (FloraBase 2014).

An estimated 6,400 individuals of this species were recorded at 53 locations (**Appendix E** and **Figures 32-37**) within the main Study Area, proposed haul road and southern borefield during the 2012 and 2013 surveys. The largest populations of *Goodenia crenata* were recorded in broad floodplains in vegetation associations VA10 – *Eucalyptus chlorophylla* plains; VA12 – *Corymbia flavescens* broad drainage, VA12/15 – *Corymbia flavescens* and *E. victrix* mosaic and VT15 – *Eucalyptus victrix* drainage lines. Populations of *Goodenia crenata* were also recorded in areas of concentrated drainage between and surrounding low rocky rises (VA1 – *Eucalyptus brevifolia* rocky hills) and in VA6 (*Eucalyptus brevifolia* plains), VA6/VA10 *Eucalyptus brevifolia* and *E. chlorophylla* plains and VA8 *Eucalyptus brevifolia* with *E. pruinosa*.

The numbers of *Goodenia crenata* and population sizes recorded during the 2013 survey were less than in 2012; however it was apparent that the foliage of many had died off prior to this survey. Given the very large numbers of individuals recorded in both 2012 and 2013 it is estimated that several tens

of thousands of individuals are likely to occur in the Study Area, however a more conservative estimate is provided for this assessment.

There are an estimated 400 individuals recorded at seven locations within the Development Envelope. This represents 6.4% of the conservative estimate of individuals within the Study Area.

Two populations of *Goodenia crenata* (WPJA38, Brow 66) represented by an estimated 70 individuals are located within the Development Footprint. This is 1.1% of the estimated total population recorded in the Study Area.

Eight records of this species are recorded on FloraBase (2014) and 11 populations are listed on the ALA database, all within Western Australia including within the Tanami bioregion (**Figure 13**). Two other studies within the vicinity of the Browns Range Study Area have also recorded populations of *Goodenia crenata* on creek bed banks in the Uranio Project Study Area (Ecotec 2008b) and in the Alfmeco Project area (Ecotec 2008a). Population sizes for these records were not available.

Plate 1: Priority 3 Flora Species *Goodenia crenata*

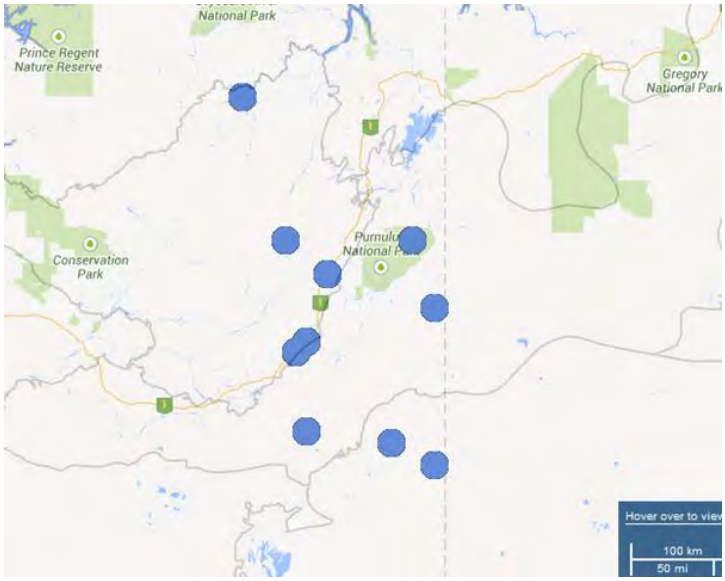


Figure 13: Known distribution of Goodenia crenata (ALA, 2014).

Heliotropium uniflorum

Priority 1 Flora species *Heliotropium uniflorum* is an annual or biennial herb to 0.3 m which has white flowers between March and December (FloraBase 2014). The habitat is described as 'sandstone, quartzite stony slopes and undulating rocky plateaus' and the nearest listed populations are recorded in the Ord-Victoria Plains bioregion. FloraBase lists six records of this species within Western Australia and 46 records are listed on the ALA database, extending across the Tanami bioregion into the Northern Territory, with one record in Queensland (**Figure 14**).

One individual of *Heliotropium uniflorum* was recorded in QBrow21 (52K 493396 m E and 7910695 m in vegetation association 1, which is described as a broad, rocky ridge habitat within the Study Area. This record is located within the Study Area, but not the Development Envelope or Development Footprint area. Rocky hills are relatively widespread within and extending outside of the Study Area and thus it is likely that other populations of this species are extant within the vicinity.

Figure 14: Known distribution of *Heliotropium uniflorum* (ALA 2014)

Trachymene villosa

Trachymene villosa is an annual herb with pink/white flowers that has been recorded growing to 1 m on skeletal soils over quartzite (FloraBase 2014). There are three known localities of this species on the WA Herbarium database, all associated with quartz substrates and a further 37 populations have previously been recorded on the ALA database, extending into the Northern Territory Tanami (**Figure** 15).

One population of ten individuals of the Priority 1 Flora species *Trachymene villosa* (**Plate 2**) was recorded in the Study Area in 2012 and a further ten populations comprising 46 individuals (**Appendix E** and **Figures 32-37**) were recorded in 2013. The population recorded in 2012 was not re-recorded in 2013, possibly due to a fire passing through this area in October 2012. The emergence of this species may correlate with fire frequency in addition to favourable seasonal conditions. The preferred habitat for this species was consistently found to be sandy soils at the base of rocky hills.

Two populations of *Trachymene villosa* representing 26 individuals are located within the Development Envelope, which represents 56.5% of the known population in 2013. The vegetation associations in which this species are mapped vary from VA1 (*Eucalyptus brevifolia* rocky hills), VA2 (*Eucalyptus cupularis* rocky hills), VA6 (*Eucalyptus brevifolia* plains), VA9 (*Corymbia opaca*) and VA14 (*Melaleuca nervosa* flats) however topography is a better indicator of the likely presence of this species, which is at the base of rocky hills. It was not possible to neither discriminate nor map the vegetation in which this species occurred at a meaningful scale.

No populations were recorded within the Development Footprint. Given the availability of suitable rocky hills habitat it is anticipated that further populations of this species do occur both within the Study Area and similar habitat in the vicinity. *Trachymene villosa* was recorded in the Alfmeco Project area (Ecotec 2008a) however no specimen is currently listed on FloraBase for this record and population size data is not available.

Plate 2: Priority 1 Flora Species *Trachymene villosa*

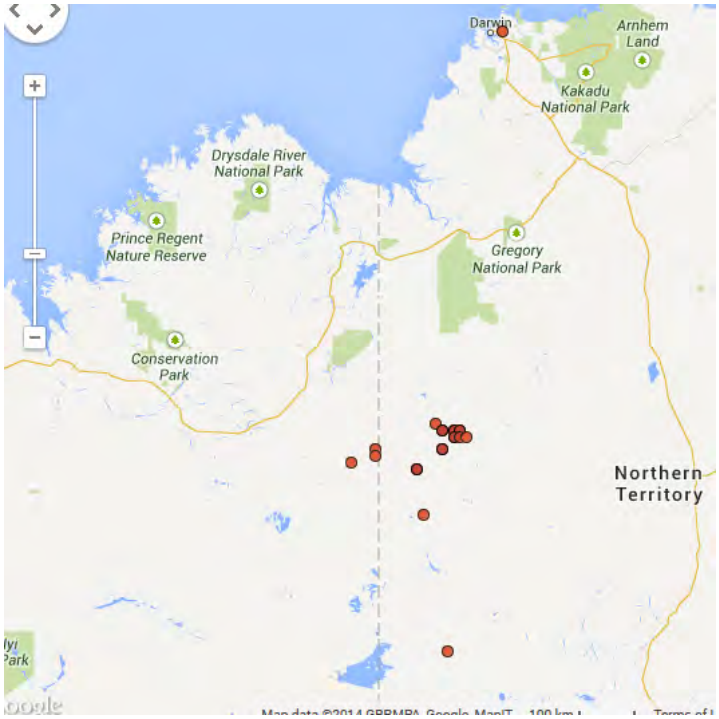


Figure 15: Known distribution of *Trachymene villosa* (ALA, 2013)

4.3.3. Flora Of 'Other Conservation Significance'

WA Herbarium data on FloraBase was used to initially assess potential species of flora of 'Other Conservation Significance' in accordance with Guidance Statement 51, which defines these species as outlined in **Section 2.10**.

A total of 170 species were considered range extensions based on FloraBase specimens (2013). These were then reviewed using data from the ALA (ALA) database, which includes Australia-wide records, including those lodged in the WA Herbarium. The ALA records for Western Australian species in particular, may be less reliable than those in the WA Herbarium (P. Gioia *pers comm.* 2013), depending on whether they have been curated by a specialist, however provide valuable information related to the overall distribution of species. Several species listed as conservation significant within Western Australia are considered common within other states.

A rating system was devised to review the status of the 170 apparent range extension species which took into consideration the following aspects:

- If specimens had been recorded within the vicinity or Tanami Bioregion in the ALA database (within existing distribution);
- If the distribution extended across either side of the Study Area/Tanami bioregion (contiguous distribution);
- If the species has been recorded within the adjacent Ord Victoria Plain and Great Sandy Desert bioregions and is within 200 km from the Study Area; and
- If the historical species records were within 100 km, 200 km, 500 km or greater distance away from the Study Area.

The data was tabulated (**Appendix F**), mapped (**Appendix G**) and the species rated based on criteria listed in **Table 6**.

Table 6: Assessment of Range Extensions based on ALA Database Records

Rating	Within Vicinity of Study Area	Contiguous distribution	Present in Tanami Bioregion	Present in OVP, GSD	>100km	100-200km	200-500km	500km+
No Extension	X	X	X		X			
Very Low		X	X			X		
Low		X		X		X		
Low			X			X		
Medium				X			X	
High						X	X	X

Seventeen species are considered to be species of 'Other Conservation Significance' and are discussed in detail following and summarised with their Range Extension Rating (in **Table 7**). These include an undescribed *Goodenia*, recorded during the 2012 survey; two species being considered for listing as Priority Flora by the DPaW [*Brachychiton multicaulis* and *Stemodia* sp. Tanami (P. K. Latz 8218)]; and *Goodenia goodeniacea* and *Sesbania muelleri*, which have not previously been recorded in Western Australia. Five additional species are considered to be High Range Extensions and seven were identified as Medium Range Extensions. Two of the Priority Flora species previously discussed **(Section 4.3.2**) were also considered to be High (*Eleocharis ochrostachys)* and Medium Range Extensions *Heliotropium uniflorum*.

Table 7: Species Considered of 'Other Conservation Significance' in the Browns Range Study Area

Taxon	Summary Rationale for listing as 'Other Conservation Significance'	Range Extension Rating
Brachychiton multicaulis	Under consideration for nomination as Priority Flora (*pers. comm.* Dr R. Barrett 2013) given the low number of known locations and records.	Very Low
Corynotheca micrantha var. *gracilis*	Widespread distribution throughout Kimberly bioregions in northwest Australia. Presence in Tanami Desert is unexpected but not highly significant.	Medium
Cyperus haspan subsp.?juncoides	Significant? Western Australian endemic –disjunct record – validated by Dr R Barrett	High
Euphorbia armstrongiana var.?distans	Very significant record – Western Australian endemic usually restricted to the Central and Northern Kimberley regions - also few records	High
Euphorbia ?inappendiculata	Several populations in Pilbara and Kimberly regions, common in South Australia and two populations in mid Northern Territory and north of Alice springs. Widespread distribution indicates presence in Tanami is not surprising.	Medium
Exocarpos latifolius	Very common throughout the North of Australia. Disjunct occurrence within the Tanami bioregion.	Medium
Fimbristylis pauciflora (s. l.)	Widespread throughout the north of Australia from Broome to Gulf of Carpentaria. Presence in Tanami Desert is disjunct from other populations.	Medium
Gomphrena flaccida	Widespread throughout the north of Australia from Broome to Queensland coast. Not commonly found in inland desert locations. Presence in Tanami bioregion is disjunct from other populations.	Medium
Goodenia arachnoidea	Very significant record –usually only in Northern Kimberley - also few records.	High
Goodenia goodeniacea	Not previously recorded in WA	Very Low
Goodenia ?sp. nov	Apparently undescribed species (*pers. comm.* M. Hislop 2013) that could not be recollected in 2013 as its habitat had been burnt.	Not rated

Taxon	Summary Rationale for listing as 'Other Conservation Significance'	Range Extension Rating
Polymeria lanata (s. l.)	Very significant record – recorded in the Pilbara, Dampierland and Northern Kimberley- also few records	High
Sesbania muelleri	Very significant record – not previous verified in WA and there are also few records	High
Stemodia sp. Tanami (P. K. Latz 8218)	Under consideration for nomination as Priority Flora (*pers. comm.* R. Barrett 2013).	Very Low
Swainsona ?formosa	Very common throughout much of inland Australia, although usually further south. It presence within the Tanami bioregion is therefore unexpected.	Medium
Vigna vexillata var. angustifolia	Widespread across northern Australia, extending to southern New South Wales however in Western Australia recorded in Dampierland and Northern Kimberley bioregions.	High
Whiteochloa airoides	Widespread throughout the north of Australia from Broome to Queensland coast. Some populations inland in Eremaean provence. Presence in Tanami not entirely surprising.	Medium

Brachychiton multicaulis

This perennial shrub species (**Plate 3** and **Plate 4**) has been recorded growing on sandy plains in small numbers in only two locations in the Ord-Victoria Plain region. Its Australian distribution extends across into the Northern Territory with a further 42 records listed on the ALA database (**Figure 16**) and thus it was rated as a Very Low Range Extension. Given that *Brachychiton multicaulis* is being considered by DPaW for listing as Priority Flora; it is treated as a species of 'Other Conservation Significance' here.

A total of 53 populations and 266 individuals were recorded within the Study Area (**Figures 35-37**), representing a significant increase in the number of records for Western Australia. This species was frequently found on broad floodplain areas in vegetation associations VA10 (*Eucalyptus chlorophylla*), VA11 (*Sorghum* plain), VA12 (*Corymbia flavescens* broad drainage) and VA12/15 (*Corymbia flavescens* and *Eucalyptus victrix* broad drainage), VA15 (*Eucalyptus victrix* drainage lines); but was also recorded in VA1 (*Eucalyptus brevifolia* rocky hills), VA6 (*Eucalyptus brevifolia* plains), VA8 (*Eucalyptus brevifolia* and *E. pruinosa* plains) and VA6/VA10 (*Eucalyptus brevifolia* and *E. chlorophylla* plains).

A total of 17 populations and 92 individuals were recorded within the Development Envelope (**Figures 32-37**), representing 34.5% of individuals in the Study Area.

Six populations supporting a total of 57 individuals are located within the Development Footprint. This represents 21.4% of the total number of individuals recorded within the Study Area. No other records of this species were found in available reports for surveys within the vicinity and Kimberley.

Plate 3: *Brachychiton multicaulis* - leaf

Plate 4: *Brachychiton multicaulis* - flower

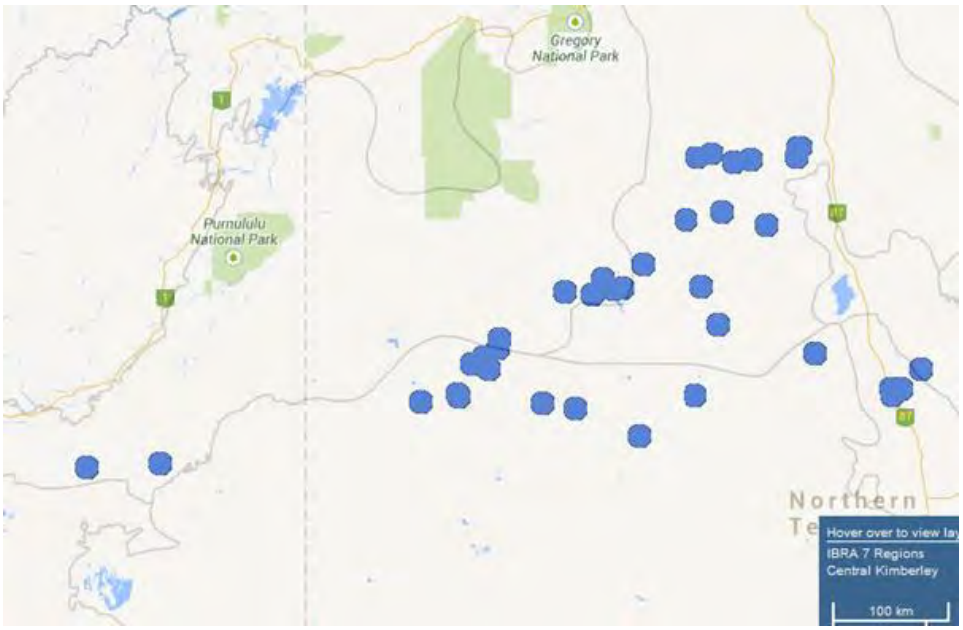


Figure 16: Known distribution of *Brachychiton multicaulis* (ALA, 2014).

Corynotheca micrantha var. gracilis

This species is described as a rhizomatous, tufted, tangled perennial herb or shrub to 1.3 m with white/cream flowers between June and October (FloraBase 2014). This is the first record of this family in the Tanami bioregion as it has not been previously recorded on either the FloraBase or ALA databases.

There are 25 records of this species across a distribution largely confined to northern Western Australia, extending from Broome to just across the Northern Territory border The Browns Range records represent the southern-most known extent of this species by several hundred kilometres and thus it was rated as a Medium Range Extension (**Figure 17**). This species was recorded in the Study Area on broad sand plains with relatively dense low shrubland/heathland in vegetation associations VA6 (*Eucalyptus brevifolia* plains), VA7 (*Owenia reticulata* elevated plains) and VA8 (*Eucalyptus brevifolia* and *E. pruinosa* plains) one population in each and in VA10 (*Eucalyptus chlorophylla*) and VA12/14 (*Corymbia flavescens* and *Melaleuca nervosa*).

Corynotheca micrantha var. *gracilis* was recorded in five quadrats (QBrow 55, QBrow 66, QBrow 51a, QBrow 273 and QBrow284) and one mapping note site (JA212) (**Figures 32-36**) within the Study Area. Only estimates of percentage cover were recorded, numbers of individuals were not assessed.

None of the *Corynotheca micrantha* var. *gracilis* populations are located within the Development Envelope or Development Footprint, although a small area supporting these was disturbed during exploration activities at the original campsite and for access tracks prior to commencement of the 2012 survey.

Figure 17: Known distribution of *Corynotheca micrantha* var. *gracilis* (ALA, 2014)

Cyperus haspan subsp.?juncoides

This species is described as a rhizomatous, tufted perennial (**Plate 5**) growing to 0.6 m high in sand, clay and alluvium swamps, watercourses and pools (FloraBase 2014). There are 54 records of this species in the WA Herbarium distributed across the Central Kimberley, Dampierland, Northern Kimberley, Ord Victoria Plain and Victoria Bonaparte bioregions (**Figure 18**). Given the distance between these localities and the Study Area this species is considered to be a High Range Extension.

Unfortunately the label for the one specimen collected in the Browns Range Study Area was lost, however given its preferred habitat of standing water these areas should be avoided if possible. This subspecies is not listed on the ALA however the distribution of *Cyperus haspan* runs from northern Western Australia to New South Wales.

Plate 5: *Cyperus haspan* subsp. *juncoides* (Florabase, 2014).

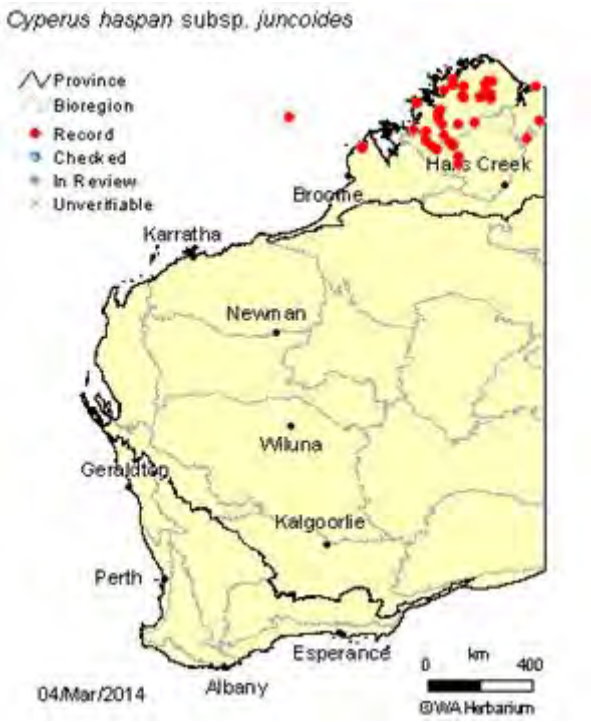


Figure 18: Known distribution of *Cyperus haspan* subsp. *juncoides* (Florabase, 2014)

Euphorbia armstrongiana var.?distans

Euphorbia armstrongiana var. *distans* is described as a diffuse annual with reddish stems and discolorous leaves. The taxonomic confirmation of the specimen from Browns Range could not be further clarified following the 2013 survey as it was not relocated in 2013.

This species has previously only been recorded at 20 locations in the Central and Northern Kimberley (**Figure 19**), growing on the edge of creeks, amongst massive sandstone and dolerite boulders. The ALA database lists 23 records however they are all within Western Australia. Given the significant distance between the known populations and the Study Area, this species is considered to represent a High Range Extension.

One population of one individual of this species was recorded in the Study Area (**Appendix E**) in vegetation association VA12/15 (*Corymbia flavescens* and *Eucalyptus victrix* broad drainage). However it is not located within the Development Envelope or Development Footprint.

Figure 19: Known distribution of *Euphorbia armstrongiana* var ?*distans* (ALA, 2014)

Euphorbia ?inappendiculata

Euphorbia inappendiculata is described as a spreading, procumbent shrub to 0.4 m with pink flowers in August, growing in clay soils amongst broken rocky screes (FloraBase 2014).

There are 11 records of this species in the WA Herbarium, with the main distribution within the Pilbara and Ashburton bioregions, however one record from 1973 was collected north of the Duncan Highway and the Study Area (**Figure 20**). Given this one record the population at Browns Range is considered a Medium Range Extension, and taking into consideration that there are 54 records of this species on the ALA database including 38 in (central) South Australia, three in the Northern Territory and one in Queensland. *Euphorbia inappendiculata* was recorded at three locations in the Study Area within vegetation associations VA2 (*Eucalyptus cupularis* rocky hills), VA9 (*Corymbia opaca*) and VA12/14 (*Corymbia flavescens* and *Melaleuca nervosa* broad drainage/flats) and none of these populations are within the Development Envelope or Development Footprint.

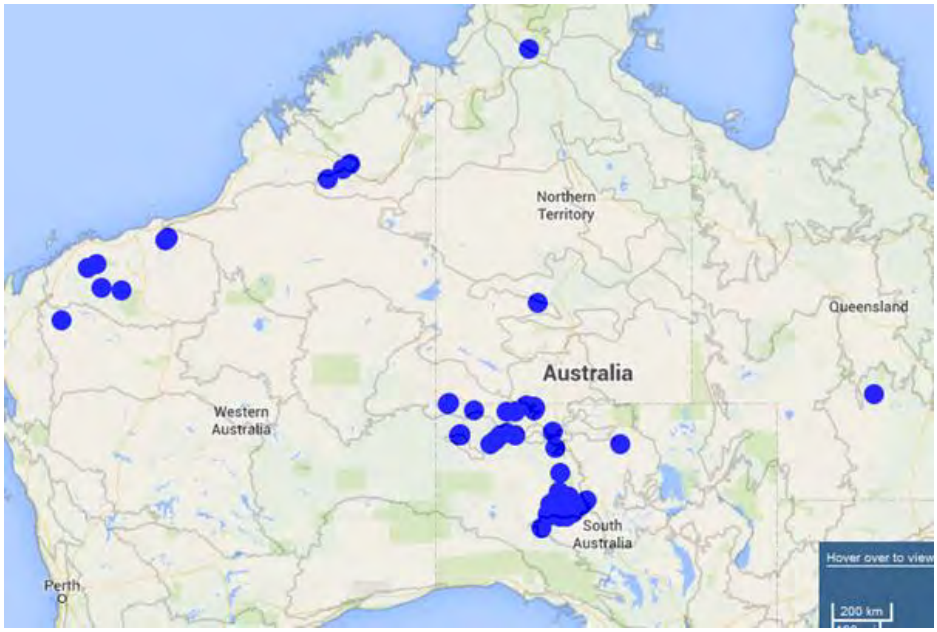


Figure 20: Known distribution of *Euphorbia inappendiculata* (ALA, 2014)

Exocarpos latifolius

Exocarpos latifolius is a small hemiparasitic tree or shrub that has been recorded in sandstone gullies, sand dunes and river banks (**Plate 6**). This species is relatively common across the Kimberley in Western Australia, the Northern Territory and Queensland extending to northern New South Wales (**Figure 21**). The ALA database lists 2,661 records, however the collection in the Browns Range Study Area is still considered to represent a Medium Range Extension due to it being disjunct by some distance from other Western Australian records. It was recorded in only one location in the Study Area, in quadrat QBrow1 supporting vegetation association VA10 (*Eucalyptus chlorophylla*). This population is not within the Development Envelope or Development Footprint.

It is possible that the population in the Study Area is a relict or was introduced to the area, possibly by Traditional Owners, particularly as smoke produced from the leaves of this species is considered a powerful medicine in some areas and the swollen sections of the fruit were eaten like chewing gum (Wiynjorrotj *et al.* 2005).

Plate 6: *Exocarpos latifolius* (ALA 2014) http://www.anbg.gov.au/copyright.html (photo by M. Fagg)

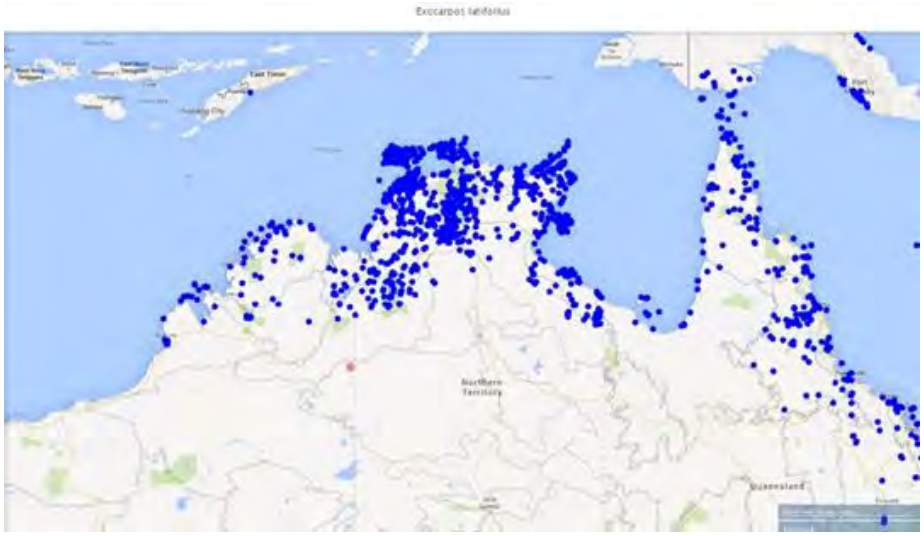


Figure 21: Known distribution of *Exocarpos latifolius*

***Fimbristylis pauciflora* (*s. l.*)**

This species is described as a tufted perennial or annual that grows to 0.25 m in damp sand and seepage areas (FloraBase 2014). The record in the Study Area represents a Medium Range Extension taking into consideration that although a large distance south of the known distributions in the Ord Victoria Plain and Central Kimberley, the species extends across into the Northern Territory and on the east coast to southern Queensland with one record in Papua New Guinea (**Figure 22**). There are 944 records for this species in the ALA database and 56 records on the FloraBase database.

Only one record of *Fimbristylis pauciflora* was recorded in the Study Area at Dr. R. Barrett's WP57 in vegetation association VA6 (*Eucalyptus brevifolia* plains). This location is not within the Development Envelope or Development Footprint.

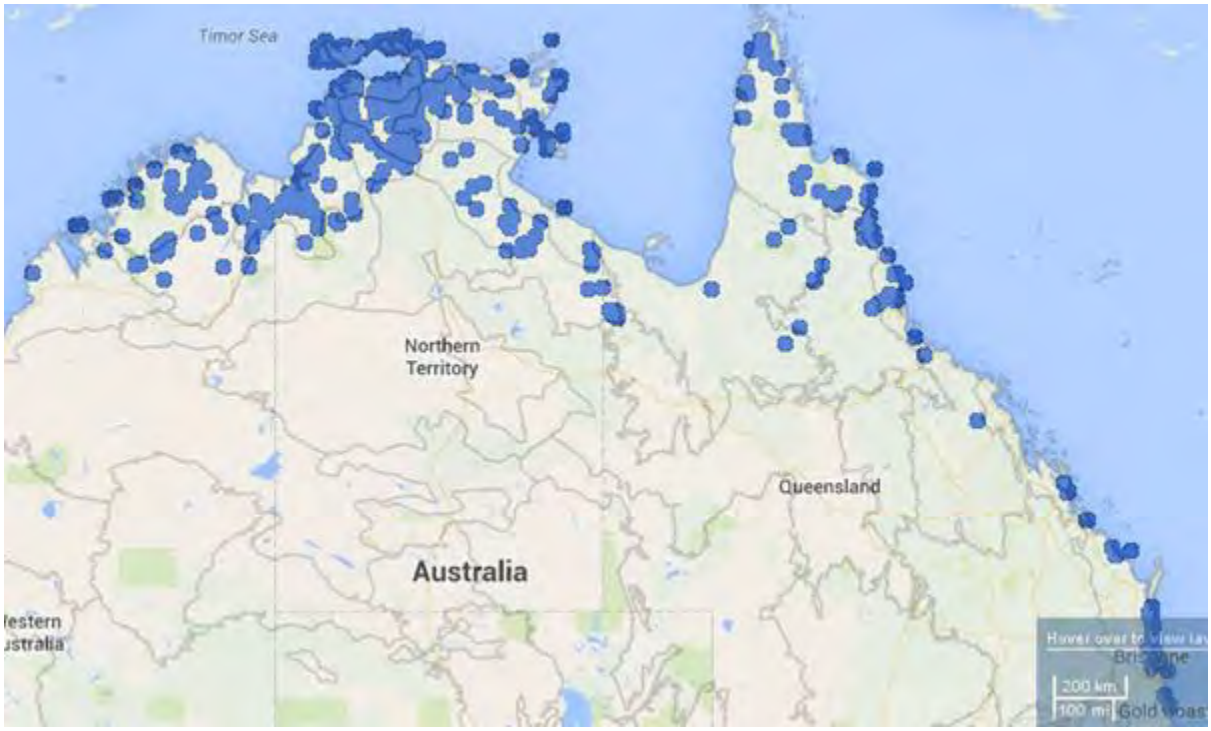


Figure 22: Known distribution of *Fimbristylis pauciflora* (s.l.) (ALA, 2014)

Gomphrena flaccida

This species is described as an erect annual to 1 m high, with white-pink-purple flowers (**Plate 7**) growing on rocky hills and plains (FloraBase 2014).

The ALA database lists 844 records of this species from northern Western Australia across to Queensland and FloraBase lists 103 records across Dampierland, Victoria Bonaparte and the Central and Northern Kimberley bioregions (**Figure 23**).

One individual of *Gomphrena flaccida* was recorded in quadrat QBrow421, vegetation association VA12 (*Corymbia flavescens* broad drainage) in the Study Area. This location is not within the Development Envelope or Development Footprint.

Given the large distance between the specimen recorded at quadrat QBrow421 and the known distribution, and taking into consideration the broader distribution, this record represents a Medium Range Extension.

Plate 7: *Gomphrena flaccida* (ALA, 2014)

Photograph by F.A. Zich available at http://anbg.gov.au/copyright.html

Figure 23: Known distribution of *Gomphrena flaccida* (ALA, 2014)

Goodenia arachnoidea

Goodenia arachnoidea is described as an erect to ascending herb with yellow flowers (**Plate 8**) between January and July, growing on gravelly sand, laterite and alluvium on sandstone outcrops and plateaus, rocky hills and near creeks (FloraBase 2014). There are 40 records of this species listed on FloraBase and 58 on the ALA database for the Northern Kimberley bioregion (**Figure 24**).

Goodenia arachnoides was recorded in one quadrat QBrow56 supporting vegetation association VA1 (*Eucalyptus brevifolia* rocky hills) in the Browns Range Study Area but not within either the Development Envelope or Development Footprint. This record represents a High Range Extension based on the distance from the closest known populations.

Plate 8: *Goodenia arachnoidea* (ALA, 2014)

Photograph by M. Fagg, available at http://anbg.gov.au/copyright/html

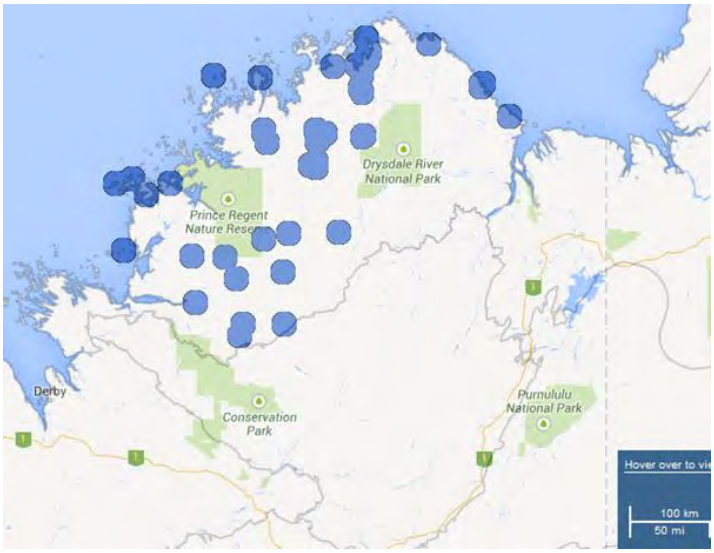


Figure 24: Known distribution of Goodenia arachnoidea (ALA, 2014)

Goodenia goodeniacea

Twenty-seven records of this species extend across the Northern Territory and central Queensland (ALA 2013) (**Plate 9**) with one record from the King George Falls in Western Australia and another record in the Central Ranges, 14 km west of the Docker River settlement near the Northern Territory border (**Figure 25**).

Twelve populations comprising an estimated 265 individuals of *Goodenia goodeniacea* were recorded in the Study Area, all within vegetation association VA12/15 (*Corymbia flavescens* and *Eucalyptus victrix* broad drainage). There are no populations of *Goodenia goodeniacea* within the Development Envelope or Development Footprint.

Plate 9: *Goodenia goodeniacea* at Waypoint JA59

Figure 25: Known distribution of Goodenia goodeniacea (ALA, 2014)

G*oodenia* ?sp. nov

One individual of an unnamed G*oodenia* was collected from QBrow 100 in a slight depression on a broad drainage area in 2012 and was revisited in 2013, however the site had been burnt and no evidence of any individuals from this locality were found. This record is located within vegetation association VA12/15 (*Corymbia flavescens* and *Eucalyptus victrix* broad drainage). A pressed specimen of this *Goodenia* is illustrated (**Plate 10**). The *Goodenia* is described as a small, softly hairy shrub growing to 20 cm. The locality at which this potential new species was collected is not within the Development Envelope or Development Footprint.

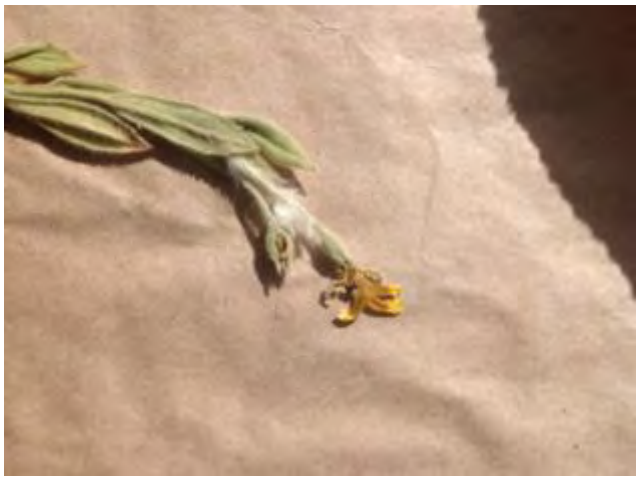


Plate 10: Unnamed species of *Goodenia* recorded in the Study Area

***Polymeria lanata* (*s.l.*)**

Polymeria lanata is described as a prostrate, mat-forming perennial, herb to 0.2 m with pink/white flowers (**Plate 11**) in February or September (FloraBase 2014). It has previously been recorded in Dampierland, the Pilbara and Victoria Bonaparte bioregions. FloraBase (2014) lists 19 records of this species and ALA (2014) has a further 32 records which extend to the east coast of Queensland (**Figure 26**).

Three populations of *Polymeria lanata* are located within the Study Area in quadrats QBrow7, QBrow30 and QBrow32 within vegetation associations VA6 (*Eucalyptus brevifolia*), VA10 (*Eucalyptus chlorophylla*) and VA1 (*Eucalyptus brevifolia*) respectively. One population of *Polymeria lanata* (QBrow7) was recorded within the Development Envelope, none of these populations are within the Development Footprint.

Plate 11: *Polymeria lanata* (Florabase, 2014)

Figure 26: Known distribution of *Polymeria lanata* (ALA, 2014)

Sesbania muelleri

One flora species recorded in the Study Area, *Sesbania muelleri* has not been previously recorded in Western Australia; however has been recorded in the Northern Territory. Five records of this species are listed on the ALA (2013), distributed east-west across the Northern Territory (**Figure 27**).

Sesbania muelleri was recorded at two locations in the Study Area, in QBrow24 and QBrow56, both on rocky ridges vegetation association VA1 (*Eucalyptus brevifolia* rocky hills). The numbers of individuals in these populations were not estimated in 2012; however it was recorded as occupying 1% of the vegetative cover in the quadrats. Attempts to estimate the number of individuals were made in 2013; following the fire in October 2012.

Fifteen burnt individuals were noted in QBrow 56. The records of this species in the Browns Range Study Area are considered to be a High Range Extension as it is the south-western most extent of its distribution by approximately 400 km. The known populations of *Sesbania muelleri* are not located within the Development Envelope or Disturbance Footprint, however it is likely that other populations occur in the rocky hills within the Study Area.

Figure 27: Known distribution of Sesbania muelleri (ALA, 2014)

***Stemodia* sp. Tanami (P. K. Latz 8218)**

Stemodia sp. Tanami (P. K. Latz 8218) is described as a rounded, perennial, odoriferous plant (**Plates 12**) with purple flowers (FloraBase 2014). In the Study Area, this species was found on low rocky rises emergent in a broad plain (**Plate 13**).

Stemodia sp. Tanami (P. K. Latz 8218) has previously been recorded in limited numbers in the northern part of the Tanami 1 subregion and in the Mann-Musgrave Block subregion from two records on FloraBase (2014). *Stemodia* sp. Tanami (P. K. Latz 8218) extends across the Tanami Desert almost to the border of Queensland (**Figure 28**) and is represented by 114 records in the ALA database (2014).

An estimated total of 20 individuals of *Stemodia* sp. Tanami (P. K. Latz 8218) were recorded at five small emergent rocky outcrops in the Study Area within vegetation associations VA6 (*Eucalyptus brevifolia*), VA8 (*Eucalyptus brevifolia* and *E. pruinosa*), VA12/15 (*Corymbia flavescens* and *Eucalyptus victrix* broad drainage). One population of two individuals is located within the Development Envelope and Development Footprint (WPJA317). This species is likely to also occur in similar habitats within and extending outside of the Study Area.

Plate 12: *Stemodia* sp. Tanami – habit

Plate 13: *Stemodia* sp. Tanami - habitat

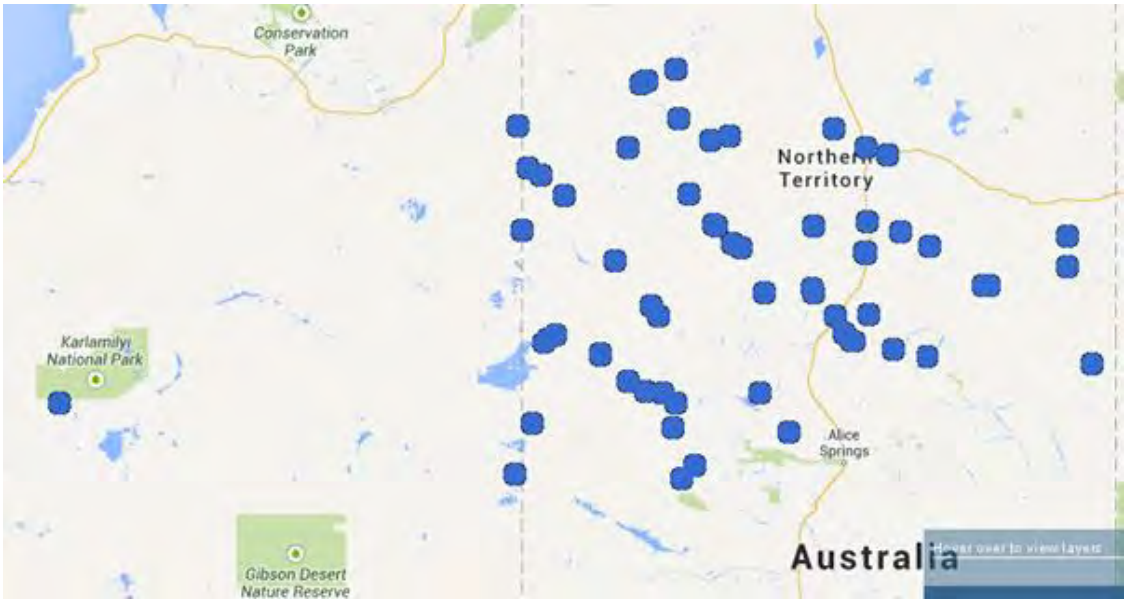


Figure 28: Known distribution of Stemodia sp. Tanami (P.K. Latz 8218) ALA (2014)

Swainsona ?formosa

Swainsona formosa is a prostrate annual or short-lived perennial growing to 0.2 m and 3 m wide, with red and black flowers (**Plate 14**) between June and October (FloraBase 2014). It is a common and widespread species across central Western Australia (98 records in the WA Herbarium) extending across to New South Wales (657 records in ALA 2014) (**Figure 29**).

Swainsona formosa was recorded in one location, in vegetation association VA10 (*Eucalyptus chlorophylla*) quadrat QBrow65 in 2012 but was not re-recorded in 2013. This quadrat is not within the Development Envelope or Development Footprint. This record of *Swainsona formosa* is considered to be a Medium Range Extension given that it has previously been recorded less than 200 km to the south of the Study Area, within the Great Sandy Desert.

Plate 14: *Swainsona formosa* (Florabase, 2014)

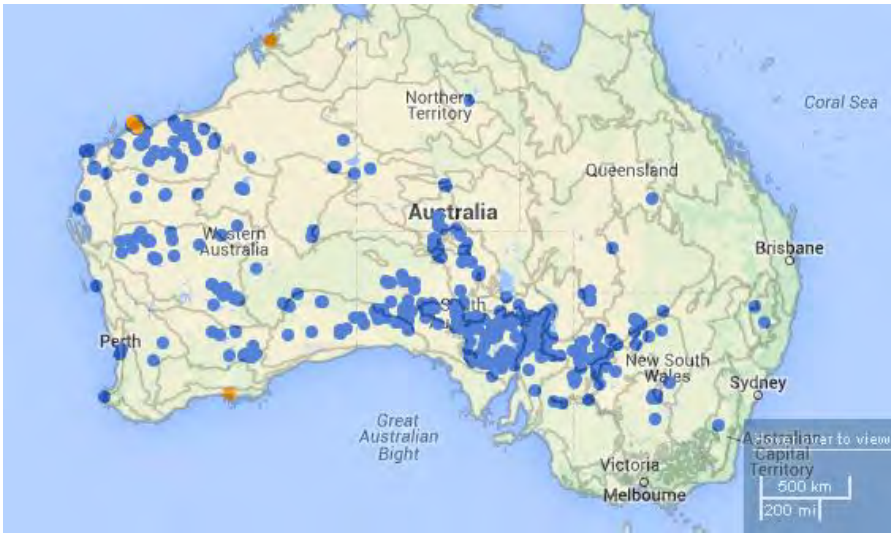


Figure 29: Known distribution of Swainsona formosa (ALA, 2014)

Vigna vexillata* var. *angustifolia

This species is described as *a* prostrate or climbing perennial with purple-blue flowers between April and June, growing in swampy areas (FloraBase 2014).

There are ten records of this species in the WA Herbarium within the Dampierland and Northern Kimberley bioregions and 416 records in the ALA database, indicating a distribution that extends across to southern New South Wales (**Figure 30**). Despite this contiguous distribution, the Study Area is a long distance south of the closest known record and thus this species represents a High Range Extension.

One individual of this species was recorded in vegetation association VA1 (*Eucalyptus brevifolia* rocky hills), quadrat QBrow46a in 2012 (collected by Dr R. Davies 1542 and identified by Dr. R. Barrett). No estimate of the numbers of individuals was made but the cover was described as less than 1%. This record is not within the Development Envelope.

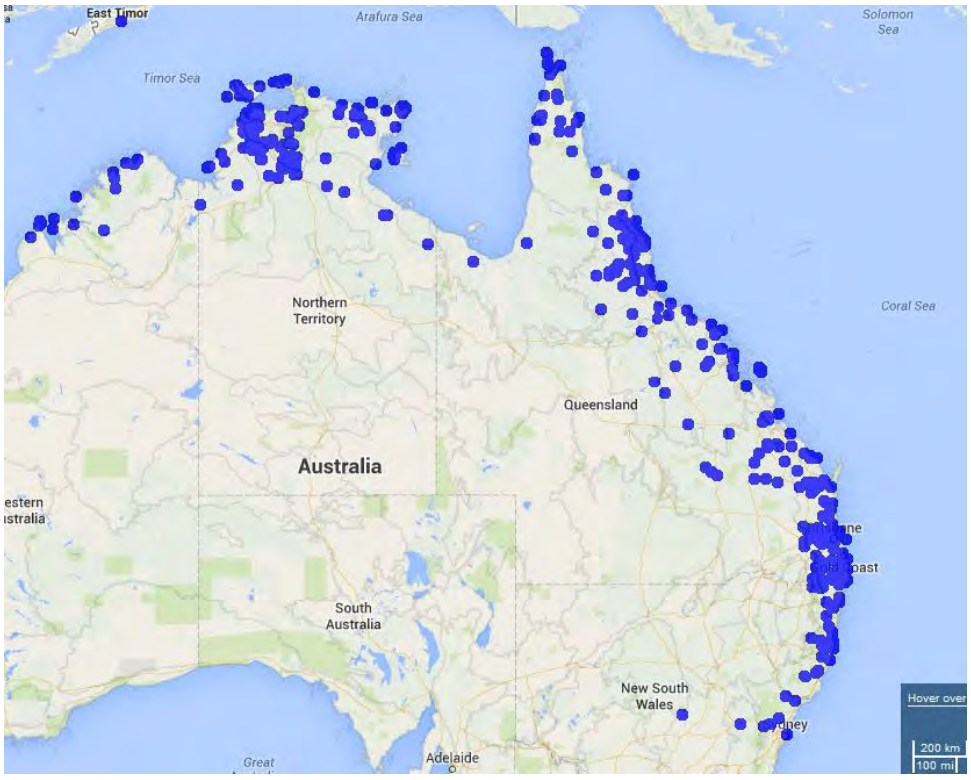


Figure 30: Known distribution of *Vigna vexillata var. angustifolia* (ALA, 2014)

Whiteochloa airoides

This species is described as a tufted perennial or annual to 1.5 m with green-purple flowers between February and August. It has been recorded growing in white or red sand on coastal dunes, stream banks and levees (FloraBase 2014).

Whiteochloa airoides is represented by 648 records in the ALA database (2014) extending across a large proportion of the Australian north (**Figure 31**).

One population of *Whiteochloa airoides* was recorded in the Study Area in vegetation association VA8 (*Eucalyptus brevifolia* and *E. pruinosa*), in quadrat QBrow49, but not within the Development Envelope and Development Footprint. It has been designated as a Medium Range Extension as the record in Browns Range is relatively disjunct despite it being recorded in the Ord Victoria Plains.

Figure 31: Known distribution of Whiteochloa airoides (ALA, 2014)

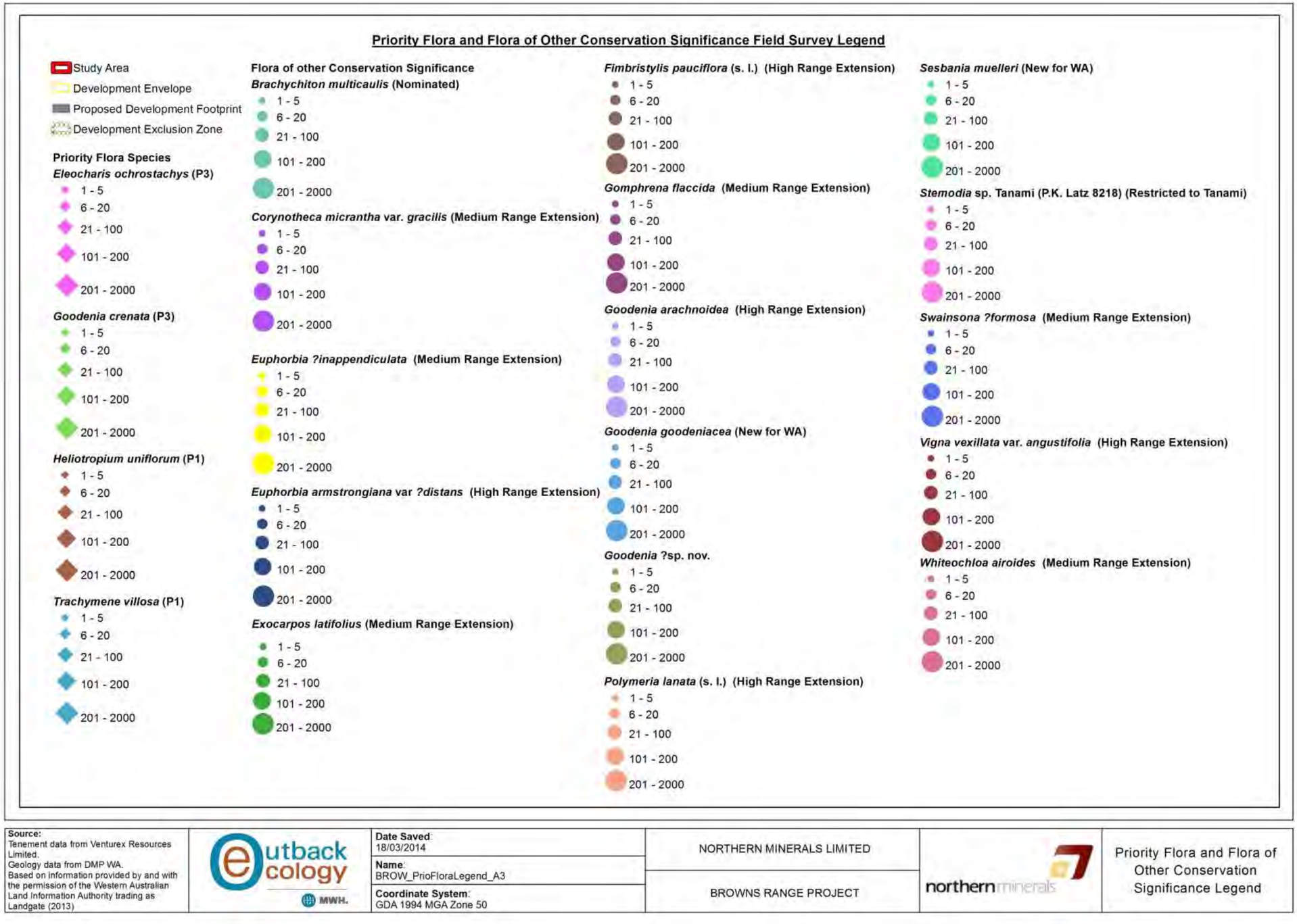


Figure 32: Legend for Priority Flora and Flora of 'Other Conservation Significance' in the Browns Range Study Area

Figure 33: Priority Flora and Flora of 'Other Conservation Significance' in the Northern Borefield Section of the Browns Range Study Area

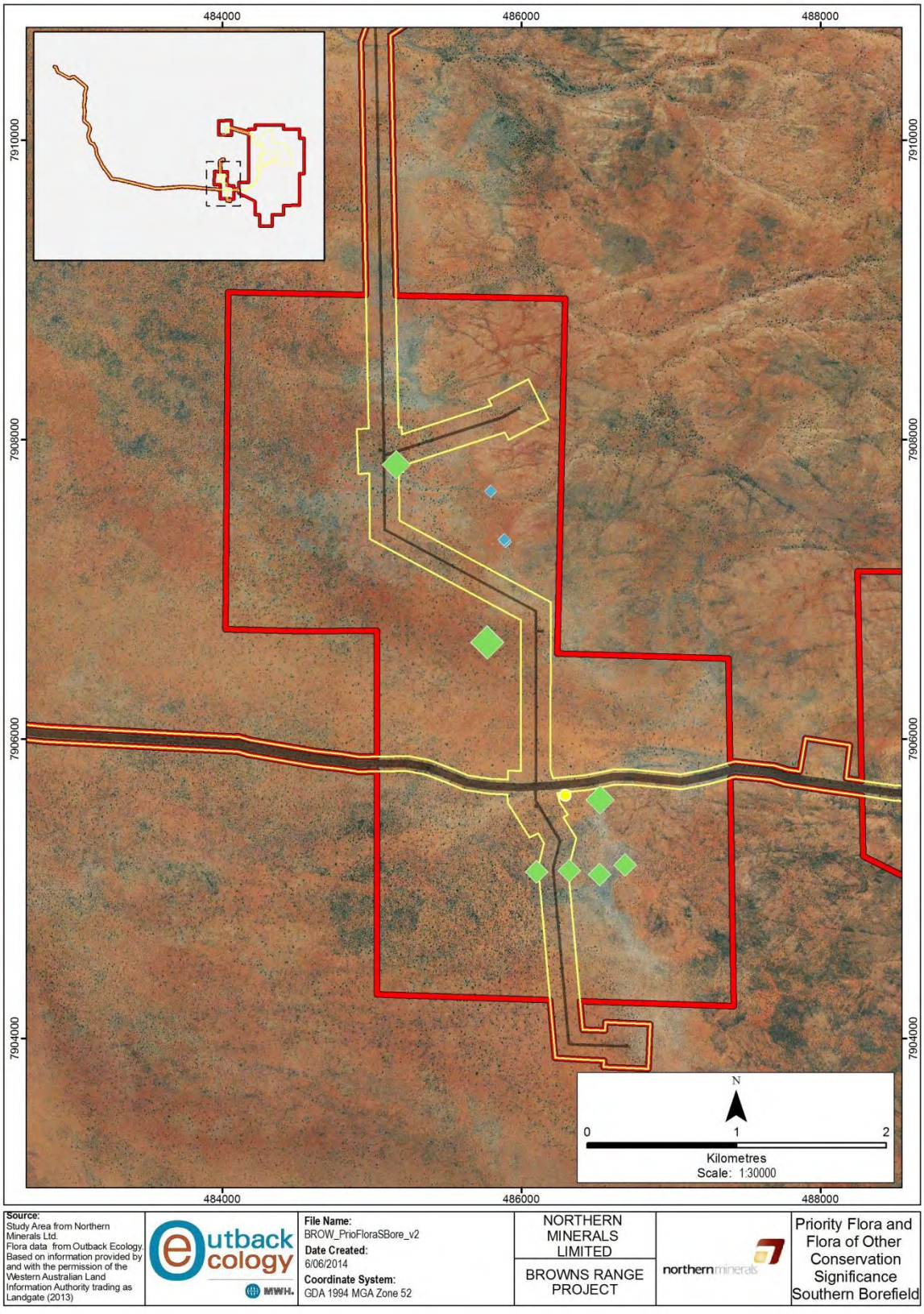
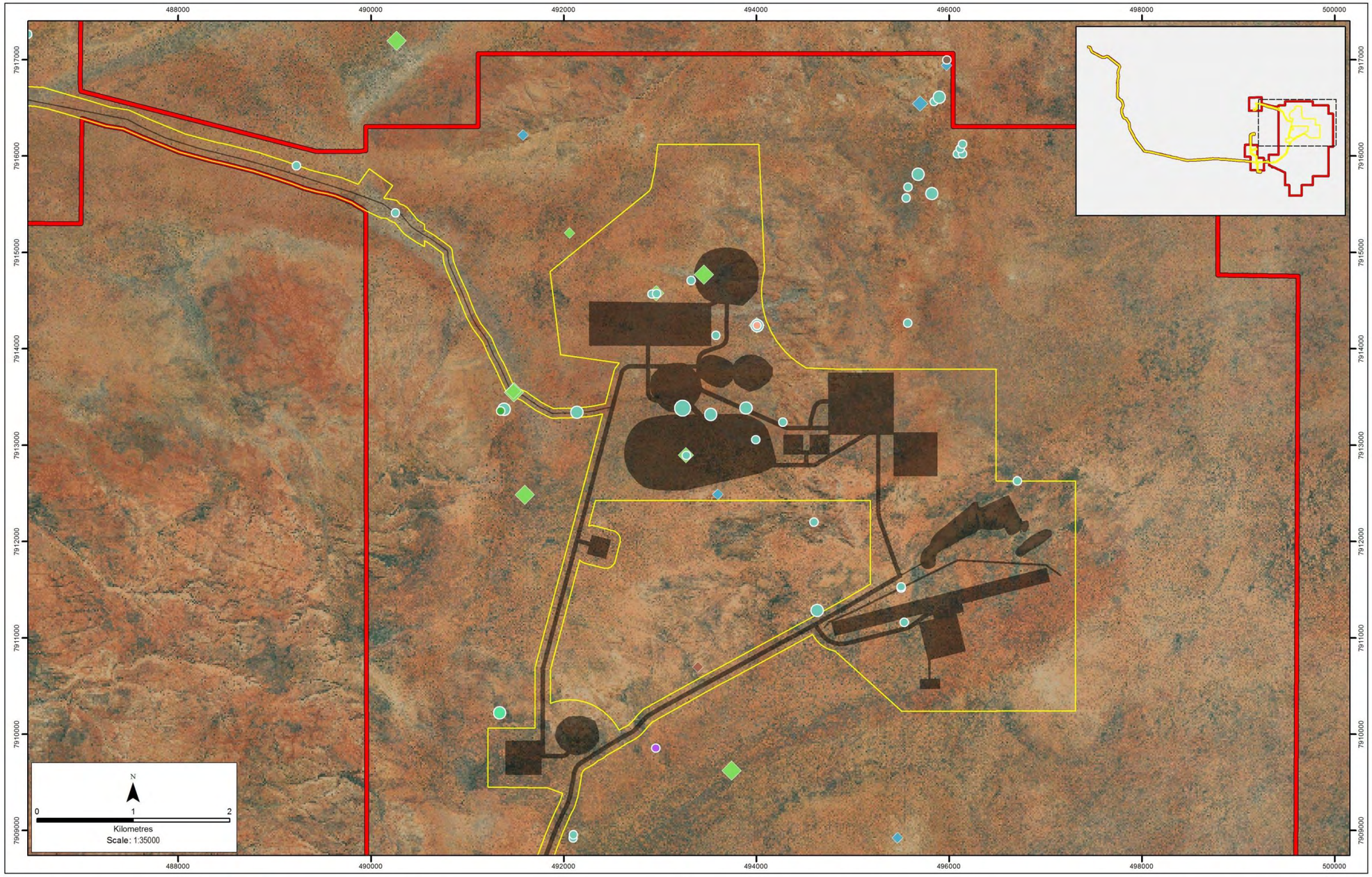
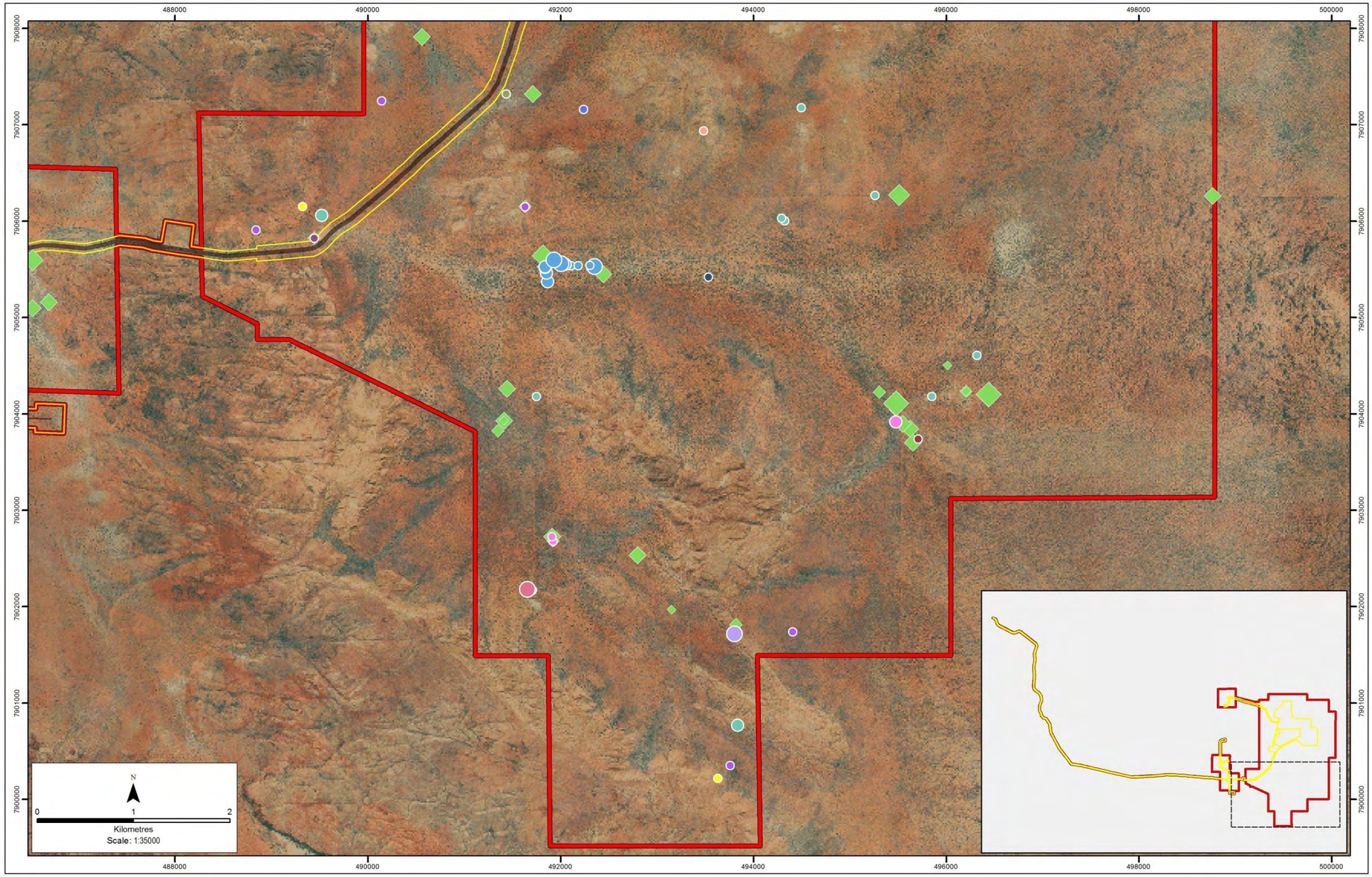


Figure 34: Priority Flora and Flora of 'Other Conservation Significance' in the Southern Borefield Section of the Browns Range Study Area



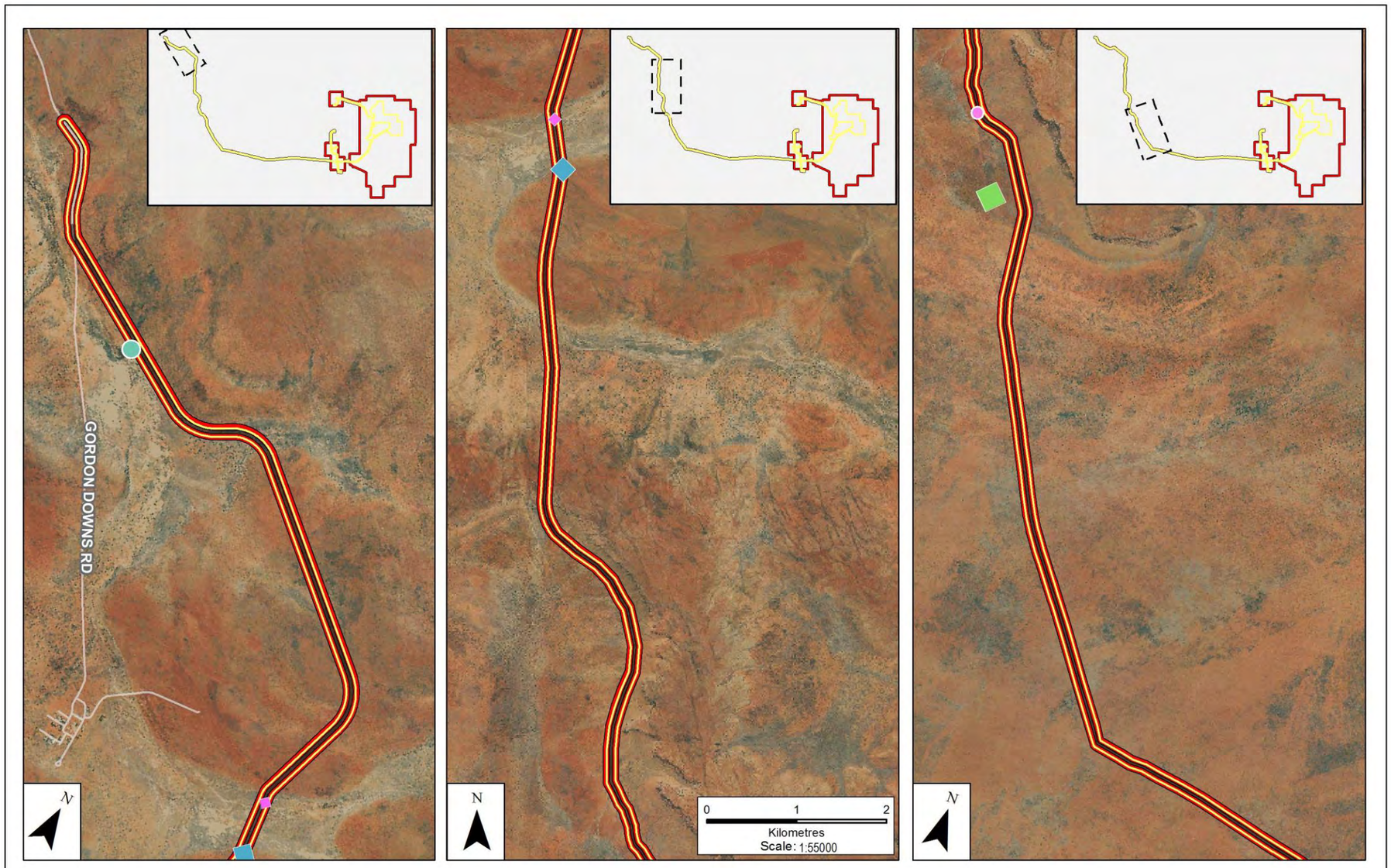
Source: Survey boundaries from Northern Minerals Ltd. Survey data from Outback Ecology. Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2013).	outback ecology MWH.	**Date Saved**: 6/06/2014 **Name**: BROW_PrioFloraMainN_A3_v2 **Coordinate System**: GDA 1994 MGA Zone 52	NORTHERN MINERALS LIMITED BROWNS RANGE PROJECT	northern minerals	Priority Flora and Flora of Other Conservation Significance: North

Figure 35: Priority Flora and Flora of 'Other Conservation Significance' in the Northern Section of the Browns Range Study Area



Source: Survey boundaries from Northern Minerals Ltd. Survey data from Outback Ecology. Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2013).	Outback Ecology MWH.	**Date Saved**: 6/06/2014 **Name**: BROW_PrioFloraMainS_A3_v2 **Coordinate System**: GCS GDA 1994	NORTHERN MINERALS LIMITED BROWNS RANGE PROJECT	northern minerals	Priority Flora and Flora of Other Conservation Significance: South

Figure 36: Priority Flora and Flora of 'Other Conservation Significance' in the Southern Section of the Browns Range Study Area



Source: Study Area from Northern Minerals Limited. Habitat data from Outback Ecology. Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2013).	Outback Ecology MWH.	**Date Saved:** 6/06/2014 **File Name:** BROW_PrioFloraHaulRd_v2 **Coordinate System:** GDA 1994 MGA Zone 52	NORTHERN MINERALS LIMITED BROWNS RANGE PROJECT	northern minerals	Priority Flora and Flora of Other Conservation Significance: Haul Road

Figure 37: Priority Flora and Flora of 'Other Conservation Significance' in the Browns Range Study Area Northern Haul Road

4.3.4. Introduced Species

Five introduced species were recorded across the Study Area during the 2013 survey. The thirteen locations in which they were found are listed (in **Table 9**) and shown in **Figure 38**. None of these species are Declared Pests as listed under the *Biosecurity and Agriculture Management Act 2007*.

Brief notes regarding these species, derived from FloraBase (2013) and Hussey *et. al*. (2007) follows:

- *Cenchrus setiger* (Birdwood Grass) was recorded at the northern end of the haul road (north of Ringer Soak and north east of old Ringer Soak settlement) and was associated with earthworks (water management bunds);
- *Echinochloa colona* (Awnless Barnyard Grass) is a widespread weed of creeks, swamps and irrigated crops in the Kimberley and Pilbara. One record of this species was recorded in the northern end of the haul road (south of Ringer Soak);
- *Malvastrum americanum* (Spiked Malvastrum) is a weed of river and creek margins, wasteland and many arid zone habitats from the Kimberley to the Pilbara and Gascoyne regions. One individual was recorded in the south of the main Study Area;
- *Panicum antidotale* (Giant Panic Grass) is a rhizomatous perennial, native to India, widely introduced as a forage species or for soil binding. One population was recorded at the northern end of the haul road south of Ringer Soak; and
- *Stylosanthes hamata* (Verano Stylo) is naturalised throughout most of the Kimberley and is a weed of seepage areas, creek banks, pool edges, lawns and disturbed vegetation. Dense infestations were recorded close to existing roads near Ringer Soak and in an area which appears to have been historically cleared for a laydown or camp site. One record of one individual was recorded within the main Study Area.

Table 8: Introduced Flora Species Recorded in the Browns Range Study Area

Taxon	AMG Zone 52K		Site
	Easting	Northing	
Cenchrus setiger	492110.28	7905535.42	JA67
	456280.29	7927152.70	JA322
Echinochloa colona	461570.33	7922257.06	VY337
Malvastrum americanum	492861	7902519	QBrow52
Panicum antidotale	491153.65	7913965.39	WPAS438
Stylosanthes hamata	492110.28	7905535.42	JA67
	456280.29	7927152.70	JA322
	463061.74	7913009.46	JA311
	463001.21	7912943.05	JA312
	463008.34	7912958.01	JA313
	463028.03	7913068.59	JA314
	463075.49	7913089.48	JA315
	463068.90	7913016.88	JA316

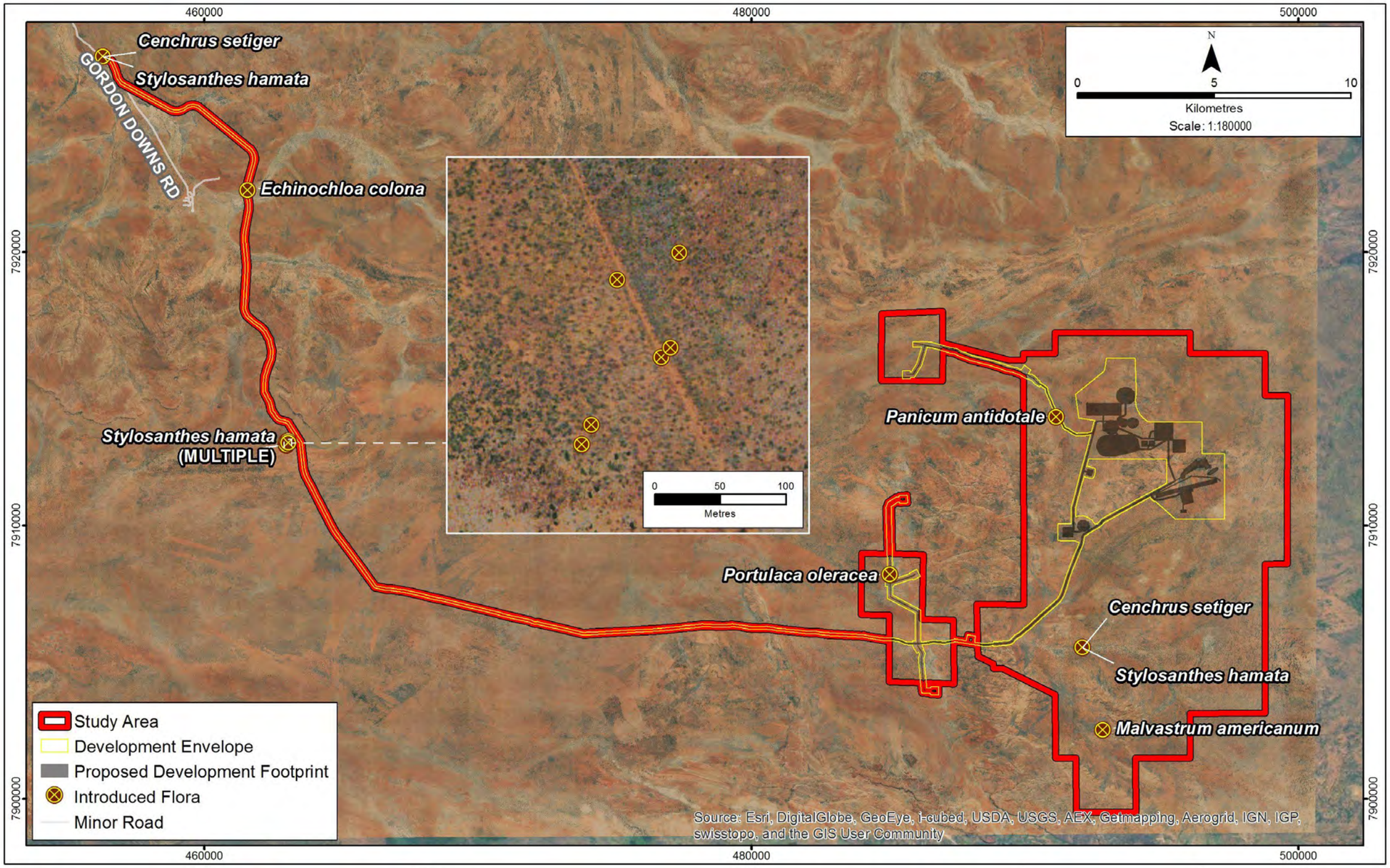


Figure 38: Introduced Flora Recorded in the Browns Range Study Area

4.4. Vegetation Survey Results

An extensive fire crossed the Browns Range Study Area in October 2012 (**Figure 9**) and many quadrats surveyed in May 2012 could not be re-sampled in 2013. Nineteen of the 37 quadrats established in May 2012 were re-sampled during the Phase 2 survey in May 2013.

An additional 22 quadrats and 82 relevés were established and flora and vegetation mapping notes from 731 locations were recorded in May 2013 (**Figure 39-44** and **Appendix H**) providing data (**Appendix I**) to describe 20 vegetation communities and three mosaics within the Study Area.

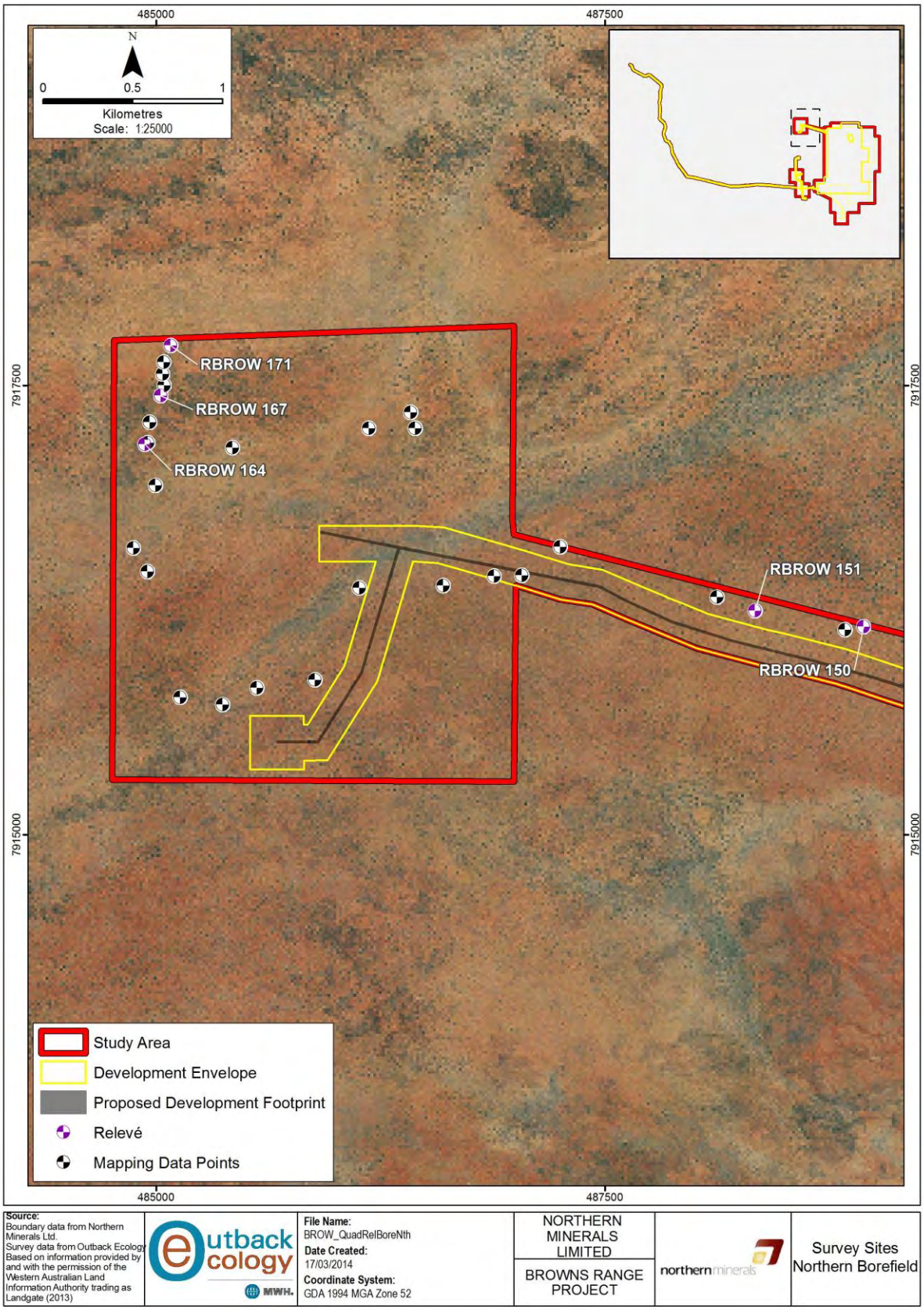


Figure 39: Vegetation Relevés and Mapping Note Sites Recorded in the Northern Borefield Section of the Browns Range Study Area

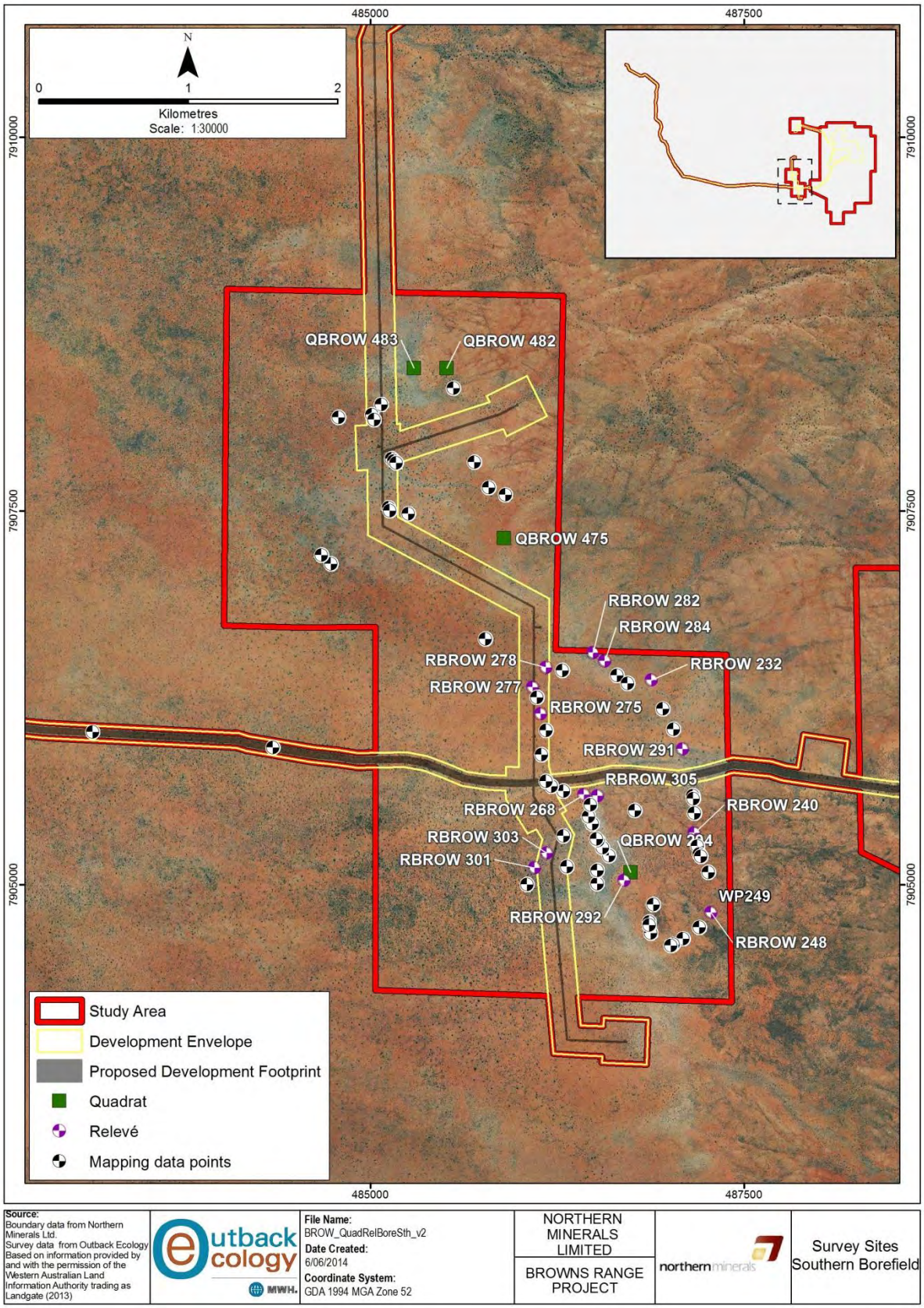


Figure 40: Vegetation Quadrats, Relevés and Mapping Note Sites Recorded in the Southern Borefield Section of the Browns Range Study Area

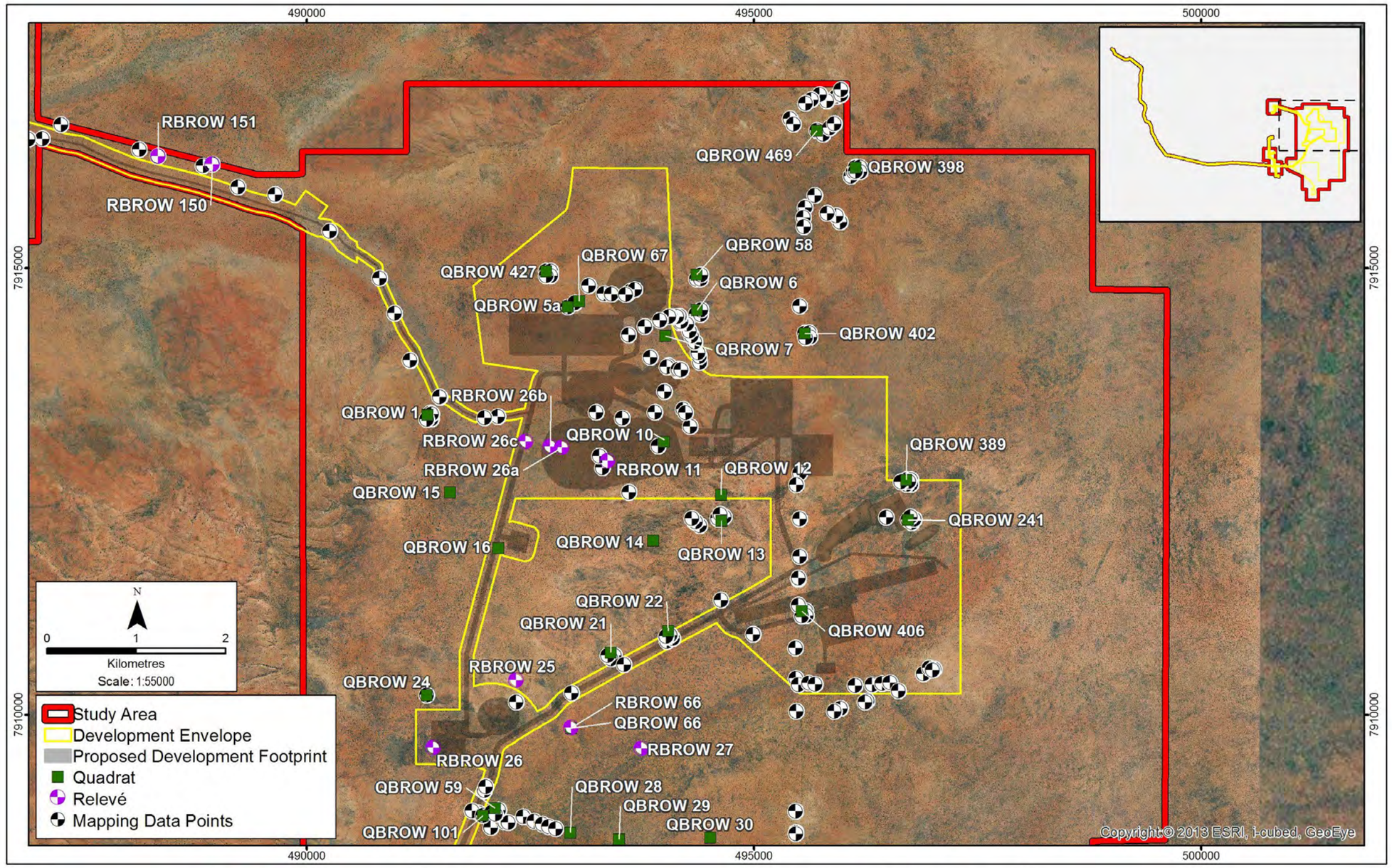


Figure 41: Vegetation Quadrats, Relevés and Mapping Note Sites Recorded in the Northern Section of the Browns Range Study Area

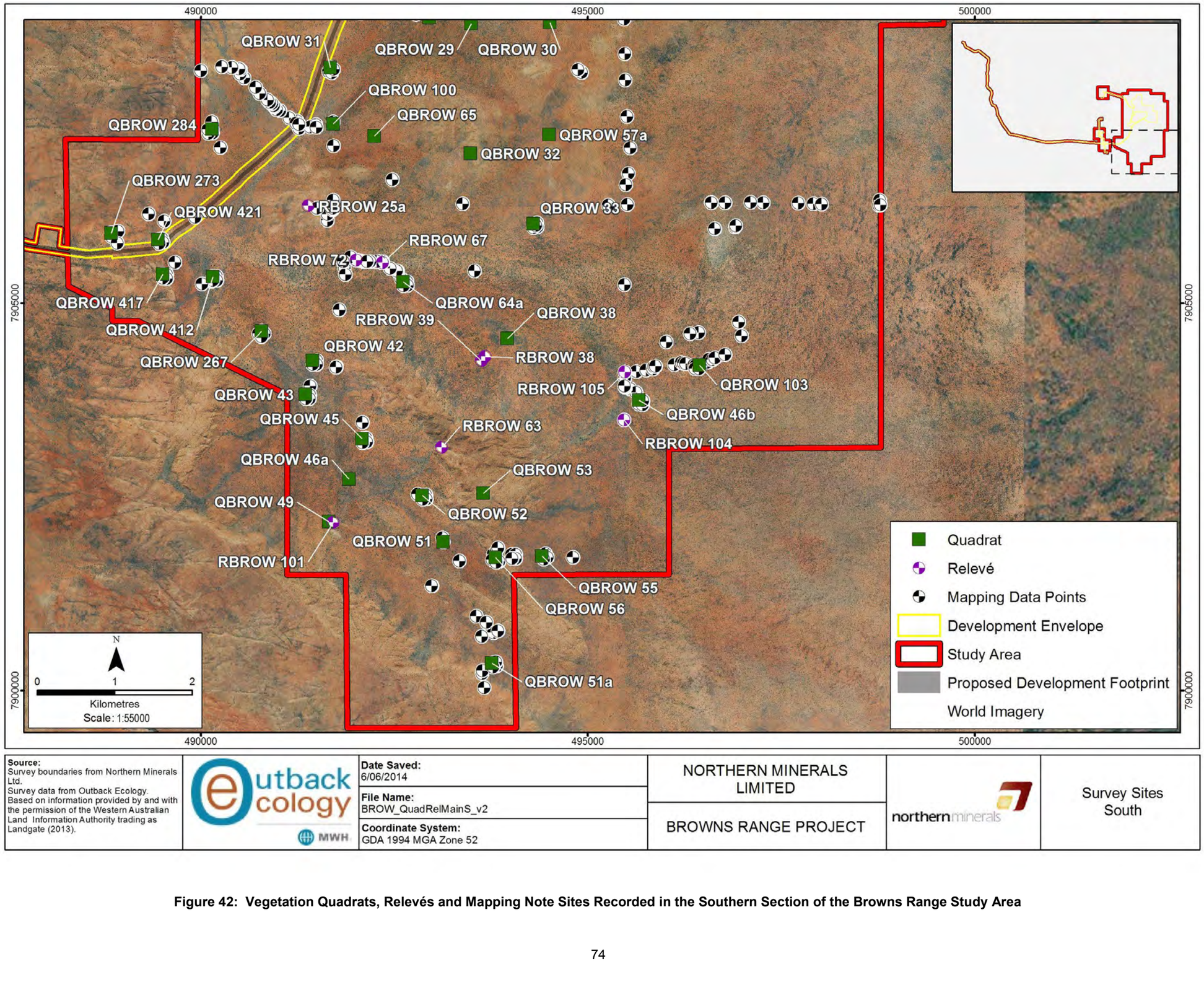


Figure 42: Vegetation Quadrats, Relevés and Mapping Note Sites Recorded in the Southern Section of the Browns Range Study Area

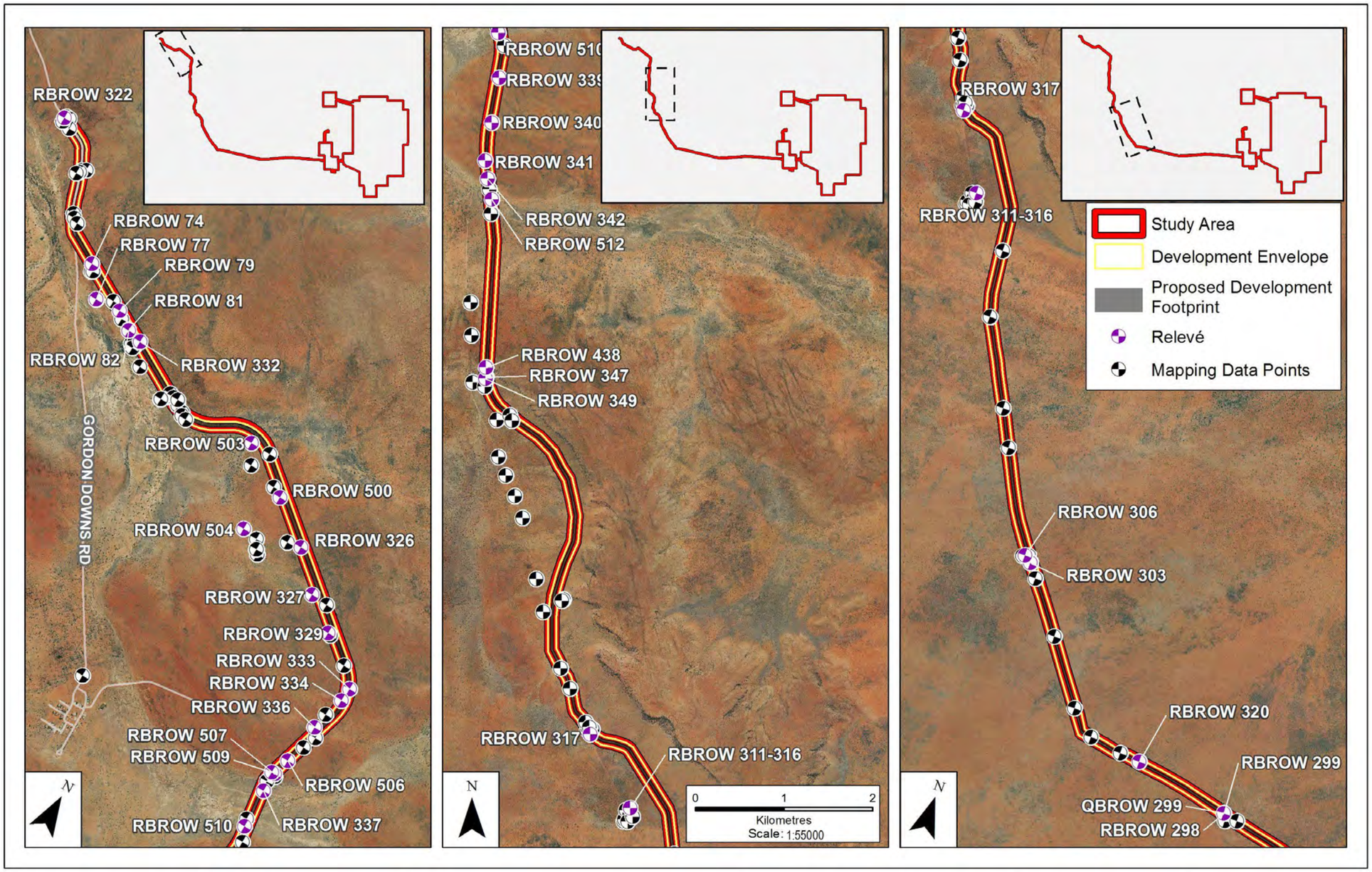


Figure 43: Vegetation Quadrats, Relevés and Mapping Note Sites Recorded in the Northern Section of the Browns Range Study Area Haul Road

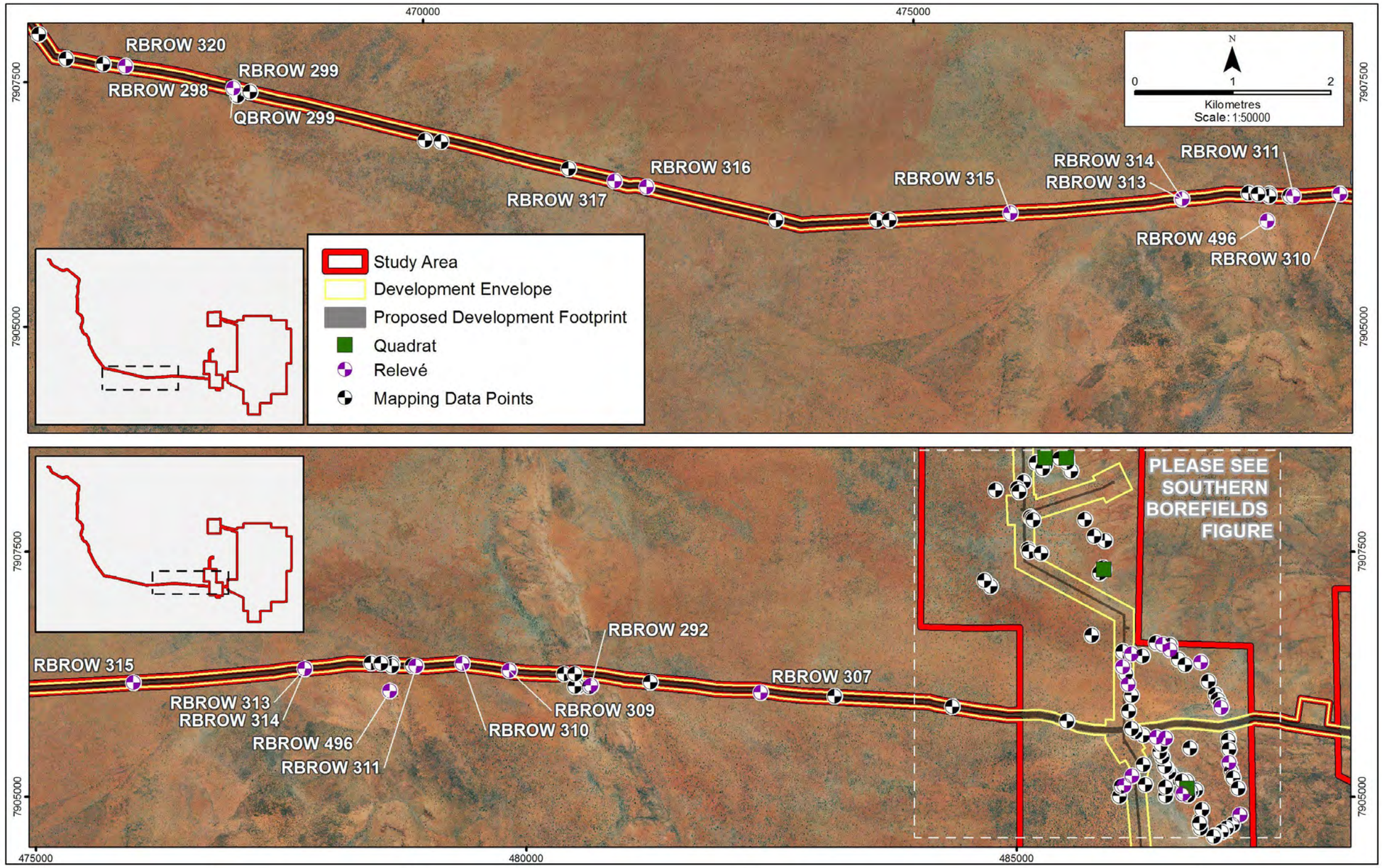


Figure 44: Vegetation Quadrats, Relevés and Mapping Note Sites Recorded in the Southern Section of the Browns Range Study Area Haul Road

4.4.1. Statistical Analysis

The floristic data from 48 quadrats, comprising 29 resamples and 19 new quadrats were subject to a multivariate analysis using Primer-E version 6.1.5 (Clarke & Gorley 2006). Not all quadrats were included in the analysis as the dominant trees and tall shrubs within some quadrats could not be resampled in 2013 to determine these unknown species as they had been burnt. Quadrats with the most species in common are clustered together by this analysis based on the presence or absence of any given species within each quadrat.

The resulting dendrogram (**Figure 45**) indicated a 30% similarity, with the clusters of quadrats comprising of 10 groupings. These could be reduced to a higher level of groupings of about seven groups, which may be ecologically more meaningful; two of the seven groups are represented by only one site (BROW105, BROW16) (**Figure 46**). The level of stress was 0.23, indicating a slightly sub-optimal fit is shown in a multi-dimensional scaling (MDS) plot which shows the results of the cluster analysis as smoothed convex contours, drawn around the quadrat points at distances related to their similarities. This in part could be accounted for by the variability in understorey species recorded across the site, which is likely to be an artefact of mosaic fires and succession vegetation. It may also be related to subtle changes in surface water movement and underlying geology.

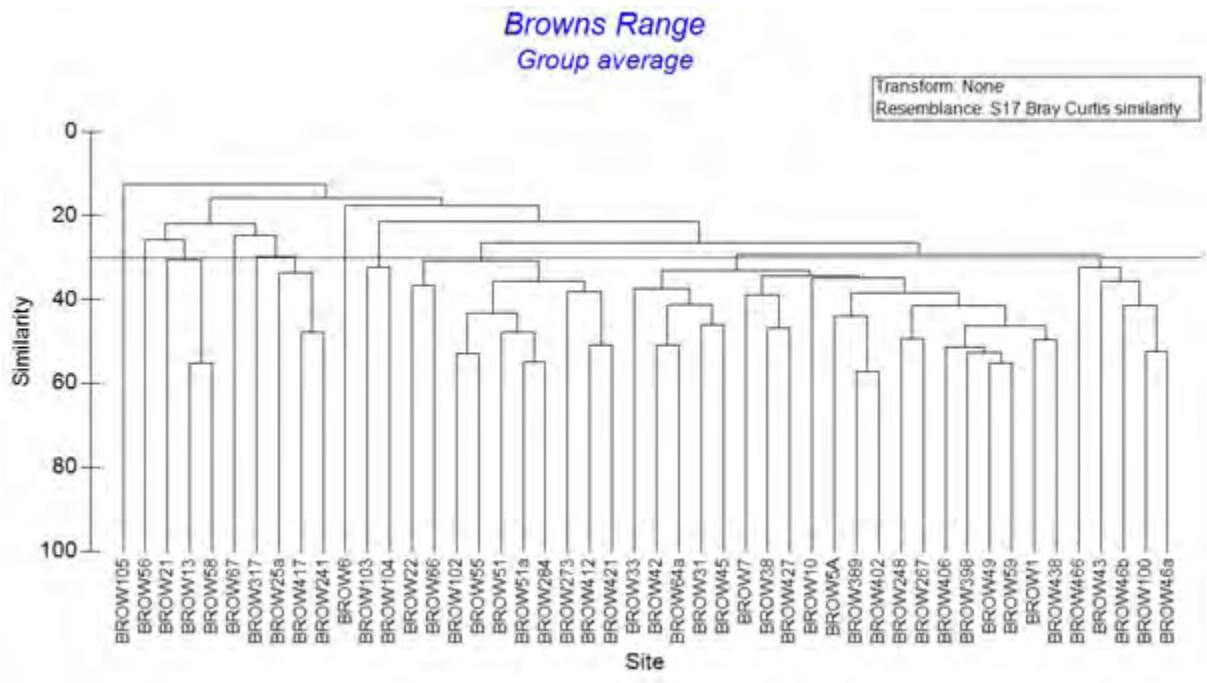


Figure 45: Bray-Curtis Dendogram for 48 Quadrats within the Browns Range Study Area

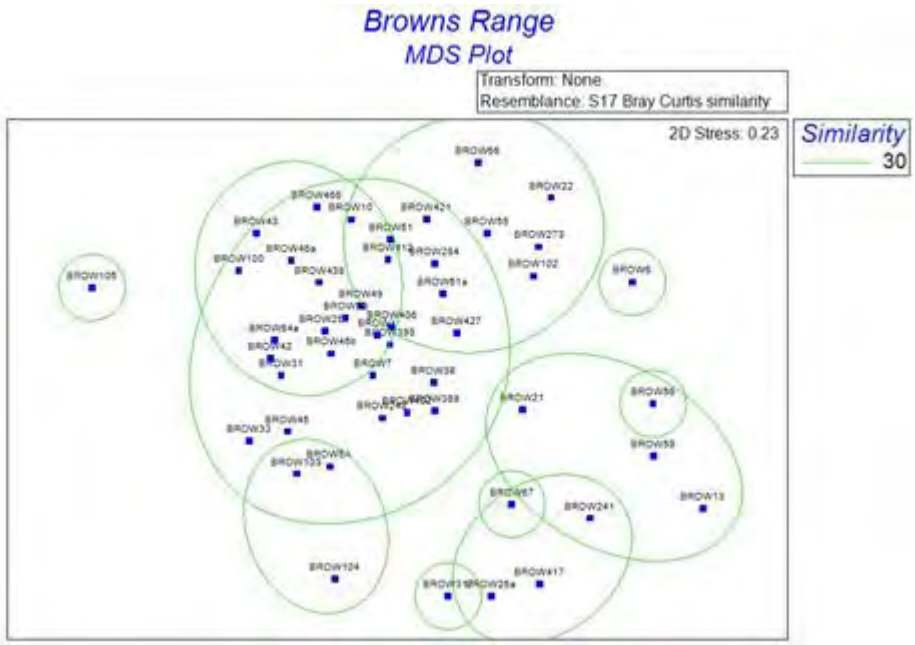


Figure 46: MDS Plot shows Floristic Similarity between 48 quadrats within the Browns Range Study Area

The completeness of the survey was evaluated using a species accumulation curve (**Figure 47**). This curve indicates that on average, based on the subset of quadrat data, 82% (319 out of 390) of the species theoretically expected to occur in the Study Area were recorded, suggesting that a comprehensive survey was completed. Numerous annuals were recorded during the 2012 survey which could not be incorporated into the species accumulation curve analysis as the quadrats in which they were recorded had missing values for dominant species which could not be checked during the 2013 survey as they had been burnt in October 2012. Thus given that the analysed data was a subset of the total dataset and that the number of species recorded across the Study Area exceeded the total number of species previously recorded within the entire Tanami subregion it is considered that the survey was very comprehensive.

The statistical analysis provided some guidance for the delineation of vegetation communities however given the complex and generally highly variable understorey species composition key dominant species and habitat were the primary determinants. Underlying geology was also particularly useful for defining boundaries where aerial imagery was limited, especially with regard to fire scarring.

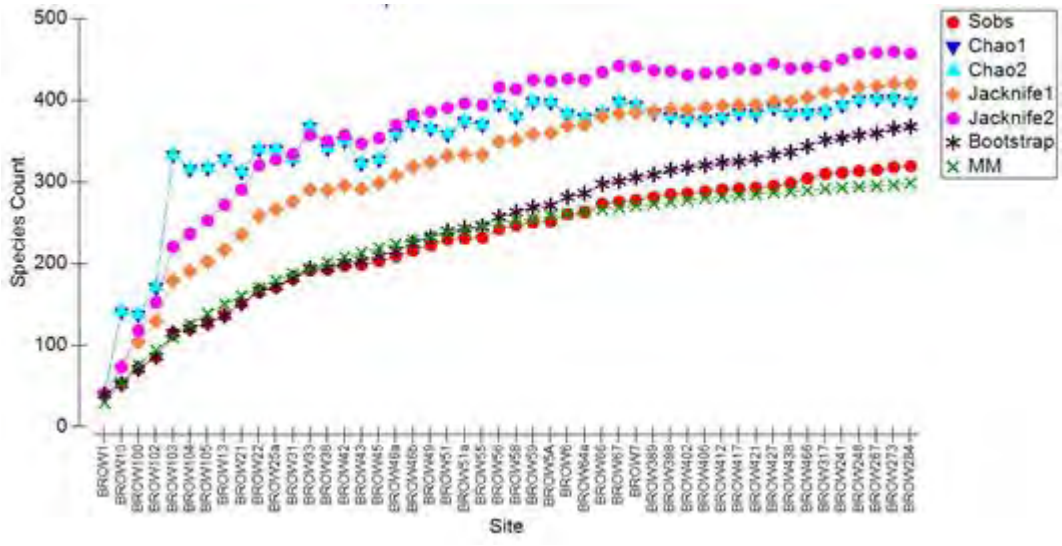


Figure 47: Species Accumulation Curve for 48 quadrats within the Browns Range Study Area

4.4.2. Vegetation Associations

Vegetation associations described in 2012 were modified based on 2013 quadrat, relevé and mapping note data. The haul road and potential borefield areas were mapped and surveyed in 2013 and thus the vegetation associations in areas that had been burnt in October 2012 were extrapolated where necessary. Twenty vegetation associations and three mosaic associations are described for the Browns Range Study Area. An additional area ('vegetation association 18') was mapped to indicate areas where surface water flows were concentrated as indicated by denser shrub and tussock grassland cover. A brief description of the associations, areas and percentages of each of these within the Study Area, Development Envelope and Development Footprint are provided (**Table** 9). The proportion of the total mapped extent of these vegetation associations within the Development Footprint is also provided in this table. Vegetation mapping was extrapolated over several smaller areas associated within the borefields.

The raw data used to define vegetation associations is provided in **Appendix I**. Vegetation associations are described in detail (in **Appendix J**) and mapped (**Figures 48-53**).

Table 9: Areas and Percentage of each Vegetation Association within the Browns Range Study Area, Development Envelope and Proposed Development Footprint

VA	VA description (landform)	Study Area (SA)		Development Envelope (DE)			Proposed Development Footprint (DF)		
		Area (ha)	(%)	Area (ha)	(%)	(%) of SA	Area (ha)	(%)	(%) of SA
1	*Eucalyptus brevifolia (*rocky hills)	2436.0	15.0	342.33	13.22	14.05	87.30	12.28	3.58
2	*Eucalyptus cupularis* (rocky hills)	651.3	4.0	91.09	3.52	13.9	28.07	3.95	4.31
3	Drainage basins (amongst rocky hills)	8.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0
4	Perched damplands (upland hills)	2.8	0.0	2.75	0.11	98.06	0.95	0.13	34.01
5	Treeless Plain (rocky hills)	93.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0
6	*Eucalyptus brevifolia* (plains)	3347.4	20.5	470.19	18.15	14.05	120.29	16.92	3.59
7	*Owenia reticulata* (elevated plains)	66.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0
8	*Eucalyptus brevifolia* and *E. pruinosa* (plains)	607.9	3.7	0.0	0.0	0.0	0.0	0.0	0.0
9	*Corymbia opaca* (undulating plains)	404.6	2.5	251.41	9.71	62.14	98.46	13.85	24.33
10	*Eucalyptus chlorophylla* (plains)	5901.7	36.2	860.74	33.23	14.58	266.42	37.47	4.51
11	*Sorghum* (floodplain)	64.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0
12	*Corymbia flavescens* (broad drainage)	1638.1	10.1	377.57	14.58	23.05	64.76	9.11	3.95
13	*Eucalyptus victrix* (low-lying depression)	22.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0
14	*Melaleuca nervosa* (flats)	52.9	0.3	22.53	0.87	42.59	4.11	0.58	7.76
15	*Eucalyptus victrix* (drainage lines)	167.1	1.0	64.27	2.48	38.46	13.75	1.93	8.23
16	*Triodia basedowii* (low foothills)	18.1	0.1	17.00	0.66	93.94	7.25	1.02	40.04
17	*Acacia synchronicia* over Tussock Grassland (broad flats)	19.4	0.1	18.42	0.71	94.93	7.78	1.09	40.10
18	Minor Flowlines	35.6	0.2	2.44	0.09	6.87	0.07	0.01	0.2
19	*Corymbia opaca* over *Acacia monticola* (low rises)	1.4	0.0	1.40	0.05	100	0.56	0.08	39.9
20	*Corymbia opaca* over *Chrysopogon fallax* (flats at base of hills)	10.4	0.1	9.93	0.38	95.45	4.14	0.58	39.8
6/10	Mosaic (plains)	177.8	1.1	44.40	1.71	24.97	3.09	0.43	1.74
12/14	Mosaic (floodplains)	88.4	0.5	13.49	0.52	15.26	4.07	0.57	4.6
12/15	Mosaic (floodplains)	477.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0
Total		**16293.6**	**100.0**	**2589.94**	**100.0**		**710.8**	**100**	

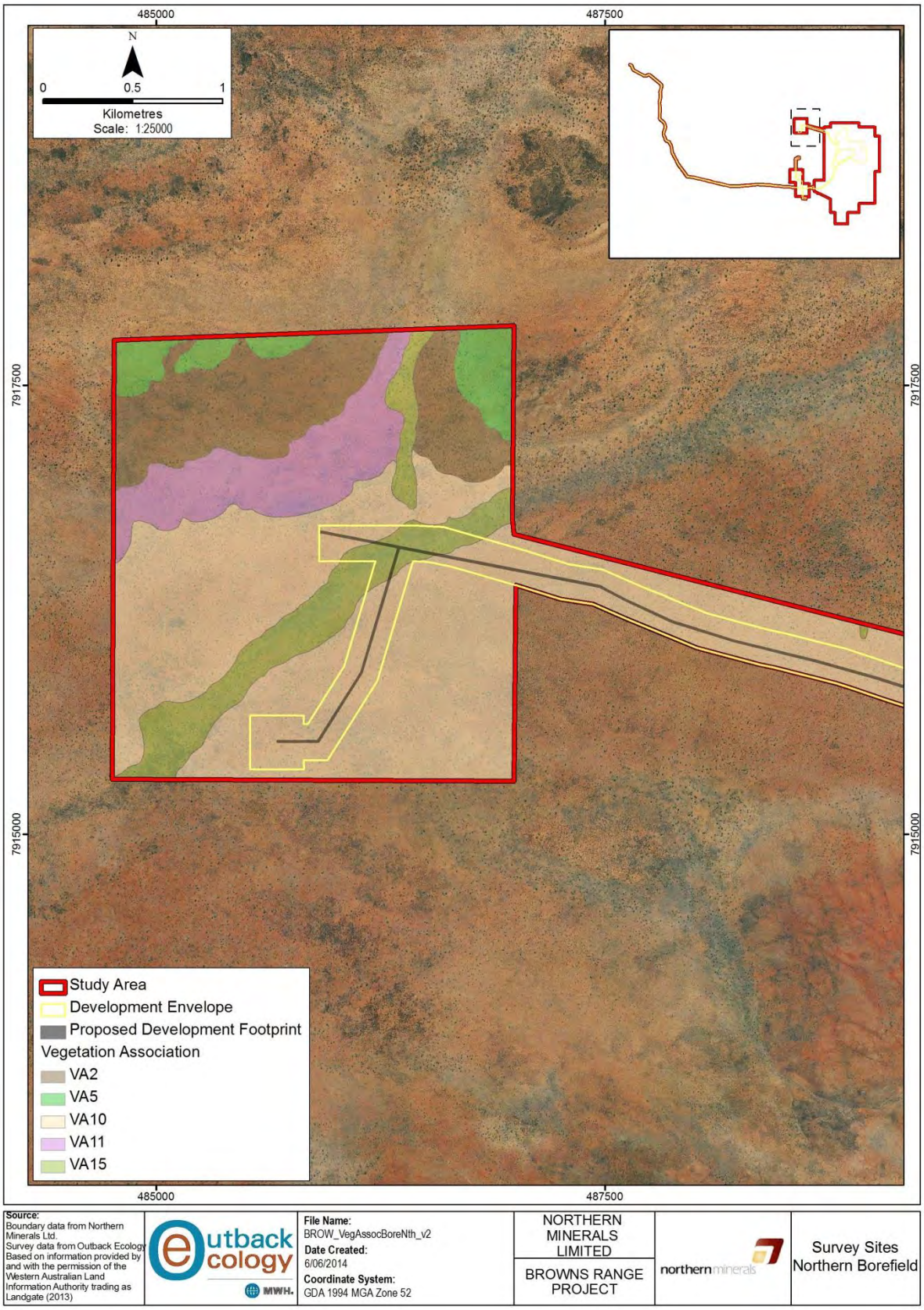


Figure 48: Vegetation Associations in the Northern Borefield Section of the Browns Range Study Area

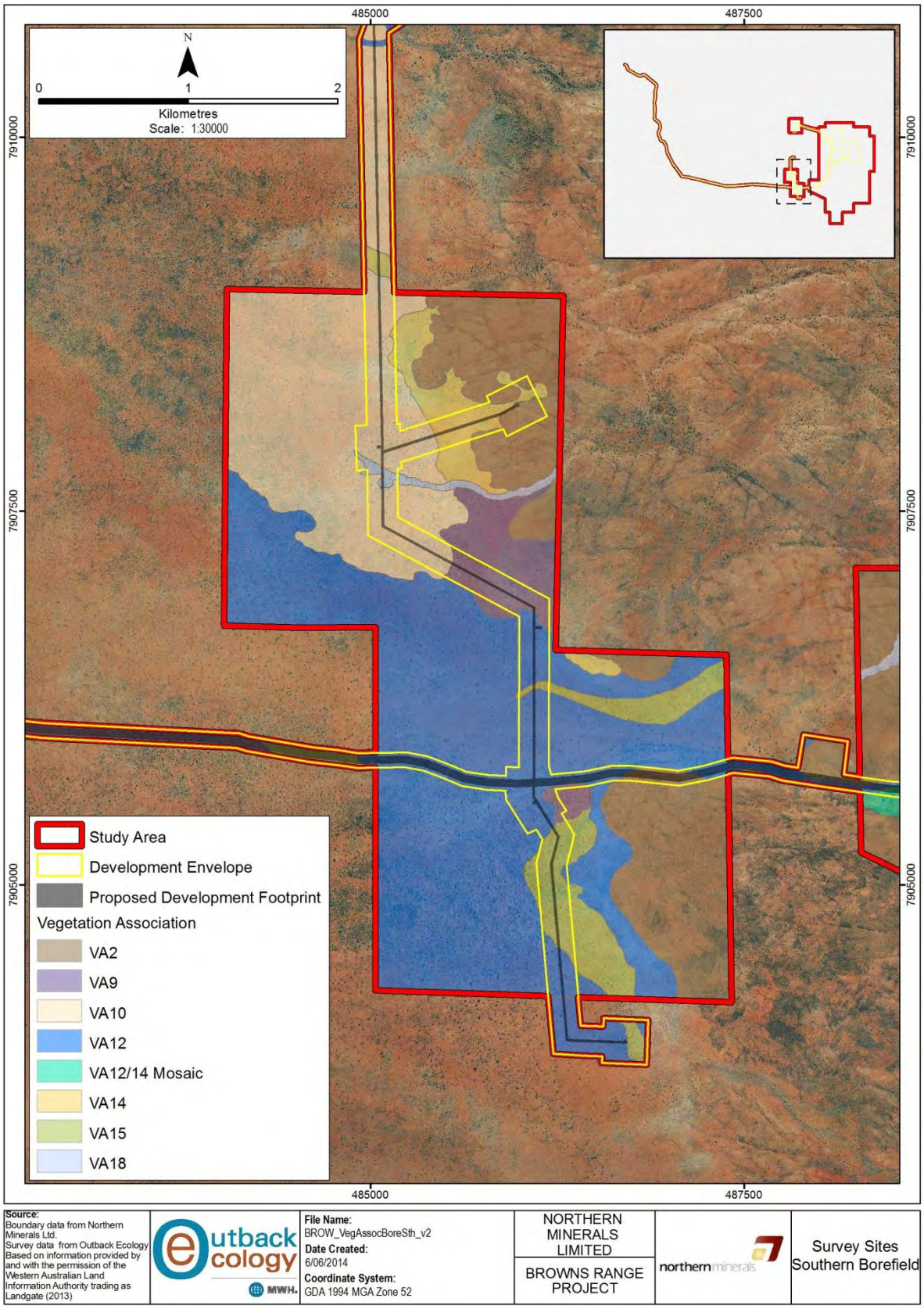


Figure 49: Vegetation Associations in the Southern Borefield Section of the Browns Range Study Area

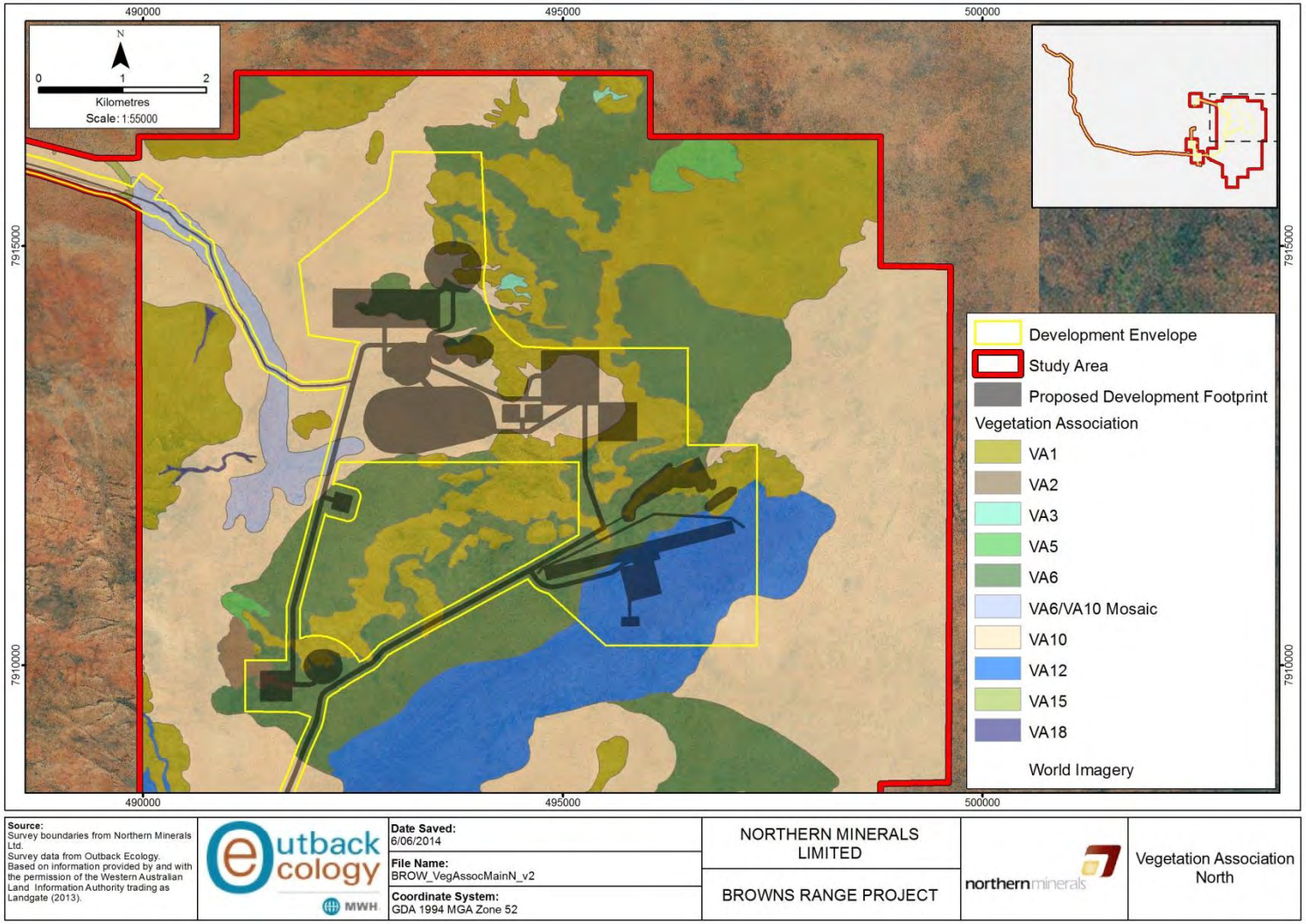


Figure 50: Vegetation Associations in the Northern Section of the Browns Range Study Area

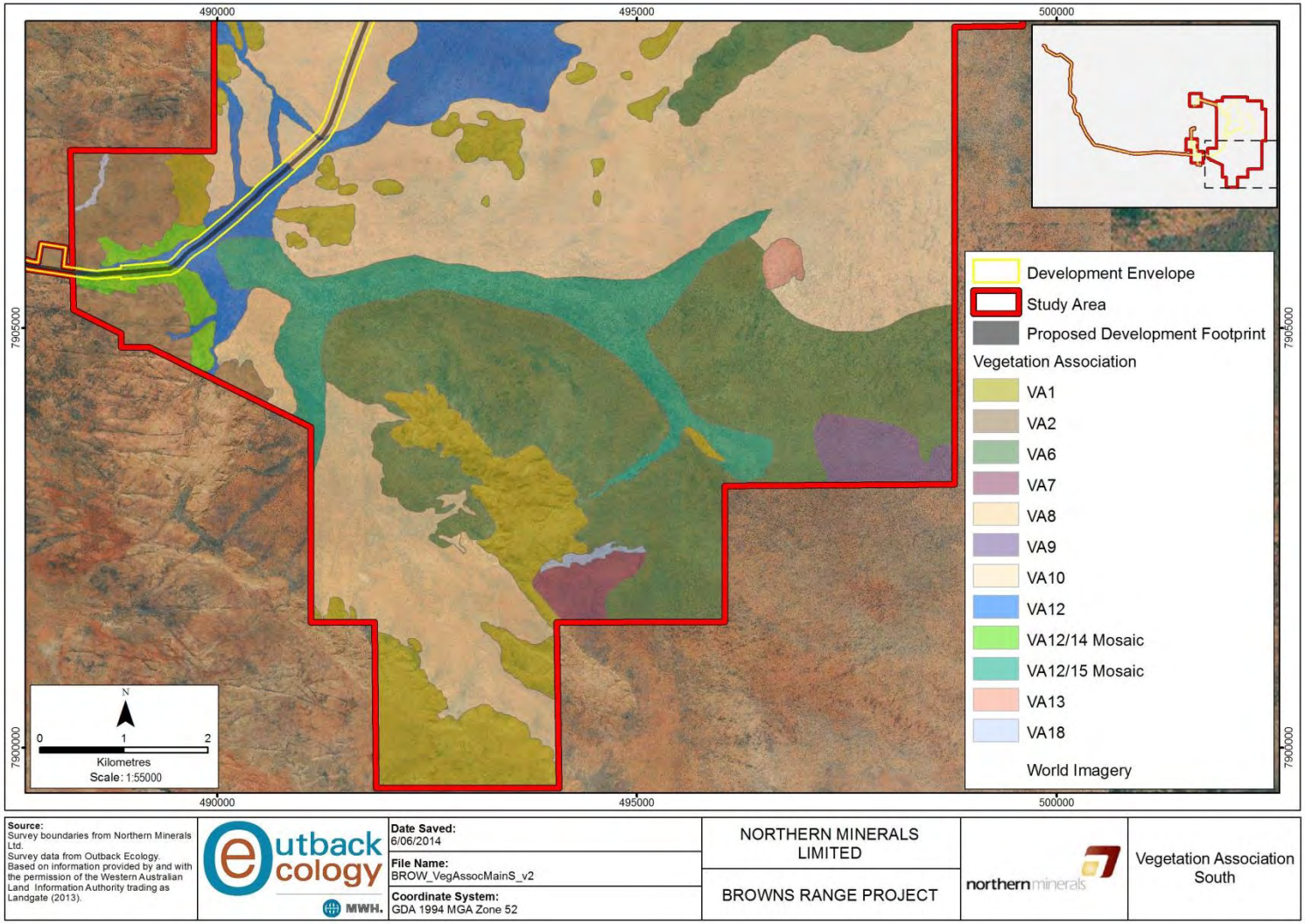


Figure 51: Vegetation Associations in the Southern Section of the Browns Range Study Area

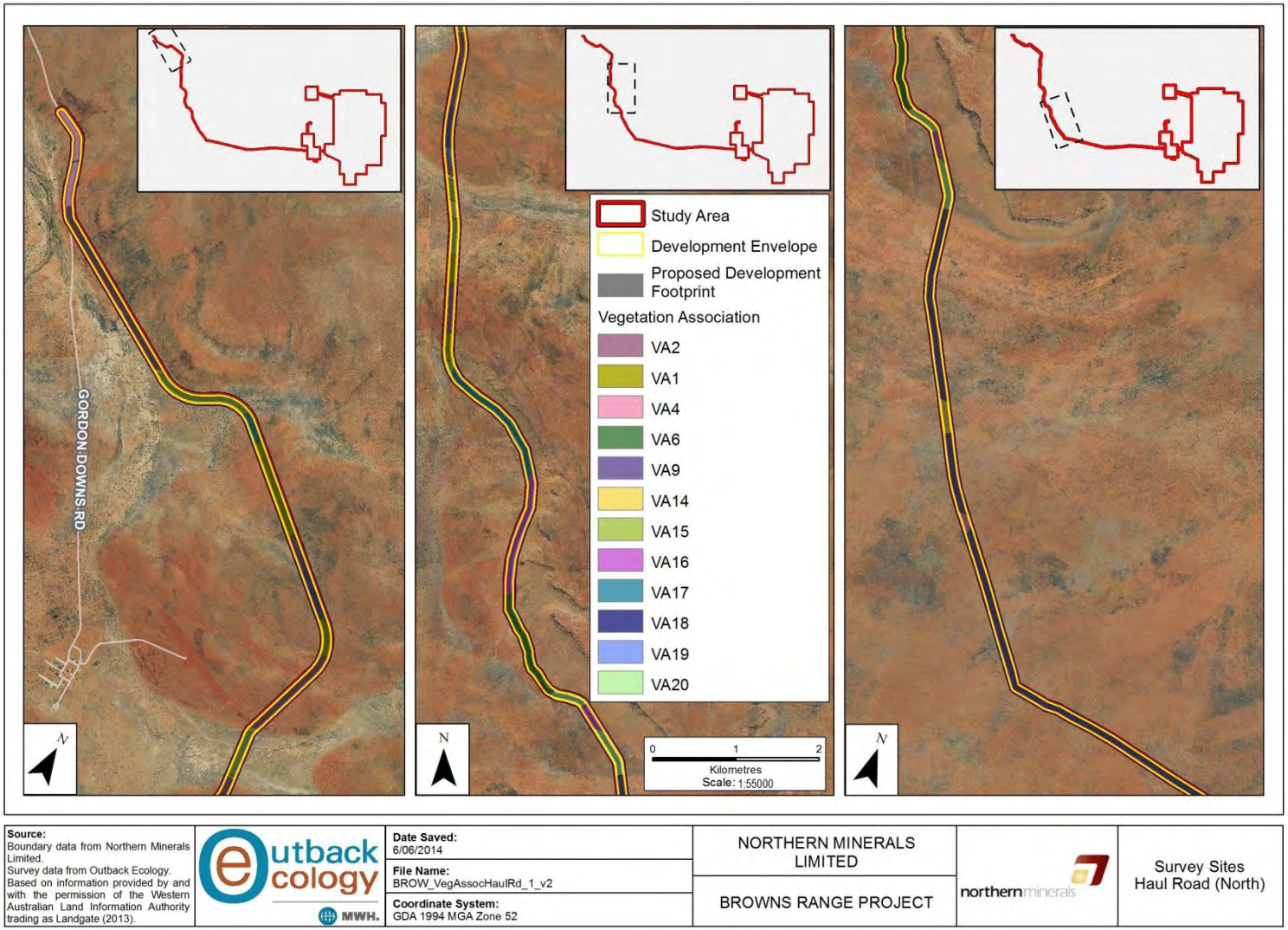


Figure 52: Vegetation Associations in the Northern Section of the Browns Range Study Area Haul Road

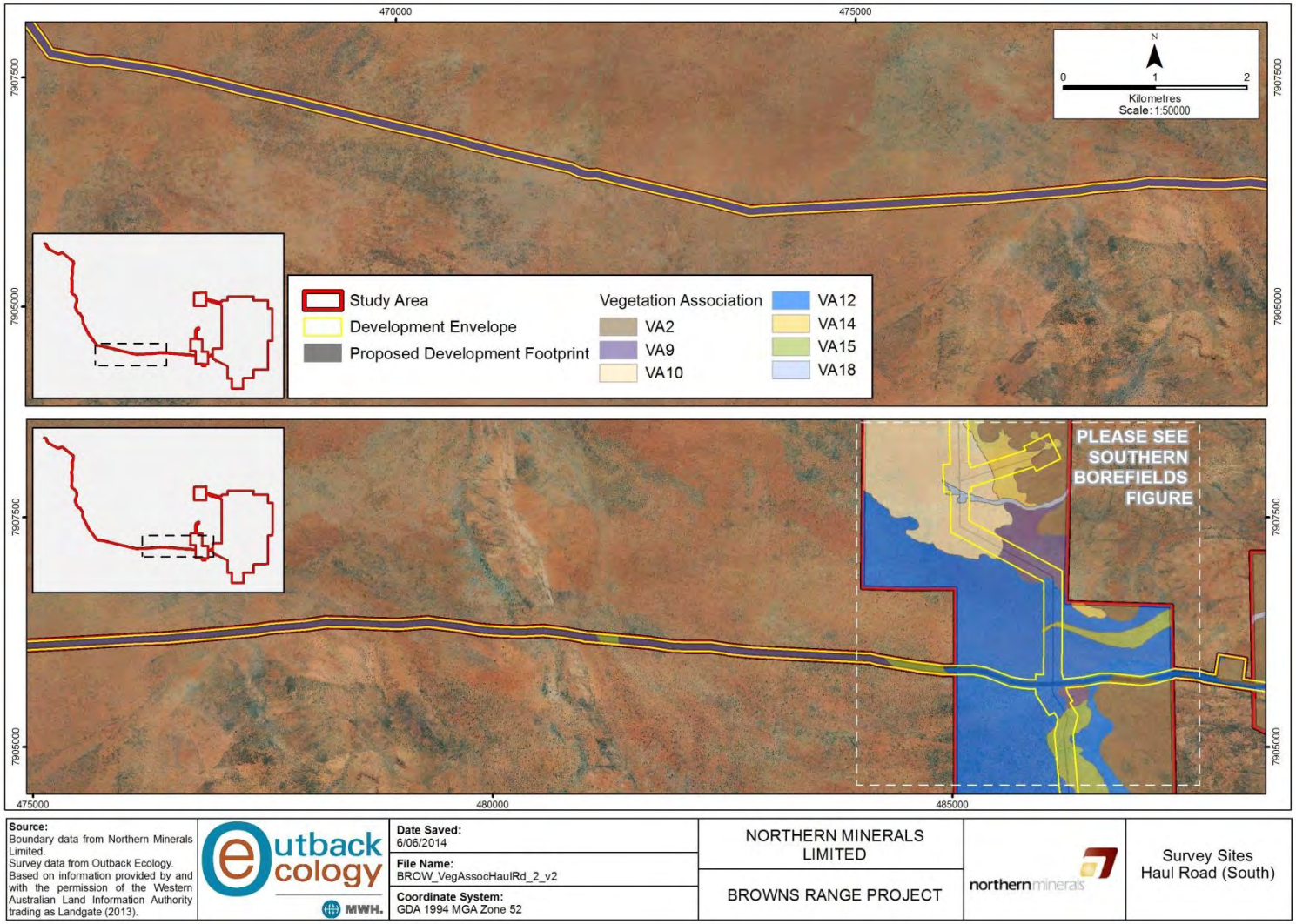


Figure 53: Vegetation Associations in the Eastern End of the Browns Range Study Area Haul Road

4.4.3. Threatened And Priority Ecological Communities

No TECs or PECs have been listed for the Tanami 1 bioregion or are recorded within 100 km of the Study Area. None of the vegetation communities recorded during the survey was analogous to any TEC or PEC described within the Eremaean or Northern Botanical Provinces.

4.4.4. Regional Significance of the Vegetation Associations

There is relatively limited quadrat based/systematic data from which to compare vegetation associations recorded within the Browns Range Study Area. Quadrats were established in the Northern Territory Tanami but recorded only two or three dominant species for each stratum and thus did not provide adequate data from which to conduct a statistical analysis or more detailed comparison.

MBS Environmental (2004) described two vegetation communities which aligned with two associations recorded in the Study Area. These were the *Aristida holathera* grassland-*Grevillea wickhamii* shrubland which aligns with Vegetation Association 9 and the 'tall to low open *Acacia lysiphloia* shrubland over *Triodia ?pungens* understorey with sparse emergence of *Eucalyptus brevifolia*" which compares well with Vegetation Association 6. Unfortunately the geographic extent of these communities within the Study Area was not provided.

Triodia-dominated grassland with low acacia shrubs and small trees on sandplains and rocky ridges was the most dominant vegetation association recorded in the Gardner Range Study Area (Ecotec 2008a). The vegetation described in areas 4a and 5b aligned well with the rocky hill Vegetation Associations 2 and 1 respectively. Grassland vegetation interspersed with *Eucalyptus brevifolia* and *E. victrix* with *Acacia elachantha, A. tenuissima, A. lysiphloia, Gossypium australe, Hibiscus leptocladus* and *Capparis lasiantha* correlated well with vegetation described by Ecotec (2008a) in areas 2b, 5c and 5d. Unfortunately the geographic extents of these vegetation types within the Study Area were not provided.

4.4.5. Local Significance of the Vegetation Associations

The percentages of the mapped extant of each vegetation association within the Study Area, Development Envelope and Development are shown in **Table 9**. Nineteen of the vegetation associations and three mosaics each comprise less than 5% of the total Study Area and thirteen are represented by less than 100 ha or 1%, however this is largely attributable to the associations mapped within the haul road as this narrow corridor crosses a range of more widespread vegetation associations. This applies to associations VA4, VA9 VA16, VA17, VA19 and VA20 where greater than 20% of their mapped extent is within the Development Footprint, all with less than 1% cover in the Study Area and they are all mapped within the northern section of the Haul Road (**Figure 52**).

The Drainage basins amongst rocky hills (VA3) *Owenia reticulata* elevated plains (VA7), *Sorghum* floodplain (VA11), *Eucalyptus victrix* low lying depression (VA13) and *Melaleuca* nervosa flats (VA14)

are the only associations that were more restricted across the Study Area and surrounds. Of these VA3 has been excluded from the Development Envelope and Footprint. as in addition to being apparently highly restricted in its extent, likely due to its unique topographic and hydrological attributes, it supports two species of Short Range Endemic invertebrates (Outback Ecology 2012).

Vegetation associations VA4, VA7, VA11, VA13 and VA14 were all restricted to habitats with limited and distinct topography, soils and/or hydrology, however none of VA7, VA13 and VA11 and only a small area (4.11ha) of VA14 is located within the Development Footprint and this represents 7.76% of the total mapped extent of this association in the Study Area. The key species in this association, *Melaleuca nervosa* and *Chrysopogon fallax* are both distributed from near Broome in WA to southern Queensland (ALA 2014). Combinations of these species are common in the literature but with variable floristics and structure, for example a *Melaleuca* community survey in the Northern Territory describes one *Melaleuca nervosa* community occupying 967 km2, with a wide range of understory grass species recorded in the Study Area, but none with *Chrysopogon fallax* (Brocklehurst and Lynch, 2001). Vegetation association VA4 (perched damplands) is locally restricted with only 2.8 ha occurring in the Study area, of this 0.95ha (34.01% of total mapped association) occurs within the development footprint. This vegetation association was observed to extend outside of the Study Area, however its regional extent is not known.

Association VA9, which is described as *Corymbia opaca* undulating plains, comprises 2.5% of the Study Area and of this 24.33% is within the Development Footprint; however this association extended outside of the Study Area in several locations and thus is unlikely to be significantly impacted by development of the Project.

The rocky hills association VA1 represents 15% of the Study Area and 3.58% is within the Development Footprint. This association is analogous to vegetation types broadly discussed in several reports within the Tanami bioregion and beyond (Wilson *et al.,* 1990, Dames and Moore, 1980) and it is not considered that it will be significantly impacted by this Project. Similar rocky hills are evident outside of the Study Area and a large number are mapped on the Northern Territory side of the Tanami bioregion (Wilson *et al.,* 1990).

Broad drainage association VA12 comprises 10% of the Study Area and 3.95% is within the Development Footprint, however this association extends broadly into the surrounding areas to the west of the Study Area (**Figure 49** and **Figure 53**) and is not considered to be at risk of significant impacts from the Project.

Plains associations VA6 and VA10 comprise respectively 20% and 36% of the Study Area and 3.59% and 4.5% are within the Development Footprint. Additionally, associations VA6 and VA10 are mapped as a mosaic in 1.1% of the Study area (with 1.74% of this occurring within the development footprint) Broad areas of association VA6 extend outside the Study Area towards the southeast, northeast and

on the haul road (**Figures 50-52**). Association VA10 similarly extends to the north and east outside of the Study Area (**Figures 48-51**). It is highly unlikely that the status of either of these will be significantly impacted by the Project.

4.4.6. Vegetation Condition

Vegetation condition recorded across the majority of the Study Area was considered to be 'Excellent' with the exception of site QBrow1 which showed signs of mechanical (vehicular) disturbance and exploration-related clearing in the resource areas since the 2012 survey and limited populations and numbers of the introduced species *Cenchrus setiger*, *Echinochloa colona, Malvastrum americanum, Panicum antidotale, Portulaca oleracea* and *Stylosanthes hamata* were recorded in the main Study Area. The condition at these sites was considered to be 'Very Good'. Disturbance across the main Study Area is generally limited to tracks and historical exploration, however in the haul road area, particularly near the Ringer Soak community, some dense populations of *Cenchrus setiger* and *Stylosanthes hamata* were recorded, which were probably introduced during road works.

In October 2012 an extensive fire impacted a large proportion of the Study Area and many locations revisited in 2013 were burnt. In many instances these could not be re-surveyed as insufficient regeneration had occurred to accurately assess the species present.

4.4.7. Groundwater And Surface Water Dependent Ecosystems

No obligate phreatophytic vegetation was recorded in the Study Area. Some of the vegetation associations in the Study Area are likely to be dependent on surface water flows.

Vegetation associations VA 10, 11, 12, 14 and 15 occur on the broad floodplains and drainage areas within the Study Area (**Figure 48**). None of the vascular flora species recorded within these vegetation associations is currently recognised as an obligate phreatophyte groundwater dependent species. Phreatophyte species are recognised as dependent on some degree of groundwater sources for water uptake (Busch *et al.,* 1992; Halpern Glick Maunsell, 1999; Maunsell, 2006). These species often show physiological and/or morphological signs of water stress related drought-like conditions and have a negative response in regards vegetation health decline and death from rapid groundwater drawdown (Smith *et al.,* 1998; Halpern Glick Maunsell, 1999; Graham, 2001; Maunsell, 2006).

Eucalyptus victrix is considered to be a vadophyte (not a true phreatophyte) and is relatively drought tolerant, but is likely to show signs of water stress when they have decreased access to groundwater sources (Muir, 1995). *Eucalyptus victrix* is classified as a facultative phreatophytic species that uses soil moisture in the unsaturated zone above the water table and opportunistically utilises groundwater sources when available (Halpern Glick Maunsell, 1999; Thorburn *et al.,* 1992; BHP, 1997; Weston & Trudgen, 1995; Maunsell, 2006). The extent of groundwater dependency of the GDE present is related to the distribution, size and composition of the species within the Study Area.

Given the density of *Chrysopogon fallax,* a species generally associated with creeks, floodplains and damp areas, it is likely that that the floodplain vegetation relies on concentrated surface water drainage. The Priority 3 species *Goodenia crenata* is also abundant in these broad floodplain areas and is likely to be dependent on seasonal inundation via surface flows. One small dampland area supporting *Eucalyptus victrix*, disjunct from any noticeable flow lines, was recorded in a depression in the south east of the Study Area (VA 13) and is also likely to be dependent on surface water flows.

Some small areas in close proximity to the base of rocky hills (VA 14) support seasonally inundated and seepage-related damplands. These damplands provide habitat for several species such as the common and widespread species *Drosera derbyensis, Melaleuca nervosa* and *M. lasiandra. Drosera derbyensis* and *Melaleuca nervosa* are primarily distributed across the Northern Botanical Province. The furthest south that *Melaleuca nervosa* has been recorded is approximately 153 km southwest of the Study Area and *Drosera derbyensis* approximately 26 km to the south of the Study Area (FloraBase 2013). They and their associated habitat are likely to be relatively common but poorly known due to a lack of survey effort in the bioregion.

Numerical modelling of the groundwater system to simulate pit dewatering for five proposed pits and for groundwater extraction was completed by Klohn Crippen Berger (2014a and 2014b). They summised that drawdown extent would range from 60 m to 600 metres at a depth of 5 to 200 m at the pit void perimeters. The contours for these drawdown extents were overlain on the vegetation association mapping and it was concluded that none of them intercepted any associations that supported *Eucalyptus victrix*, which is considered the most likely species to be impacted by any changes in groundwater levels.

4.4.8. Constraints And Limitations

The EPA (2004) lists a number of possible limitations and constraints that can impinge on the adequacy of flora surveys. These are listed in **Table 10** with an assessment relating to the May 2012 and May 2013 surveys. All factors identified by the EPA (2004) were considered in the design of this survey, and only two partial limitations were identified – information sources and contextual information. Few biological surveys have been conducted in the bioregion and thus floristic data from which to put vegetation associations recorded in the Study Area into context were limited. Those reports that were available did not have adequate floristic and structural data from which to make meaningful comparisons.

To a lesser degree, access was limited to several main tracks and although both surveys were conducted in a relatively moderate time of year in terms of daytime temperatures, the carrying of adequate water for longer walks limited the number of sites and speed at which sites could be accessed. Despite this a large number of species were recorded and several populations of

conservation significant flora were identified throughout the Study Area and therefore this aspect was not identified as potential limitation of the survey.

Table 10: Potential limitations of the survey

Aspect	Constraint	Comments regarding the flora and vegetation survey
Competency/experience of consultants	No	Members of the survey team were flora specialists employed by Outback Ecology, and who together had over 50 years' experience undertaking flora surveys of this kind within Australia.
Scope	No	The scope was clearly defined and realistically achievable within the designated timeframe.
Proportion of flora identified	No	Of the 392 taxa recorded during the 2012 and 2013 surveys only four taxa could not be positively identified to species level (*Abutilon macrum, Amaranthus ?induratus, Euphorbia ?inappendiculata* and *Marsilea ?hirsuta*). The specimens lacked adequate flowering material or the taxonomy of these species is under review or poorly known. Unidentifiable taxa were compared to conservation significant species in order to remove the possibility of missing a significant species.
Information sources (e.g. historic or recent)	Partial	Few local and regional studies have been completed. However available data was reviewed prior to commencement of the surveys. The EPA and DPaW libraries were searched for historic material from which to assess the vegetation communities however in many instances the data was inadequate to provide meaningful comparisons to vegetation associations described in this study.
Proportion of task achieved, and further work which might be needed	No	A large proportion of the vegetation communities were recorded in quadrats, relevés and mapping notes during the survey. A Species Accumulation Curve suggests that 82% of the expected flora was recorded. However given that the analysis utilised a subset of the floristic data collected, the number of new flora records and range extensions for the region and State, the proportion of the task achieved is considered to be high.
Timing / weather / season / cycle	No	The two surveys were undertaken following three months of average to above average rainfall events and were reflected in the high species diversity both within quadrats and across the Study Area as a whole.
Disturbances	No	The whole Study Area has been little disturbed and is rated as being in "Very Good" to "Excellent" condition.
Intensity	No	Survey intensity was in accordance with Guidance Statement 51. The scope of works undertaken meets the requirements for a Level 2 survey and has provided significant flora records for the WA Herbarium and Threatened Species and Communities Unit (DPaW).
Completeness	No	An average 30 species per quadrat were recorded much higher than anticipated based on the total number of 367 species listed for the bioregion, likely a reflection of lack of prior regional surveys. In 2012 many sites supported 50 to 60 species. The phase 2 survey followed a widespread fire in October 2012 and many quadrats established in 2012 could not be rescored. Despite this the comprehensive species list and vegetation associations described indicate that the Level 2 assessment is complete.
Resources	No	WAH specimens; taxonomic guides; DEC database searches and

Aspect	Constraint	Comments regarding the flora and vegetation survey
		the FloraBase database were all used to prepare for the field surveys and used for the identification of unknown species and the confirmation of known species. Resources were adequate to carry out the survey.
Remoteness / access problems	No	The survey team was able to traverse large sections of the Study Area by vehicle and on foot to adequately subsample the flora and all representative vegetation associations.
Availability of contextual information	Partial	Information was available from the Interim Biogeographic Regionalisation for Australia (IBRA) Tanami 1 subregion, FloraBase, ALA, DPaW lists and the Bureau of Meteorology. Limited information was available for the Northern Territory vegetation associations within the Tanami bioregion, however at a very broad scale. There have been relatively few surveys in the bioregion to facilitate a clear understanding of representativeness of both flora and vegetation.

5. IMPACT ASSESSMENT

The desktop review and survey design for assessment of the flora and vegetation in the Study Area followed the guidelines in EPA Guidance Statement 51. Utilising available flora and vegetation data, the scale and nature of the impact (**Table 11**) to clear the Development Footprint (711 ha) for the Browns Range Project is considered to be **Low to Moderate**.

Table 11: Potential Impacts of Clearing the Development Footprint for the Browns Range Project

Area Characteristics	Scale and Nature of Impact		
	High	Moderate	Low
Degree of degradation or clearing within Tanami bioregion			In the Study Area, local area and bioregion there are extensive ecosystems with more than 50% of vegetation in better condition.
Size/scale of proposal impact	The Tanami bioregion is in Group 4 and the Development Footprint is greater than 75 ha (711 ha).		
Rarity of Vegetation – restricted or rare (PECs/TECs), either naturally or as a result of clearing.			No TECs or PECs are listed for the Tanami bioregion and none were located in the Study Area.

Area Characteristics	Scale and Nature of Impact		
	High	**Moderate**	**Low**
Significant Vegetation Unit	**Vegetation associations that naturally comprise less than 5% in the local area (15 km radius) or the bioregion, or a TEC.** The majority of vegetation associations comprised less than 5% of the Study Area, however much of this was due to the fact that the haul road linear corridor bisected short lengths of relatively widespread associations. For 12 of these associations, less than 1% of their extent in the Study Area is within the Development Footprint. Two associations are apparently locally uncommon and their regional status is uncertain. Vegetation association VA4 is poorly represented in the Study Area and appears to be locally uncommon although it was noted in areas adjacent to the haul road corridor. Avoidance of these upland damplands would be prudent when constructing the haul road wherever feasible. The corridor is likely wide enough to accommodate this in most instances. Vegetation association VA13 comprises 22.6 ha in only one locality and is a wetland vegetation association in a low lying, clay depression. The development envelope has been modified to exclude this vegetation association.	**Vegetation associations that naturally comprise less than 5 to 10% in the local area (15 km radius) or the bioregion.** No vegetation associations comprised 5 to 10% of the Study Area.	**Vegetation that is naturally more widespread than 10% of the local area (15 km radius) or the bioregion.** Vegetation associations VA1, VA6, VA10 and VA12 were widespread both within and outside of the Study Area and collectively represent 81.8% of the mapped vegetation. This reflects the relative homogeneity of the landforms and soils across the Study Area. A similar proportion of these associations were within the Development Footprint (75.78%).

Area Characteristics	Scale and Nature of Impact		
	High	Moderate	Low
Refugia			VA3 Drainage basins (amongst rocky hills) represent possible refugia supporting two species of Short Range Endemic invertebrates. Approximately 0.95 ha (34.1% of total mapped area) of this Vegetation association occurs within the Development Footprint no other VAs are considered likely to be refugia.
Rare or Priority Flora		Four Priority species are found in the Study Area and populations of three of these are within the Development Envelope. Only one of these species occurs within the Development Footprint (*Goodenia crenata*). The potential impacts on this species and the proportion of known individuals in the Study Area this represents are 1.1%	
Other Significant Flora		17 species considered to be of 'Other Conservation Significance' were recorded in the Study Area, however only two of these (*Brachychiton multicaulis* and *Stemodia* sp. Tanami (P.K. Latz 8218) occur within the Development Footprint. *Brachychiton multicaulis* is being considered for listing as a Priority Flora (R. Barrett *pers. comm*. 2013). The potential impact to this species in the local area represents 24.1% of the mapped individuals, however it should be noted that not all occurrences were mapped as this species was found extensively across the Study Area and thus the potential impact is considered to be less than this value indicates. *Stemodia* sp. Tanami (P.K. Latz 8218) is being considered for listing as a Priority Flora (R. Barrett *pers comm* 2013). The potential impact to this species in the local area represents 10% of the mapped individuals.	
Size of Remnant and Condition/Intactness of Vegetation			Study Area is not in a fragmented environment or an environment with extensive areas of otherwise degraded vegetation, such as some rangeland environments.

Area Characteristics	Scale and Nature of Impact		
	High	Moderate	Low
Ecological Linkage			The Study Area is not part of an ecological linkage.
Heterogeneity or complexity of the vegetation			The Study Area and its immediate surrounds are less complex relative to the characteristics of the local and regional scale. The topography and geology are relatively homogeneous.

6. POTENTIAL IMPACTS FROM CLEARING WITHIN THE DEVELOPMENT FOOTPRINT

6.1. Threatening Processes

Threatening processes relevant to the Tanami bioregion, in which the Project lies, have been identified by the Australian Natural Resources Audit (ANRA) (ANRA 2009a, ANRA 2009b). Aspects of the Project that constitute threatening processes with potential to impact upon flora and vegetation include the following:

- clearing of flora and vegetation;
- inappropriate fire regimes;
- altered hydrology;
- dust emissions; and
- introduced flora.

The Browns Range mining Project will include clearing, earthworks, construction of roads and landforms, processing, generation of rubbish, waste water, and electric power. The aspects of the Project with the greatest potential to impact upon flora and vegetation is the removal and modification of habitat through land clearing, the introduction and proliferation of introduced flora; and changed hydrological regimes. The other aspects of the Project listed above have potential to impact on flora and vegetation, however the extent of the impacts are likely to be localised and have negligible to no effect at a regional scale. The potential impacts of these aspects are discussed in the following sections.

6.1.1. Clearing of Flora and Vegetation

Clearing flora and vegetation is a necessary aspect of the Project with the greatest potential to impact upon both common and conservation significant flora and vegetation in the Study Area. The development of the Project will result in the loss of 711 ha of vegetation (Development Footprint) via land clearance within the 2590 ha Development Envelope. Land clearance will result in a reduction in the proportions of conservation significant flora species and vegetation associations within the Study Area. The key attributes of the flora and vegetation in the Study Area are summarised in **Appendix K.**

Flora

Six flora species of conservation significance are located within the Development Envelope, three Priority Flora species *Goodenia crenata, Eleocharis ochrostachys* and *Trachymene villosa*; and three species of 'other conservation significance' – *Brachychiton multicaulis, Stemodia* sp. Tanami (P.K. Latz 8218) and *Polymeria lanata.*

Of the Priority Flora species, *Eleocharis ochrostachys* and *Trachymene villosa* do not occur within the Development Footprint, and of the flora species of other conservation significance *Polymeria lanata* does not occur in the development footprint. Two populations and 70 individuals of *Goodenia crenata*

(Priority 3) may be cleared in the Development Footprint; which represents 1.1% of the population recorded in the Study Area and 3.2% of the known populations. This one assessment has increased the number of known populations from 11 to 51 and thus it is highly unlikely that the status of this species will be significantly impacted by the Project. It is also highly likely that there are numerous additional populations of this species within the Study Area and surrounds as not all areas of suitable habitat were surveyed.

Prior to this assessment only two records of *Brachychiton multicaulis* were recorded on FloraBase and thus it was being considered for listing as a Priority Flora species. However, there are 46 records on the ALA database and 53 populations were recorded in the Study Area of which six, supporting 57 individuals are likely to be impacted by clearing. This represents 21.4% of the total number of individuals in the Study Area; however the total number of new populations recorded has doubled the number of extant populations of this species. There are likely to be more populations of this species both within and outside of the Study Area given the available habitat.

Stemodia sp. Tanami (P. K. Latz 8218) were recorded at five small emergent rocky outcrops in the Study Area. One population of two individuals is located within the Development Footprint representing 10% of the total number of individuals in the Study Area. This species is likely to also occur in similar habitats within and extending outside of the Study Area.

The tag for the specimen of *Cyperus haspan* subsp. *?juncoides* was lost and thus it is unclear where this population is located within the Study Area, however its preferred habitat is standing water and if this is avoided, it is unlikely that this species will be impacted by the development.

The impacts to all of these conservation significant species will not be significant either on a local and regional scale with the clearing of the Development Envelopment. If development plans change then populations of conservation significant flora should be avoided.

Vegetation

No TECs, PECs or vegetation communities of conservation significance were recorded in the Study Area. Nineteen of 23 vegetation associations and mosaic associations described had limited (<5%) local distribution in the Study Area: namely VA2, VA3, VA4, VA5, VA6/10, VA7, VA8, VA9, VA11, VA12/14, VA12/15, VA13, VA14, VA15, VA16, VA17, VA18, VA19 and VA20. Several of these associations are poorly represented within the Study Area as they are largely haul road and access corridors to the borefields intercepting more widespread vegetation associations. Vegetation association VA3 was excluded from the Development Envelope and Development Footprint as it is highly restricted in its distribution and supports two Short Range Endemic invertebrate species. Vegetation associations VA5, VA7, VA8, VA11, VA12 and VA13 are not within the Development Footprint and thus will not be impacted by clearing. Eight vegetation associations (or mosaics) have less than 5% of their mapped extent within the Development Footprint and thus the impacts of clearing would be Negligible to Low. Two vegetation associations have between 5-20% of their

mapped extent within the Development Envelope and the impacts of clearing on these are considered to be Low to Moderate. Six associations have more than 20% of their known extent in the Study Area within the Development Footprint; these associations are generally small intercepts of more widespread associations except for VA4 perched damplands in upland hills. This vegetation appears to be locally uncommon and given that they are wetter and less stable areas should be avoided if possible when constructing the haul road corridor.

6.1.2. Inappropriate Fire Regimes

The development and ongoing operation of the Project may alter the fire regime of the Study Area through the introduction of unplanned fire resulting from vehicle movements and/or other Project activities (e.g. hot work). Too frequent fires can impact conservation significant flora and vegetation associations by influencing which species persist in an area. Seed setting can be influenced if inadequate time elapses prior to flowering and fruiting.

6.1.3. Altered Ground and Surface Water Hydrology

A large proportion of the Study Area is represented by floodplains and plains that are subject to seasonal inundation or surface water flows. *Eucalyptus victrix* occurs in several areas and is likely to be dependent on these surface water flows and may also use ground water if the water table is accessible. Other trees such as *Eucalyptus chlorophylla* and *Corymbia flavescens* also are more abundant in seasonal floodplains and flowlines. *Melaleuca* flats vegetation (VA 14) also appears to be dependent on the runoff and or seepage from adjacent rocky hills. Significant changes to the movement of surface water within the Study Area may have an impact on vegetation by reducing or increasing the volumes of water received. In addition, three flora species of conservation significance (*Eleocharis ochrostachys, Goodenia crenata* and *G. goodeniacea*) are also likely to be dependent on the seasonal influx of surface water. *Brachychiton multicaulis* also occurs primarily in the floodplain and seasonally inundated vegetation communities, however it is unclear whether it is dependent on these flows.

None of the vascular flora species recorded within vegetation associations in broad floodplains and drainage areas are currently recognised as obligate groundwater-dependent species. Groundwater abstraction for water supply and for pit dewatering during the construction and operation phases of the Project is unlikely to affect the vegetation as the drawdown zones do not intercept any vegetation associations that support *Eucalyptus victrix*. Nonetheless, this species and the vegetation associations it forms a part of are not restricted in the landscape and an impact from alterations to groundwater would likely be low on a regional scale. There is a risk that vegetation may be impacted close to abstraction points.

Vegetation association 18, 'Minor Flowlines' are mapped for the Study Area, to assist in management of surface water flows and identification of surface water-reliant vegetation. The Proposed Development Footprint intersects a very small proportion of these areas. In addition, the extent of these flowlines is likely to be much larger than mapped since, once burnt, these areas in particular are

indiscernible from the surrounding vegetation. Potentially the primary impact to surface water flows, if any, and thus surface water dependent vegetation, will be from road construction.

Conventional surface water control measures that maintain surface flows are likely to ameliorate any potential risks to the vegetation and flora from changes in flows. Given the relatively small variation in relief in the Study Area, these practices will also provide other benefits such as minimising erosion.

6.1.4. Contamination of Surface and Groundwater

Evaporation ponds, tailings dams, pipelines and other facilities may affect flora and vegetation if these facilities leak or erode. The standard management controls applied to mining activities and engineering of on-site facilities, in addition to minimising of spills of hydrocarbons and other potential contaminants will reduce the risks and thus potential impacts to flora and vegetation.

6.1.5. Dust Emissions

Access roads into the Project area will probably be unsealed and thus haulage trucks and light vehicles will generate dust, except during and following seasonal rainfall events. Any impacts to vegetation from dust are likely to be relatively limited to within 50 to 100 metres of the roads. Dust is unlikely to result in the loss of any particular vegetation association or individuals of conservation significant flora, particularly if management actions to minimise other potential impacts are implemented.

6.1.6. Introduced Flora

Several weed species were recorded in low numbers and frequency within the Study Area: *Cenchrus setiger* (Birdwood Grass), *Stylosanthes hamata* (Verano Stylo), *Malvastrum americanum* (Spiked Malvastrum), *Panicum antidotale* (Giant Panic Grass), *Echinochloa colona* (Awnless Barnyard Grass) and *Portulaca oleracea* (Purslane). These species are unlikely to diminish the biological diversity of the Study Area as the majority are generally found in low numbers and are spread by fauna and water vectors. However along the proposed haul road route, *Cenchrus setiger* (Birdwood Grass) and *Stylosanthes hamata* (Verano Stylo) were recorded in patches, mostly alongside the road verge and sometimes in very large populations. The proliferation of these two species is likely to pose a major risk to the biological diversity within the Study Area, particularly if they spread to the broader floodplains and drainage line areas. This haul road will be used by the public as well as Northern Minerals. This should be considered in planning and allocating management activities.

Management practices which will minimise the risk of spread of *Cenchrus setiger* and *Stylosanthes hamata* should include ensuring that any machinery (particularly for earthworks) entering the Project area should be subject to quarantine/hygiene measures that ensure that no contaminated soils or weed seeds enter the area. Typically this would involve using a wash down bay or station, and educating the workforce with environmental inductions. Within the Project area, machinery used in earthworks in areas with known populations of the less aggressive weeds should also be cleaned prior to entering uncontaminated areas and where practical larger populations of these species should

be controlled. Soil disturbance and altered drainage are considered significant aspects that can exacerbate the spread and introduction of weeds into new areas (Normandy NFM Limited 1999).

6.2. Assessment Against the 10 Clearing Principles

The proposed clearing of 711 ha for the Development Footprint has been assessed against the 10 Clearing Principles (**Appendix L**) and due to the exclusion of vegetation association VA13 from the development envelope it is considered that the proposal is not a variance to any of the principles.

7. CONCLUSIONS AND RECOMMENDATIONS

The Browns Range Study Area has a relatively rich flora considering that the number of species recorded exceed the number listed for the bioregion on FloraBase, however given that the ALA database has a much greater number of species listed for the bioregion; reflects more a lack of survey effort throughout the region. The results of this survey have greatly enhanced both the number of species recorded in the bioregion and particularly provided significant population data for the assessment of the status of the four Priority Flora species recorded and the flora species of 'Other Conservation Significance'. The proportions of the three species of conservation significance located in the Development Footprint that are likely to be impacted by the Project are considered not significant, particularly in light of the much greater number of individuals identified outside of the development. The records within the Study Area also indicate that there are likely to be a number of additional populations of the conservation significant flora found within the vicinity based on their habitat preferences.

The vegetation data collected for the Browns Range Study Area is not readily comparable to other studies in the bioregion, particularly as limited detailed data is available, but provides useful baseline information for future survey work. The majority of the Study Area (81.8%) and Development Footprint (81.4%) comprised four vegetation associations, with rocky hills (*Eucalyptus brevifolia*) representing 15% and the remaining 66.8% were plains and broad drainage dominated by *Eucalyptus brevifolia, Corymbia flavescens* or *Eucalyptus chlorophylla*. Nineteen vegetation associations each represented less than 5% of the Study Area; however in most cases this was because of the linear corridors intercepting more broad scale associations. However two associations were considered of local significance. Vegetation association VA4, a series of small upland damplands was recorded in the northern haul road corridor and although extending outside of the Development Footprint and Envelope was considered worthy of avoidance where possible, given that their extant in the regional context could not be verified.

Vegetation association VA13 a clay wetland in a low lying depression surrounded by *Eucalyptus victrix* was also considered of local significance as it was represented in only one locality and no other example outside of the Study Area was identified during the 2012, 2013 surveys. This vegetation type has been excluded from the Development Envelope and will therefore not be impacted by this project.

Vegetation association VA3, which was recorded in two locations in the Study Area, is described as drainage basins amongst rocky hills. It was recognised as locally significant following the 2012 surveys as it is limited in extent and has internal drainage that maintains soil moisture for extended periods. Northern Minerals excised this association from the Project area, particularly as it also supports two Short Range Endemic invertebrate species.

The following broad management recommendations have been developed as a guide for mitigating the potential impacts of the Project to flora and vegetation.

1.1. Project Design

- During Project design, consider options for aligning infrastructure footprints to avoid or minimise clearing of habitats that have been identified as likely to support species of conservation significance, such as at the base of rocky hills (*Trachymene villosa*) and broad drainage areas (*Goodenia crenata* and *Brachychiton multicaulis*);
- ;
- Where possible avoid modifying surface water flows to minimise the risk of vegetation stress and loss or proliferation of introduced flora species.

1.2. Land Disturbance and Clearing Activities

- Where practicable, minimise land disturbance and clearing activities particularly in vegetation associations VA13 and VA4.
- clearing boundaries should be demarcated in the field by Northern Minerals environmental personnel or appropriate representatives;
- Locations of Priority Flora and flora of 'Other Conservation Significance' within the Development Envelope should be buffered by between 30 to 50 metres to minimise the chance of accidental clearing; and
- stockpile cleared vegetation, topsoil and oversize waste overburden separately to ensure maximum reuse of these resources in subsequent rehabilitation;

1.3. Project Operation

- Implement dust suppression measures to reduce the effects of dust on flora and vegetation– this should include management of vehicle speed on unsealed roads;
- prepare and implement a weed management strategy to prevent the spread of existing weed species and the establishment of new weeds;
- prepare and implement a strategy for prevention of unplanned fires, which should include all vehicles being fitted with fire extinguishers and all personnel being trained in their use;
- prepare and implement a fire management strategy so as not to increase the frequency and scale of fires; and
- train personnel and implement measures to minimise and control off-road access. This will help prevent damage and loss of vegetation and also reduce rehabilitation closure costs.

1.4. Rehabilitation and Closure

- Implement a progressive rehabilitation and closure plan to ensure disturbed areas are rehabilitated as soon as practicable.

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APPENDIX A

Vegetation Structural Classes and Condition Scale Rating

Vegetation Structural Classes – Specht (1970) as modified by Aplin (1979).

Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees >30m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland	Scattered tall trees
Trees 10-30m	Closed forest	Open forest	Woodland	Open woodland	Scattered trees
Trees <10m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Shrubs >2m	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 <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

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.

APPENDIX B
Definitions of Threatened and Priority Flora

Definitions for Threatened Flora (Threatened Flora) and Priority Flora (Priority Flora) (DEC 2011)

Under the *Wildlife Conservation Act*, the Minister for the Environment may declare species of flora to be protected if they are considered to be in danger of extinction, rare or otherwise in need of special protection.

T: Threatened Flora (Declared Rare Flora — Extant)

Taxa[1] 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 (Schedule 1 under the *Wildlife Conservation Act 1950*). Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria:

- 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.

1: Priority One: Poorly-known taxa

Taxa 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, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa 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 taxa

Taxa 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, vacant Crown land, water reserves, etc. Taxa 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 taxa

Taxa 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. Taxa 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 taxa in need of monitoring

Rare. Taxa 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 taxa are usually represented on conservation lands.

Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. Taxa 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 taxa

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

APPENDIX C
Definitions of Threatened and Priority Ecological Communities

Background

In Western Australia, the DPaW recognizes four categories of Threatened Ecological Communities (TECs), as developed by English and Blyth (1997). These include – 'Presumed Totally Destroyed', 'Critically Endangered', 'Endangered' and 'Vulnerable'. Other ecological communities that are possibly under threat but do not meet the survey criteria associated with TECs, are listed under the Department's Priority Ecological Community (PEC). These are categorised as Priority 1, Priority 2 or Priority 3 according to criteria listed in. PECs that are considered to be adequately known, and are rare but not threatened, or which have been recently removed from the threatened list, are classified as Priority 4 and require regular monitoring. Conservation-dependent ecological communities are placed in Priority 5.

In addition to TECs and PECs, ecosystems may also be described as being 'at risk'. The status of 'at risk' is recognised by the DPaW and the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC). While not conferring any form of legislative protection, the application of the 'at risk' status is a useful tool that highlights ecosystems that may be subject to threatening processes and as such, could potentially become a TEC or PEC in the future.

Definitions for Threatened Ecological Communities (TEC) (DEC 2010)

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):

B) 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);

C) 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.

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

E) 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);

F) ii) 0there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;

G) 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.

H) 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.

Definitions for Priority Ecological Communities (PEC) (DEC 2010)

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List 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 that are known from very few occurrences with a very restricted distribution (generally =5 occurrences or a total area of = 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. 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 occurrences with a restricted distribution (generally =10 occurrences or a total area of =200ha). At least some occurrences are not believed to be under immediate 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 with 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 may 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:

i) ***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.

(ii) ***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.

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

These communities require regular monitoring.

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.

APPENDIX D

Plant Species Recorded in the Study Area

Family	Species (Common Name)	ID confirmed by (year or observation type)	Within Tanami bioregion	
			DPaW	ALA
Aizoaceae	*Trianthema oxycalyptra* var. *oxycalyptra*	RB (13)		x
	Trianthema pilosa	RB (13)	x	x
	Trianthema sp. nov (aff. pilosa)	RB (13)		
Amaranthaceae	*Achyranthes aspera (*Chaff Flower)	JA (13) *		x
	*Alternanthera nana (*Hairy Joyweed)	RB (12)		x
	Amaranthus ?induratus	RB	x	x
	Gomphrena flaccida (Gomphrena Weed)	RB (13)		
	Gomphrena lanata	RB (12) (13)		x
	Gomphrena occulta	RB (13)		
	Ptilotus arthrolasius	RB (12)	x	x
	*Ptilotus calostachyus (*Weeping Mulla Mulla)	RB (12)	x	x
	Ptilotus fusiformis	RB (12)	x	x
	*Ptilotus polystachyus (*Prince of Wales Feather)	RB (12)	x	x
Apocynaceae	*Carissa lanceolata* (Conkerberry)	RB (field)		x
	Marsdenia angustata	RB (field)		x
	Sarcostemma viminale subsp. *australe*			x
Araliaceae	*Trachymene villosa*	RB (12) (13)	x	x
Asteraceae	*Blumea saxatilis*	RB (12)		x
	Blumea tenella		x	x
	Calotis breviseta	RB (13)	x	x
	Centipeda minima subsp. *macrocephala* Spreading Sneezewood	RB (13)		x
	Centipeda minima subsp. *minima*	RB (12)		x
	Pluchea ferdinandi-muelleri	RB (13)	x	x
	Pluchea tetranthera	RB (12) (13)	x	x
	Pterocaulon serrulatum var. *velutinum*	RB (13)	x	x
	Pterocaulon sphacelatum	RB (13)	x	x
	Rutidosis helichrysoides subsp. *helichrysoides*	RB (13)		x
	Streptoglossa adscendens	RB (13)		x
Bignoniaceae	*Dolichandrone heterophylla* (Lemonwood)	RB (12)		x
Boraginaceae	*Ehretia saligna* (False Cedar)	RB (field)		x
	Halgania solanacea var. *solanacea*		x	x
	Heliotropium diversifolium	RB (13)	x	x
	Heliotropium glabellum	RB (12) (13)	x	x
	Heliotropium sp. Ord River (W. Fitzgerald 1611)	RB (13)		
	Heliotropium sphaericum		x	x
	Heliotropium ?tenuifolium	RB (13)	x	x
	Heliotropium uniflorum	RB (13)		
	Trichodesma zeylanicum var. *zeylanicum* (Camel Bush)	RB (field)		x
Byblidaceae	*Byblis rorida*	(12)		x
Campanulaceae	*Wahlenbergia queenslandica*			x
Capparaceae	*Capparis lasiantha* (Split Jack)			x
	Capparis umbonata (Wild Orange)		x	x
Caryophyllaceae	*Polycarpaea corymbosa*			x
Celastraceae	*Stackhousia intermedia* (s.l.)			x
Chenopodiaceae	*Atriplex vesicaria* (Bladder Saltbush)			x
	Chenopodium auricomum (Queensland Bluebush)		x	x

Family	Species (Common Name)	ID confirmed by (year or observation type)	Within Tanami bioregion	
			DPaW	ALA
Chenopodiaceae	*Dysphania plantaginella*		x	x
	Enchylaena tomentosa var. *tomentose* (Barrier Saltbush)		x	x
	Maireana villosa	RB (13)	x	x
	Rhagodia eremaea (Thorny Saltbush)		x	x
	Salsola australis		x	x
	Sclerolaena glabra	RB (13)		x
	Tecticornia indica subsp. *leiostachya* (Samphire)	RB (13)	x	x
Cleomaceae	*Cleome uncifera* subsp. *microphylla*	RB (13)	x	x
	Cleome viscosa (Tickweed)		x	x
Combretaceae	*Terminalia arostrata* (Crocodile Tree)	RB (13)	x	x
Commelinaceae	*Murdannia graminea* (Baniyu)		x	x
Convolvulaceae	*Bonamia alatisemina*			x
	Bonamia linearis	RB (13)	x	x
	Bonamia pannosa	RB (13)		x
	Evolvulus alsinoides var. *decumbens*			x
	Evolvulus alsinoides var. *villosicalyx*		x	x
	Ipomoea coptica			x
	Ipomoea muelleri (Poison Morning Glory)	RB (13)	x	x
	Polymeria ambigua (Morning Glory)	RB (13)		x
	Polymeria lanata (s. l.)	RB (12)		
Cucurbitaceae	*Cucumis argenteus*			x
	Cucumis maderaspatanus			x
Cyperaceae	*Bulbostylis barbata*	RB (13)	x	x
	Cyperus blakeanus	RB (12) (13)	x	x
	Cyperus cunninghamii subsp. *cunninghamii*	RB (13)		x
	Cyperus haspan subsp. *?juncoides*	RB (13)		
	Cyperus pulchellus	RB (12)		x
	Cyperus vaginatus (Stiff-leaf Sedge)	RB (13)		x
	Eleocharis brassii	RB (13)		
	Eleocharis ochrostachys	RB (13)		
	Fimbristylis ammobia		x	x
	Fimbristylis caespitosa	RB (13)	x	x
	Fimbristylis dichotoma (Eight Day Grass)	RB (12)		x
	Fimbristylis eremophila	RB (13)		x
	Fimbristylis littoralis			x
	Fimbristylis microcarya	RB (12)		x
	Fimbristylis nuda	RB (12)		x
	Fimbristylis pauciflora (s. l.)	RB (13)		
	Fimbristylis simulans	RB (12) (13)	x	x
	Fimbristylis tetragona	RB (13)		x
	Lipocarpha microcephala	RB (12)		x
	Schoeneoplectus dissachanthus	RB (13)	x	x
Droseraceae	*Drosera derbyensis*	JA	x	x
	Drosera indica	JA/RB	x	x
Elatinaceae	*Bergia henshallii*	RB (13)	x	x
Euphorbiaceae	*Euphorbia armstrongiana* var. *?distans*	RB (13)		
	Euphorbia australis var. *hispidula*	RB (13)	x	x

Family	Species (Common Name)	ID confirmed by (year or observation type)	Within Tanami bioregion	
			DPaW	ALA
Euphorbiaceae	*Euphorbia biconvexa*	RB (13)	x	x
	Euphorbia cinerea	RB (13)		x
	Euphorbia drummondii (Caustic Weed)			x
	Euphorbia ?inappendiculata	RB (13)		
	Euphorbia ?maconochieana	RB (13)		
	Euphorbia schizolepis	RB (13)	x	x
	Euphorbia schultzii var. *comans*	RB (13)	x	x
	Euphorbia tannensis			x
	Euphorbia wheeleri			x
	Microstachys chamaelea	RB (12)		x
	Phyllanthus exilis			x
	Sauropus trachyspermus			x
Fabaceae	*Acacia acradenia*	RB (13)	x	x
	Acacia adoxa var. *adoxa*	RB (13)	x	x
	Acacia adoxa var. *subglabra*			
	Acacia adsurgens	RB (13)	x	x
	Acacia ampliceps			x
	Acacia ancistrocarpa (Fitzroy Wattle)	RB (12)	x	x
	Acacia aneura (Mulga)			x
	Acacia bivenosa	RB (13)	x	x
	Acacia colei var. *colei*	RB (13)		x
	Acacia cowleana (Halls Creek Wattle)			x
	Acacia cuthbertsonii subsp. *cuthbertsonii*		x	x
	Acacia drepanocarpa subsp. *latifolia*	RB (13)		x
	Acacia elachantha	RB (12) (13)		x
	Acacia eriopoda (Broome Pindan Wattle)		x	x
	Acacia eriopoda x *lysiphloia*	RB (13)		
	Acacia gonocarpa (Wuluru)			
	Acacia gonoclada			x
	Acacia hammondii			
	Acacia hemignosta (Clubleaf Wattle)	RB (13)	x	x
	Acacia hemsleyi			
	Acacia hilliana	RB (13)	x	x
	Acacia jennerae			x
	Acacia lysiphloia	RB (13)	x	x
	Acacia maconochieana	RB (13)	x	x
	Acacia megalantha	RB (13)	x	x
	Acacia monticola	RB (13)	x	x
	Acacia orthocarpa		x	x
	Acacia perryi	RB (13)	x	x
	Acacia retivenea subsp. *retivenea*	RB (13)		x
	Acacia sabulosa			x
	Acacia sericophylla	RB (13)	x	x
	Acacia stipuligera	RB (13)	x	x
	Acacia stipulosa		x	x
	Acacia synchronicia	RB (13)		x
	Acacia tenuissima	RB (12) (13)	x	x

Family	Species (Common Name)	ID confirmed by (year or observation type)	Within Tanami bioregion	
			DPaW	ALA
Fabaceae	*Acacia thomsonii*			
	Acacia tumida var. *kulparn*	RB (13)	x	x
	Bauhinia cunninghamii			x
	Cajanus marmoratus			x
	Cajanus pubescens	RB (13)	x	x
	Chamaecrista absus	RB (12) (13)		x
	Chamaecrista symonii	RB (12)	x	x
	Crotalaria brevis	RB (13)		x
	Crotalaria cunninghamii (Green Birdflower)	RB (12)		x
	Crotalaria medicaginea		x	x
	Crotalaria novae-hollandiae subsp. *lasiophylla*	RB (12)	x	x
	Crotalaria ramosissima	RB (12) (13)	x	x
	Cullen balsamicum	RB (12)	x	x
	Desmodium filiforme	RB (12)		x
	Galactia tenuiflora	RB (13)		x
	Glycine tomentella (s. l.) (Woolly Glycine)	RB (12) (13)		x
	Gomphrena lanata	525		x
	Gomphrena occulta	15		x
	Indigofera ?georgei (sterile material) (Bovine Indigo)	RB (13)		x
	Indigofera colutea (Sticky Indigo)	RB (12)	x	x
	Indigofera haplophylla	RB (12) (13)		x
	Indigofera hirsuta (Hairy Indigo)	RB (12) (13)		x
	Indigofera linifolia	RB (12)	x	x
	*Indigofera linnaei (*Birdsville Indigo)	RB (12)		x
	Indigofera monophylla	RB (12) (13)	x	x
	Jacksonia aculeata	RB (12)	x	x
	Leptosema anomalum	RB (12)		x
	Mirbelia viminalis		x	x
	Nomismia rhomboidea	RB (13)		
	Petalostylis cassioides		x	x
	Rhynchosia minima	RB (12)		x
	Senna artemisioides subsp. *helmsii*	RB (13)		x
	Senna costata	RB (12)		x
	Senna curvistyla	RB (12)	x	x
	Senna glutinosa subsp. *glutinosa*	RB (13)		x
	Senna notabilis	RB (12)	x	x
	Senna venusta	RB (12)		x
	Sesbania muelleri	RB (12)		
	**Stylosanthes hamata* (Verano Stylo)			x
	Swainsona ?formosa			
	Templetonia hookeri			x
	Tephrosia aff. sp. Bungaroo Creek (M.E. Trudgen 11601)	RB (12) (13)		
	Tephrosia brachycarpa	RB (12) (13)	x	x
	Tephrosia lasiochlaena	RB (13)	x	x
	Tephrosia leptoclada	RB (12)		x
	Tephrosia rosea (s. l.) (Flinders River Poison)	RB (12) (13)	x	x
	Tephrosia rosea var. *clementii*	RB (12) (13)	x	x

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			DPaW	ALA
Fabaceae	*Tephrosia rosea* var. *rosea*	RB (13)		x
	Tephrosia simplicifolia	RB (13)		x
	Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	RB (13)	x	x
	Tephrosia sp. Pentecost River (I.D. Cowie 4168)	RB (13)		x
	Tephrosia stipuligera	RB (13)		
	Tephrosia stuartii	RB (12)		x
	Tephrosia supina	RB (12) (13)		x
	Tephrosia virens	RB (12) (13)		x
	Vigna lanceolata var *filiformis* (Maloga Vigna)	RB (12) (13)		x
	Vigna vexillata var. *angustifolia*	RB (12)		
	Zornia chaetophora			x
	Zornia muelleriana subsp. *congesta*	RB (12)		x
Goodeniaceae	*Brunonia suffruticosa*	RB (13)	x	x
	Dampiera candicans		x	x
	Goodenia arachnoidea			
	Goodenia armitiana	RB (13)	x	x
	Goodenia azurea subsp. *azurea*	RB (13)	x	x
	Goodenia crenata	RB (13)	x	x
	Goodenia goodeniacea	RB (13)		x
	Goodenia lamprosperma (s. l.)	RB (13)	x	x
	Goodenia microptera	RB (12)	x	x
	Goodenia sp. nov. (undescribed)	MH (12)		
	Goodenia triodiophila	RB (13)		x
	Goodenia vilmoriniae	RB (13)		x
	Scaevola browniana subsp. *browniana*	RB (13)	x	x
	Scaevola laciniata			x
	Scaevola spinescens (Currant Bush)			x
	Velleia panduriformis (Cabbage Poison)	RB (12)		x
Gyrostemonaceae	*Codonocarpus cotinifolius* (Native Poplar)			x
	Gyrostemon tepperi		x	x
Hemerocallidaceae	*Corynotheca micrantha* var. *gracilis*			
Hypericaceae	*Hypericum gramineum* (Small St John's Wort)	RB (12)		x
Lamiaceae	*Clerodendrum floribundum* var. *coriaceum*		x	x
	Dicrastylis exsuccosa	RB (13)	x	x
	Newcastelia cladotricha (Lambs Tail)		x	x
	Newcastelia spodiotricha		x	x
Lauraceae	*Cassytha filiformis* (Love Vine)	RB (13)		x
Loranthaceae	*Amyema sanguinea*		x	x
	Lysiana spathulata subsp. *parvifolia*	RB (13)	x	x
Lythraceae	*Ammannia baccifera*	RB (13)		x
	Rotala diandra	RB (13)	x	x
Malvaceae	*Abutilon ?macrum*	RB (13)		x
	Abutilon lepidum	RB (12)	x	x
	Abutilon otocarpum	RB (13)	x	x
	Abutilon oxycarpum (Flannel Weed)	RB (12)		
	Abutilon sp.			
	Adansonia gregorii (Boab)			x

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			DPaW	ALA
Malvaceae	*Androcalva loxophylla*	RB (13)		x
	Brachychiton multicaulis	RB (12)		x
	Corchorus pumilio	RB (13)		x
	Corchorus sidoides subsp. *sidoides*	RB (12)		x
	Corchorus sidoides subsp. *vermicularis*	RB (13)		x
	Gossypium australe (Native Cotton)	RB (12)		x
	Hibiscus aff. leptocladus	RB (13)		
	Hibiscus leptocladus	RB (12) (13)	x	x
	Hibiscus sturtii var. *campylochlamys*	RB (13)		x
	Hibiscus sturtii var. *grandiflorus*	RB (12)	x	x
	Keraudrenia nephrosperma	RB (12)	x	x
	**Malvastrum americanum* (Spiked Malvastrum)	RB (12)		x
	Sida arenicola	RB (13)		x
	Sida brachypoda (s. l.)	RB (12) (13)		x
	Sida fibulifera (s. l.)	RB (12) (13)	x	x
	Sida macropoda 'filiform pedicels form'	RB (12)		x?
	Sida platycalyx	RB (12) (13)	x	x
	Sida rohlenae		x	x
	Sida sp. dark green fruits (S. van Leeuwen 2260)	RB (13)		x
	Sida sp. B Kimberley Flora (A.A. Mitchell 2745)	RB (13)		
	Sida sp. Supplejack Station (T. S. Henshall 2345)	RB (13)		
	Triumfetta johnstonii	RB (13)	x	x
	Triumfetta micracantha	RB (12)	x	x
	Triumfetta plumigera		x	x
	Triumfetta sp. Pentecost Rivert	RB (13)		
	Waltheria indica	RB (12)	x	x
Marsileaceae	*Marsilea ?hirsuta*	RB (13)	x	x
Meliaceae	*Owenia reticulata*		x	x
Menispermaceae	*Tinospora smilacina* (Snakevine)			x
Menyanthaceae	*Nymphoides indica* (Marshwort)	RB (13)	x	x
Molluginaceae	*Mollugo molluginea*	JA	x	x
Myrtaceae	*Calytrix carinata*	RB (13)	x	x
	Corymbia aspera	RB (12) (13)	x	x
	Corymbia dichromophloia	RB (13)		x
	Corymbia flavescens	RB (13)	x	x
	Corymbia opaca	RB (12) (13)	x	x
	Corymbia pachycarpa	RB (13)	x	x
	Eucalyptus brevifolia (Snappy Gum)	RB (12)	x	x
	Eucalyptus chlorophylla	RB (13)		x
	Eucalyptus cupularis (Halls Creek White Gum)	RB (12) (13)		x
	Eucalyptus gamophylla (Twin-leaf Mallee)	RB (12)	x	x
	Eucalyptus limitaris		x	x
	Eucalyptus odontocarpa (Sturt Creek Mallee	RB (12) (13)	x	x
	Eucalyptus pachyphylla (Thick-leaved Mallee)	RB (13)	x	x
	Eucalyptus pruinosa subsp. *pruinosa* (Silver Box)			x
	Eucalyptus pruinosa subsp. *tenuata* (Silver Box)	RB (12)		x
	Eucalyptus victrix	RB (13)	x	x

Family	Species (Common Name)	ID confirmed by (year or observation type)	Within Tanami bioregion	
			DPaW	ALA
	Melaleuca glomerata	RB (13)	x	x
	Melaleuca lasiandra		x	x
	Melaleuca nervosa (Fibrebark)	RB (13)	x	x
Nyctaginaceae	*Boerhavia burbidgeana*	RB (13)		x
	Boerhavia paludosa	RB (13)		x
Orobanchaceae	*Buchnera linearis* (Blackrod)	RB (13)		x
	Buchnera ramosissima			x
Phyllanthaceae	*Sauropus trachyspermus* (s. l.)	RB (13)		x
Picrodendraceae	*Petalostigma nummularium*		x	x
Plantaginaceae	*Stemodia lythrifolia* (Bunu Bunu)			x
	Stemodia sp. Tanami (P.K. Latz 8218)	RB (13)	x	x
Poaceae	*Acrachne racemosa*	RB (13)		x
	Aristida contorta (Bunched Kerosene Grass)	RB (12)	x	x
	Aristida holathera var. *holathera*	RB (12) (13)		x
	Aristida hygrometrica (Northern Kerosene Grass)	RB (13)		x
	Aristida inaequiglumis (Feathertop Threeawn)	RB (12)		x
	Aristida latifolia (Feathertop Wiregrass)	RB (12)	x	x
	Aristida pruinosa (Gulf Feathertop Wiregrass)	RB (13)		x
	Bothriochloa bladhii (Forest Bluegrass)			
	**Cenchrus setiger* (Birdwood Grass)	RB (13)		x
	Chloris pumilio	RB (13)	x	x
	Chrysopogon fallax (Golden Beard Grass)	RB (12) (13)		x
	Cymbopogon ambiguous (Scentgrass)	RB (13)	x	x
	Cymbopogon bombycinus (Silky Oilgrass)	RB (13)	x	x
	Cymbopogon obtectus (Silkyheads)	RB (12)		x
	Dichanthium sericeum subsp. *humilius*		x	x
	Digitaria brownii (Cotton Panic Grass)	RB (12) (13)		x
	**Echinochloa colona* (Awnless Barnyard Grass)	RB (13)	x	x
	Elytrophorus spicatus (Spikegrass)	RB (13)	x	x
	Enneapogon polyphyllus (Leafy Nineawn)	RB (12) (13)	x	x
	Enneapogon robustissimus	RB (13)		x
	Enteropogon ramosus (Windmill Grass)	RB (13)		x
	Eragrostis confertiflora	RB (12)		x
	Eragrostis cumingii (Cumming's Love Grass)	RB (12) (13)		x
	Eragrostis eriopoda (Woollybutt Grass)	RB (12) (13)	x	x
	Eragrostis exigua	RB (12)		x
	Eragrostis lacunaria (Purple Lovegrass)		x	x
	Eragrostis olida			x
	Eragrostis speciosa (Handsome Lovegrass)	RB (12) (13)	x	x
	Eragrostis tenellula (Delicate Lovegrass)			x
	Eragrostis xerophila (Knotty-butt Neverfail)		x	x
	Eriachne aristidea	RB (12)	x	x
	Eriachne benthamii (Swamp Wanderrie)	RB (12)	x	x
	Eriachne ciliata (Slender Wandarrie Grass)	RB (12) (13)		x
	Eriachne mucronata (s. l.) (Mountain Wanderrie Grass)	RB (12) (13)		x
	Eriachne obtusa (Northern Wandarrie Grass)	RB (12)	x	x
	Eulalia aurea	RB (12)	x	x

Family	Species (Common Name)	ID confirmed by (year or observation type)	Within Tanami bioregion	
			DPaW	ALA
Poaceae	*Leptochloa fusca* subsp. *fusca*	RB (13)		x
	**Panicum antidotale* (Giant Panic Grass)			x
	Panicum decompositum (Native Millet)	RB (12) (13)		x
	Paraneurachne muelleri (Northern Mulga Grass)	RB (12) (13)		x
	Paspalidium rarum (Rare Paspalidium)	RB (12) (13)		x
	Schizachyrium fragile (Senale Redgrass)	RB (12) (13)		x
	Schizachyrium pseudeulalia	RB (12)		x
	Setaria surgens (Pigeon Grass)	RB (12) (13)		x
	Sorghum plumosum	RB (12)	x	x
	Themeda avenacea (Native Oatgrass)	RB (12) (13)		x
	Themeda triandra	RB (12)		x
	Triodia aff. *epactia*	RB (12)		
	Triodia angusta	RB (12)	x	x
	Triodia basedowii (Lobed Spinifex)	RB (12)	x	x
	Triodia bitextura	RB (13)	x	x
	Triodia bitextura (s. l.)	RB (13)		
	Triodia epactia			x
	Triodia epactia (s. l.)	RB (12)		x
	Triodia intermedia (Lobed Spinifex)	RB (13)		x
	Triodia pungens (Soft Spinifex)	RB (12)	x	x
	Triodia schinzii	RB (12) (13)	x	x
	Tripogon loliiformis (Five Minute Grass)	RB (field ob)		x
	Urochloa holosericea subsp. *velutina*	RB (12)	x	x
	Whiteochloa airoides			
	Yakirra australiensis var. *australiensis*	RB (12)		x
Polygalaceae	*Polygala galeocephala*	RB (13)	x	x
	Polygala isingii	RB (12)		
Portulacaceae	*Portulaca filifolia*	RB (13)	x	x
	Portulaca oleracea (Purslane)		x	x
	*Portulaca pilosa (*Djannggara)	RB (12)		
Proteaceae	*Grevillea pyramidalis* subsp. *pyramidalis* Caustic Bush	RB (12)		x
	Grevillea refracta subsp. *refracta* Silver-leaf Grevillea	RB (12)	x	x
	Grevillea stenobotrya	RB (12)	x	x
	Grevillea wickhamii subsp. *aprica* Wickhams Grevillea	RB (12) (13)	x	x
	Hakea arborescens Common Hakea			x
	Hakea chordophylla	RB (12)		x
	Hakea lorea subsp. *lorea* Witinti	RB (12)		x
	Hakea macrocarpa	RB (12)	x	x
Pteridiaceae	*Cheilanthes brownii*	RB (13)	x	x
Rhamnaceae	*Ventilago viminalis* (Supplejack)			x
Rubiaceae	*Dentella asperata*	RB (13)	x	x
	Oldenlandia mitrasacmoides			
	Oldenlandia spermacocoides	RB (13)		x
	Spermacoce hillii	RB (12) (13)		x
	Synaptantha tillacea (s. l.)	RB (13)		x
Santalaceae	*Exocarpos latifolius* Broad-leaved Cherry			
	Santalum lanceolatum Northern Sandalwood		x	x

Family	Species (Common Name)	ID confirmed by (year or observation type)	Within Tanami bioregion	
			DPaW	ALA
Sapindaceae	*Atalaya hemiglauca* Whitewood			x
	Dodonaea coriacea	RB (13)	x	x
	Dodonaea hispidula var. *arida*			x
	Dodonaea lanceolata var. *lanceolata*	RB (13)		x
Scrophulariaceae	*Eremophila bignoniiflora*		x	x
	Eremophila latrobei subsp. *filiformis*	RB (13)	x	x
	Eremophila latrobei subsp. *glabra* (s. l.)	RB (12)	x	x
	Eremophila latrobei subsp. *latrobei*		x	x
	Eremophila longifolia		x	x
Solanaceae	*Solanum cunninghamii*			x
	Solanum dioicum	RB (13)	x	x
	Solanum diversiflorum		x	x
	Solanum quadriloculatum	RB (13)	x	x
Stylidiaceae	*Stylidium desertorum*	JA	x	x
Surianaceae	*Stylobasium spathulatum*	JA/RB	x	x
Violaceae	*Hybanthus aurantiacus*	JA/RB	x	x
Zygophyllaceae	*Tribulopis angustifolia*	RB (13)		x

* = Introduced = non-native species
RB (12) (13) = Russell Barrett (specimen identified)
RB (field) = identified in the field
JA (12) (13) = Jeni Alford (specimen identified)

APPENDIX E

Locations and Estimated Population Sizes of Priority Flora Species and Flora Species of 'Other Conservation Significance' recorded in the Browns Range Study Area.

Locations and Estimated Size of Populations of Priority Flora Species in the Browns Range Study Area (DF = populations within the Development Footprint)

Location	Zone 52 K		No. of plants (% cover in a 50 metre radius of observation)
	Easting (metres)	Northing (metres)	
***Eleocharis ochrostachys* (Priority 3)**			
VY337	461570	7922257	6
***Heliotropium uniflorum* (Priority 1)**			
QBrow21	493396	7910695	1
***Goodenia crenata* (Priority 3)**			
	490269	7917198	50
QBrow 100	491709	7907316	50
QBrow 15	491600	7912487	100
QBrow 27	493743	7909622	50
QBrow 42	491444	7904260	50
QBrow 421	489446	7905821	10
QBrow 43	491353	7903820	10
QBrow 46a	491913	7902725	100
QBrow 46b	491923	7902677	10
QBrow 49	491656	7902178	100
QBrow 5A	492966	7914571	10
QBrow51	493152	7901965	1
QBrow 60-1	495308	7904221	20
QBrow 66 (DF)	**493456**	**7914770**	**50**
QBrow 7	494009	7914239	10
WPAS436	491482	7913553	10
WPAS474	485770	7906641	300
WPAS489	485159	7907833	200
WPJA 2012	491813	7905644	200
WPJA 291 -236	498763	7906260	100
WPJA103	495480	7904036	10
WPJA180	491487	7913550	100
WPJA271	496208	7904229	20
WPJA206	493820	7901806	10
WPJA212	491634	7906145	20
WPJA217	492348	7905535	20
WPJA232-290	491842	7905523	100
WPJA259	495510	7906272	200
WPJA263-267	495479	7904109	2000
WPJA271	496208	7904229	5
WPJA275	496441	7904200	1000
WPJA289	496015	7904498	5
WPJA311-316	463075	7913089	200
WPJA38 (DF)	**493273**	**7912892**	**20**

Locations	Zone 52 K		No. of plants (% cover in a 50 metre radius of observation)
	Easting (metres)	Northing (metres)	
***Goodenia crenata* (Priority 3)**			
WPJA381	490560	7907908	100
WPJA81	491412	7903927	1
WPJA81	491412	7903927	50
WPJA82	492799	7902532	100
WPJA82	492799	7902532	100
WPRB58	492444	7905446	25
WPT18	489483	7917632	50
WPVY230	495547	7903893	50
WPVY231	495624	7903844	100
WPVY233	495655	7903697	100
WPVY238	495474	7903927	10
WPVY298	486099	7905111	50
WPVY299	486316	7905118	50
WPVY300	486520	7905094	50
WPVY301	486690	7905157	100
WPVY301	486099	7905111	100
WPVY305	486521	7905594	50
WPVY305	486521	7905594	200
***Trachymene villosa* (Priority 1)**			
WPAS469	495703	7916538	7
WPAS473	495975	7916938	1
WPAS475	485893	7907317	1
WPAS476	485884	7907333	2
WPAS478	485793	7907655	2
WPJA186	493602	7912489	1
WPJA248	495465	7908922	1
WPVY276	489324	7906149	1
WPVY338	461652	7921698	25
	491582	7916217	5
2012 population	491623	7906197	(was 10)

Locations and Estimated Size of Populations of Flora Species of 'Other Conservation Significance') recorded in the Browns Range Study Area (DF = populations within the Development Footprint)

Location	Zone 52 K		No. of plants (% cover in a 50 metre radius of observation)
	Easting (metres)	Northing (metres)	
Brachychiton multicaulis			
	494276	7913238	2
AS395	496084	7916021	1
AS396	496116	7916074	1
AS397	496139	7916021	1
JA83	492100	7908921	1
QBrow 01	491347	7913354	1
QBrow 59	492103	7908957	1
QBrow 5A	492918	7914565	1
QBrow 1	491396	7913364	1
QBrow 10 (DF)	**493994**	**7913056**	**1**
QBrow 101	491709	7902169	1
QBrow 33	494294	7906027	1
QBrow 389	496708	7912628	1
QBrow 398	496138	7916122	1
QBrow 402	495571	7914266	1
QBrow 406	495535	7911160	1
QBrow 51a	493762	7900350	1
QBrow 5A	492966	7914571	1
QBrow 66	492956	7909854	1
QBrow 7	494009	7914239	15
QBrow 57a	494499	7907174	1
WPAS363	495262	7906263	1
WPAS367	494328	7906002	1
WPAS432 (DF)	**493234**	**7913382**	**30**
WPAS471	495846	7916563	1
WPAS472	495900	7916610	20
WPJA145	493527	7913317	7
WPJA146 (DF)	**492137**	**7913337**	**6**
WPJA148	490255	7915410	2
WPJA149	489229	7915900	2
WPJA158	485561	7915817	5
WPJA172	485426	7917155	4
WPJA173	486185	7917263	5
WPJA175	486442	7917262	1
WPJA182	491381	7913372	19
WPJA185	493893	7913382	14

Location	Zone 52 K		No. of plants (% cover in a 50 metre radius of observation)
	Easting (metres)	Northing (metres)	
Brachychiton multicaulis			
WPJA187	495500	7911529	2
WPJA190	493323	7914708	1
WPJA196 (DF)	**493273**	**7912892**	**5**
WPJA200	494597	7912201	2
WPJA267	495853	7904178	2
WPJA288	496320	7904605	1
WPJA78	491751	7904179	1
WPJA88 (DF)	**495501**	**7911513**	**1**
WPT492	458056	7925512	16
WPT98	493580	7914138	1
WPVY229	493839	7900766	15
WPVY248	495823	7915608	15
WPVY249	495681	7915811	10
WPVY250	495571	7915677	5
WPVY251	495556	7915564	5
WPVY277	489524	7906057	20
WPVY278	494631	7911283	10
Corynotheca micrantha* var. *gracilis			
QBrow55	494409	7901737	(1% cover)
QBrowJA212	491634	7906145	(1% cover)
QBrow66	492956	7909854	(1% cover)
BrowVY284	490144	7907246	(1% cover)
QBrow51a	493761	7900350	(1% cover)
QBrowVY273	488842	7905906	(1% cover)
***Cyperus haspan subsp.?juncoides* (High Range Extension)**			
Tag Missing			?
***Euphorbia ?inappendiculata* (Medium Range Extension)**			
VY273	488842	7905906	(1% cover)
276-06	489324	7906149	(1% cover)
WPTJA269	486291	7905624	(1% cover)
WP57RB	493632	7900216	(1% cover)
WPT57JA	492527	7905416	(1% cover)
QBrow 1	491347	7913354	(1% cover)
***Fimbristylis pauciflora* (s. l.) (Medium Range Extension)**			
WP61RB	495974	7916995	
***Gomphrena flaccida* (Medium Range Extension)**			
QBrow 421	489446	7905821	(1% cover)
***Goodenia arachnoidea* (High Range Extension)**			
QBrow 56	493806	7901717	<1% cover
	12	265	Floodplain

Location	Zone 52 K		No. of plants (% cover in a 50 metre radius of observation)
	Easting (metres)	Northing (metres)	
***Goodenia arachnoidea* (High Range Extension)**			
WPJA76	491854	7905458	20
WPJA 75	491841	7905519	20
WPJA 74	491842	7905523	20
WPJA 59	492353	7905526	70
WPJA 67	492110	7905535	4
WPJA 66	492183	7905537	4
WPJA 64	492306	7905539	4
WPJA 69	492072	7905545	5
WPJA 70	492047	7905550	8
WPJA 72	492008	7905556	40
WPJA 73	491934	7905595	50
***Goodenia* ?sp. nov.**			
QBrow100	0491709	7907316	1
Goodenia goodeniacea			
WPJA77	491867.3	7905369	20
***Polymeria lanata* (s. l.) (High Range Extension)**			
QBrow 7	494009	7914239	(1% cover)
QBrow 30	494510	7908626	(1% cover)
QBrow 32	493486	7906935	(1% cover)
Sesbania muelleri			
QBrow24	491339	7910221	5 (<1% cover)
QBrow56	493806	7901717	60 (1% cover)
***Stemodia* sp. Tanami (P. K. Latz 8218)**			
WPJA317 (DF)	**462623**	**7913922**	**2**
Brow46b	491923	7902677	2
Brow46a	491913	7902725	4
WPVY236	495487	7903911	2
WPVY237	495478	7903916	10
***Swainsona ?formosa* (Medium Range Extension)**			
QBrow 65 (2012)	492241	7907158	1
***Vigna vexillata* var. *angustifolia* (High Range Extension)**			
QBrow46a (2012)	495662	7903746	1
***Whiteochloa airoides* (Medium Range Extension**			
QBrow49	491656	7902178	(<1% cover)

APPENDIX F

FloraBase Range Extension Species – Assessment against Range Extension Criteria using ALA database

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
Cyperus haspan subsp. ?juncoides			*X*		*Subsp not in ALA*							X		High
Eleocharis ochrostachys			*X*		*154*							X		High
Euphorbia armstrongiana var. ?distans				*X*	*23*							X		High
Goodenia arachnoidea			*X*		*56*							X		High
Polymeria lanata (s. l.)			*X*		*51*							X		High
Sesbania muelleri					*5*				X				X	High
Vigna vexillata var. *angustifolia*			*X*		*397*							X		High
Acacia gonocarpa (Wuluru)		*X*			*1109*				X		X			Low
Acacia hammondii			*X*		*816*				X	X				Low
Acacia hemsleyi		*X*			*340*				X		X			Low
Acacia jennerae		*X*			*364*		X	X	X		X			Low
Acacia sabulosa			*X*		*93*			X	X			X		Low
Acacia thomsonii	*X*				*176*		X		X	X				Low
Carissa lanceolata (Conkerberry) (Also known as C. spinarum - ALA)		*X*			*3788*		X	X	X		X			Low
Eleocharis brassii			*X*		*94*				X		X			Low
Euphorbia ?maconochieana		*X*			*120*		X		X	X				Low
Euphorbia schultzii var. *comans*			*X*		*22*			X	X		X			Low
Fimbristylis littoralis		*X*			*641*		X		X		X			Low
Fimbristylis tetragona		*X*			*517*			X	X		X			Low

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
Grevillea pyramidalis subsp. *pyramidalis* Caustic Bush			X		91		X	X	X	X				Low
Heliotropium sp. Ord River (W. Fitzgerald 1611)		X			12				X		X			Low
Nomismia rhomboidea		X			82		X		X	X	X			Low
Sclerolaena glabra				X	388		X	X	X		X			Low
Solanum cunninghamii			X		121			X	X			X		Low
Tephrosia sp. Pentecost River (I.D. Cowie 4168)	X				291			X	X	X				Low
Tephrosia stipuligera	X				64		X		X	X				Low
Vigna lanceolata var *filiformis* (Maloga Vigna)			X		602		X	X	X		X			Low
Euphorbia ?inappendiculata		X			52				X			X		Medium
Exocarpos latifolius Broad-leaved Cherry			X		2580				X		X			Medium
Heliotropium uniflorum		X			44				X			X		Medium
Whiteochloa airoides		X			629				X		X			Medium
Corynotheca micrantha var. *gracilis*			X		27				X			X		Medium
Fimbristylis pauciflora (s. l.)			X		932				X		X			Medium
Gomphrena flaccida (Gomphrena Weed)			X		803				X			X		Medium
Swainsona ?formosa			X		589				X			X		Medium

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
**Malvastrum americanum (Spiked Malvastrum)*		X			2400	X	X	X	X	X				No Extension
Abutilon otocarpum	X				2157	X	X	X	X	X				No Extension
Acacia ampliceps	X				391	X	X	X	X	X				No Extension
Acacia cowleana (Halls Creek Wattle)	X				796	X	X	X	X	X				No Extension
Acacia drepanocarpa subsp. *latifolia*	X				163	X	X	X	X	X				No Extension
Acacia elachantha	X				615	X	X	X	X	X				No Extension
Acacia gonoclada		X			471	X	X	X	X	X				No Extension
Acacia lysiphloia	X				1329	X	X	X	X	X				No Extension
*Achyranthes aspera (*Chaff Flower)		X			1398	X	X	X	X	X				No Extension
*Alternanthera nana (*Hairy Joyweed)		X			939	X	X	X	X	X				No Extension
Ammannia baccifera		X			282	X	X	X	X		X			No Extension
Androcalva loxophylla			X		151	X	X	X	X	X				No Extension
Aristida hygrometrica (Northern Kerosene Grass)	X				1063	X	X	X	X	X				No Extension
Aristida inaequiglumis (Feathertop Threeawn)	X				1425	X	X	X	X	X				No Extension
Atalaya hemiglauca Whitewood	X				3588	X	X	X	X	X				No Extension

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
Boerhavia burbidgeana		X			260	X	X	X	X		X			No Extension
Boerhavia paludosa	X				418	X	X	X	X	X				No Extension
Bonamia pannosa	X				918	X	X	X	X	X				No Extension
Brachychiton multicaulis	X				112	X	X	X	X	X				No Extension
Buchnera ramosissima (Blackrod)		X			264	X	X	X	X	X				No Extension
Byblis rorida			X		36	X	X	X	X	X				No Extension
Cajanus marmoratus		X			635	X	X	X	X	X				No Extension
Cassytha filiformis (Love Vine)		X			2431	X	X	X	X	X				No Extension
Centipeda minima subsp. *macrocephala* Spreading Sneezewood		X			145	X	X	X	X	X				No Extension
Centipeda minima subsp. *minima*			X		1161	X	X	X	X	X				No Extension
Chrysopogon fallax (Golden Beard Grass)		X			4895	X	X	X	X	X				No Extension
Corchorus pumilio		X			274	X	X	X	X	X				No Extension
Corchorus sidoides subsp. *sidoides*		X			441	X	X	X	X	X				No Extension
Corymbia dichromophloia		X			2638	X	X	X	X	X				No Extension
Cucumis maderaspatanus		X			1365	X	X	X	X	X				No Extension
Cymbopogon obtectus (Silkyheads)	X				1452	X	X	X	X	X				No Extension
Cyperus cunninghamii subsp.	X				147	X	X	X	X	X				No Extension

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
cunninghamii														
Cyperus pulchellus		X			774	X	X	X	X	X				No Extension
Desmodium filiforme		X			703	X	X	X	X	X				No Extension
Dodonaea hispidula var. *arida*		X			90	X	X	X	X	X				No Extension
Dodonaea lanceolata var. *lanceolata*		X			508	X	X	X	X	X				No Extension
Dolichandrone heterophylla (Lemonwood)	X				828	X	X	X	X	X				No Extension
Eragrostis exigua		X			299	X	X	X	X	X				No Extension
Eragrostis olida		X			187	X	X	X	X	X				No Extension
Eragrostis tenellula (Delicate Lovegrass)		X			1360	X	X	X	X	X				No Extension
Eriachne ciliata (Slender Wandarrie Grass)		X			2691	X	X	X	X	X				No Extension
Eriachne mucronata (s. l.) (Mountain Wanderrie Grass)		X			2648	X	X	X	X	X				No Extension
Eucalyptus chlorophylla	X				898	X	X	X	X	X				No Extension
Eucalyptus pruinosa subsp. *pruinosa* (Silver Box)		X			386	X	X	X	X	X				No Extension
Eucalyptus pruinosa subsp. *tenuata (Silver Box)*			X		229	X	X	X	X	X				No Extension

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
Euphorbia drummondii (Caustic Weed)		X			8826	X	X	X	X	X				No Extension
Evolvulus alsinoides var. *decumbens*		X			1120	X	X	X	X	X				No Extension
Fimbristylis dichotoma (Eight Day Grass)		X			5345	X	X	X	X	X				No Extension
Fimbristylis microcarya		X			736	X	X	X	X	X				No Extension
Glycine tomentella (s. l.) (Woolly Glycine)		X			2559	X	X	X	X	X				No Extension
Gomphrena lanata	X				525	X	X	X	X	X				No Extension
Gomphrena occulta		X			15	X	X	X	X	X				No Extension
Goodenia triodiophila		X			520	X	X	X	X	X				No Extension
Hakea arborescens Common Hakea	X				2383	X	X	X	X	X				No Extension
Hakea chordophylla		X			378	X	X	X	X	X				No Extension
Hakea lorea subsp. *lorea* Witinti			X		1585	X	X	X	X	X				No Extension
Hibiscus sturtii var. *campylochlamys*			X		254	X	X	X	X	X				No Extension
Hypericum gramineum (Small St John's Wort)		X			9851	X	X	X	X	X				No Extension
Indigofera ?georgei (sterile material) (Bovine Indigo)			X		500	X	X	X	X	X				No Extension
Indigofera haplophylla		X			373	X	X	X	X	X				No Extension
Indigofera hirsuta		X			1112	X	X	X	X	X				No

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
(Hairy Indigo)														Extension
Indigofera linnaei (Birdsville Indigo)	X				1337	X	X	X	X	X				No Extension
Ipomoea coptica		X			480	X	X	X	X	X				No Extension
Leptochloa fusca subsp. *fusca*			X		834	X	X	X	X	X				No Extension
Leptosema anomalum			X		150	X	X	X	X	X				No Extension
Lipocarpha microcephala		X			1109	X	X	X	X	X				No Extension
Marsdenia angustata	X				180	X	X	X	X	X				No Extension
Microstachys chamaelea		X			1622	X	X	X	X	X				No Extension
Oldenlandia spermacocoides		X			157	X	X	X	X	X				No Extension
Panicum decompositum (Native Millet)		X			2826	X	X	X	X	X				No Extension
Paraneurachne muelleri (Northern Mulga Grass)		X			854	X	X	X	X	X				No Extension
Paspalidium rarum (Rare Paspalidium)		X			911	X	X	X	X	X				No Extension
Polycarpaea corymbosa		X			1785	X	X	X	X	X				No Extension
Rhynchosia minima	X				2158	X	X	X	X	X				No Extension
Rutidosis helichrysoides subsp. *helichrysoides*			X		832	X	X	X	X	X				No Extension
Sauropus trachyspermus		X			1182	X	X	X	X	X				No Extension
Sauropus trachyspermus (s. l.)		X			1182	X	X	X	X	X				No Extension

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
Schizachyrium fragile (Senale Redgrass)		X			3671	X	X	X	X	X				No Extension
Senna artemisioides subsp. *helmsii*			X		1706	X	X	X	X	X				No Extension
Senna costata			X		227	X	X	X	X	X				No Extension
Senna venusta	X				592	X	X	X	X	X				No Extension
Setaria surgens (Pigeon Grass)	X				799	X	X	X	X	X				No Extension
Sida arenicola	X				139	X	X	X	X	X				No Extension
Spermacoce hillii		X			203	X	X	X	X	X				No Extension
Stackhousia intermedia (s.l.)		X			1467	X	X	X	X	X				No Extension
Stemodia lythrifolia (Bunu Bunu)		X			1111	X	X	X	X	X				No Extension
Streptoglossa adscendens		X			811	X	X	X	X	X				No Extension
Tephrosia leptoclada		X			1018	X	X	X	X		X			No Extension
Tephrosia simplicifolia	X				259	X	X	X	X	X				No Extension
Tephrosia stuartii		X			146	X	X	X	X	X				No extension
Tephrosia supina	X				855	X	X	X	X	X				No Extension
Tephrosia virens		X			418	X	X	X	X	X				No Extension
Themeda avenacea (Native Oatgrass)			X		731	X	X	X	X	X				No Extension
Themeda triandra		X			22469	X	X	X	X	X				No Extension
Tinospora smilacina (Snakevine)	X				2024	X	X	X	X	X				No Extension

Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
Trianthema oxycalyptra var. oxycalyptra	X				129	X	X	X	X	X				No Extension
Trichodesma zeylanicum var. *zeylanicum* (Camel Bush)		X			1703	X	X	X	X	X				No Extension
Triodia aff. *epactia (Triodia epactia)*		X			415	X	X	X	X	X				No Extension
Velleia panduriformis (Cabbage Poison)			X		154	X	X	X	X	X				No Extension
Ventilago viminalis (Supplejack)	X				1364	X	X	X	X	X				No Extension
Yakirra australiensis var. *australiensis*			X		319	X	X	X	X	X				No Extension
Zornia chaetophora			X		111	X	X	X	X	X				No Extension
Acacia aneura (Mulga)		X			9093		X	X	X	X				Very Low
Acacia retivenea subsp. *retivenea*		X			393		X	X	X	X				Very Low
Acrachne racemosa		X			110		X	X	X		X			Very Low
Adansonia gregorii (Boab)		X			320		X	X	X	X				Very Low
Aristida pruinosa (Gulf Feathertop Wiregrass)	X				645		X	X	X	X				Very Low
Atriplex vesicaria (Bladder Saltbush)			X		7270		X	X	X	X				Very Low
Bauhinia cunninghamii		X			1873		X	X	X	X				Very Low
Bonamia alatisemina			X		31	X	X	X	X		X			Very Low
Buchnera linearis (Blackrod)		X			1627	X	X	X	X		X			Very Low
Cenchrus setiger (Birdwood Grass)		X			254	X	X	X	X		X			Very Low

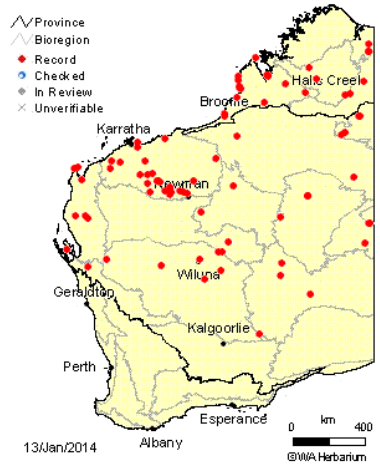
Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
Chamaecrista absus			X		599		X	X	X	X				Very Low
Codonocarpus cotinifolius (Native Poplar)			X		1269		X	X	X		X			Very Low
Crotalaria brevis			X		1007		X	X	X		X			Very Low
Crotalaria cunninghamii (Green Birdflower)	X				982	X	X	X	X		X			Very Low
Ehretia saligna (False Cedar)			X		673		X	X	X	X				Very Low
Euphorbia wheeleri			X		467	X	X	X	X		X			Very Low
Fimbristylis nuda		X			188		X	X	X	X				Very Low
Galactia tenuiflora			X		1939		X	X	X	X				Very Low
Goodenia azurea subsp. *azurea*	X				108		X	X	X	X				Very Low
Goodenia goodeniacea	Not recorded in WA				85		X	X	X	X				Very Low
Goodenia vilmoriniae			X		335		X	X	X	X				Very Low
Polygala isingii			X		190		X	X	X		X			Very Low
Scaevola laciniata	X				141		X	X	X	X				Very Low
Scaevola spinescens (Currant Bush)			X		3529		X	X	X	X				Very Low
Schizachyrium pseudeulalia		X			441	X	X	X	X		X			Very Low
Stylosanthes hamata (Verano Stylo)		X			467	X	X	X	X		X			Very Low
Templetonia hookeri		X			730		X	X	X	X				Very Low
Tephrosia rosea var. *rosea*		X			148	X	X	X	X		X			Very Low

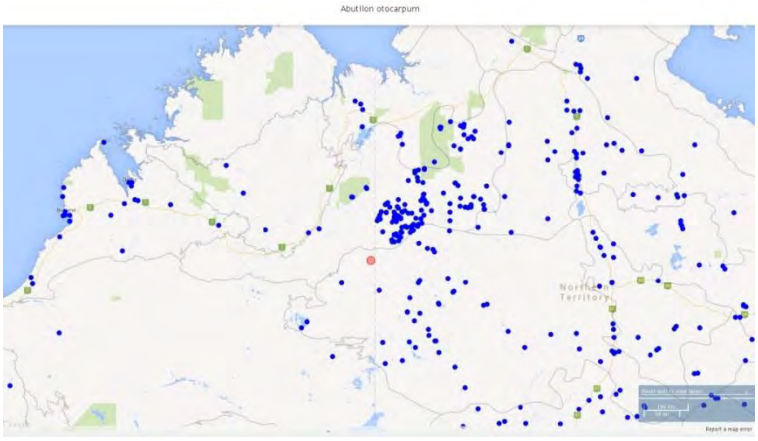
Genus species (Common name)	Approx. distance to nearest record (FB)				Atlas of Living Australia					Approx. distance to nearest record (ALA)				Extension rating
	>100km	100-200km	200-500km	500km+	# Records	Within existing distribution	Contiguous distribution	Present in Tan bioregion	Present in OVP and/or GSD	>100km	100-200km	200-500km	500km+	
Tripogon loliiformis (Five Minute Grass)		X			3848	X	X	X	X		X			Very Low
Wahlenbergia queenslandica		X			419	X	X	X	X		X			Very Low
Zornia muelleriana subsp. *congesta*			*X*		*61*		X	X	X		X			Very Low
Euphorbia cinerea (*in ALA synonym for *E. drummondii)*		*X*			*Not in ALA**									

APPENDIX G

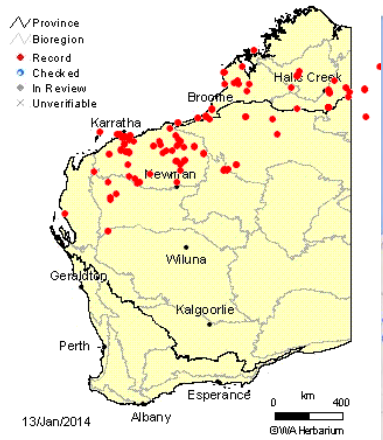
Range Extension Species - Comparison of FloraBase and Atlas of Living Australia Mapping

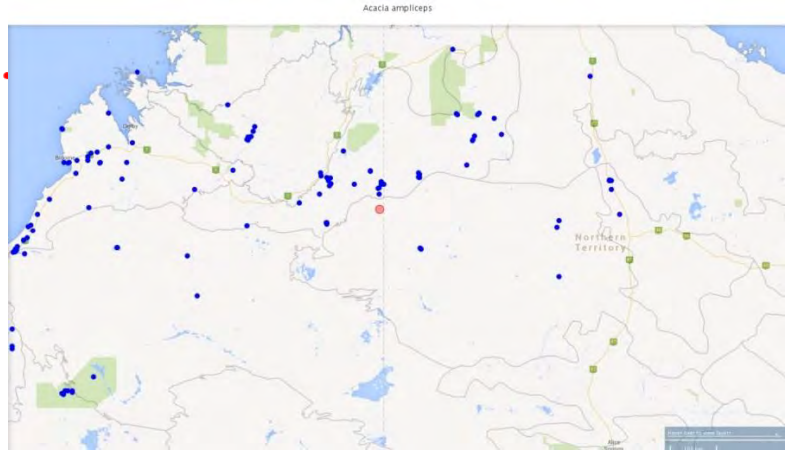
Abutilon otocarpum



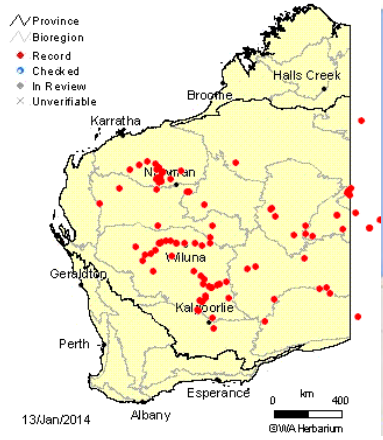


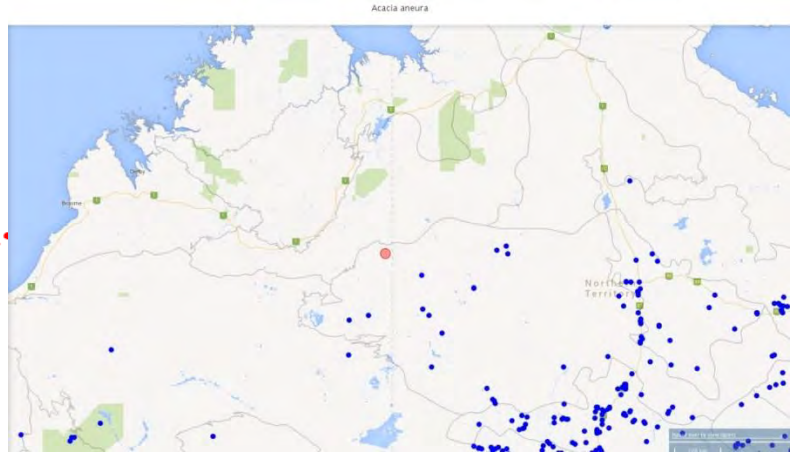
Acacia ampliceps



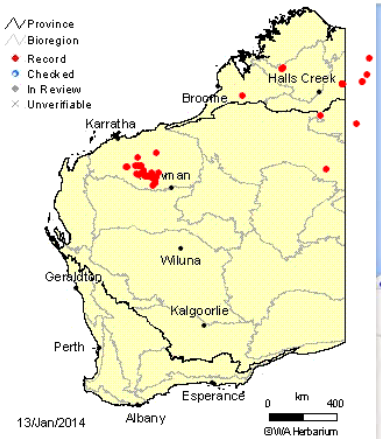


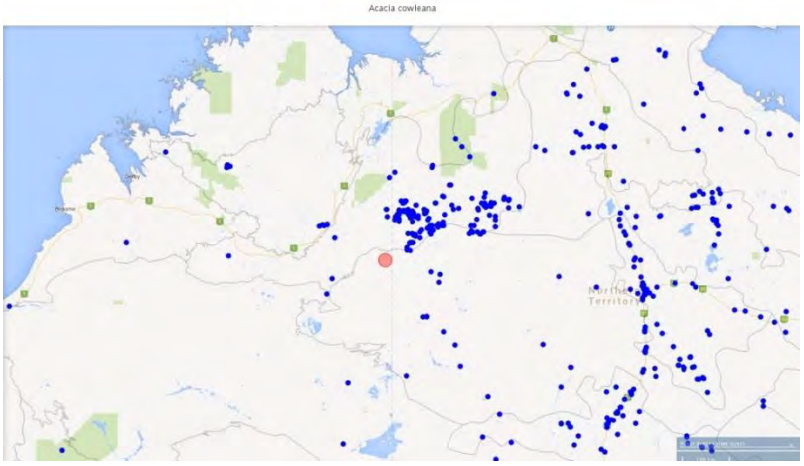
Acacia aneura



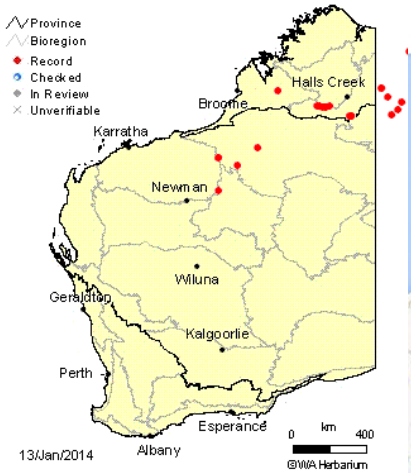


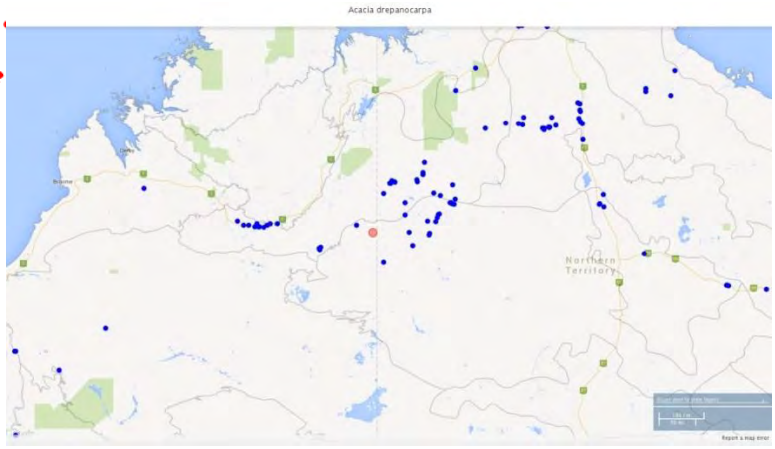
Acacia cowleana



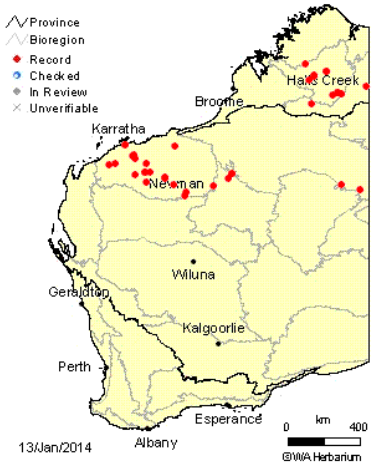


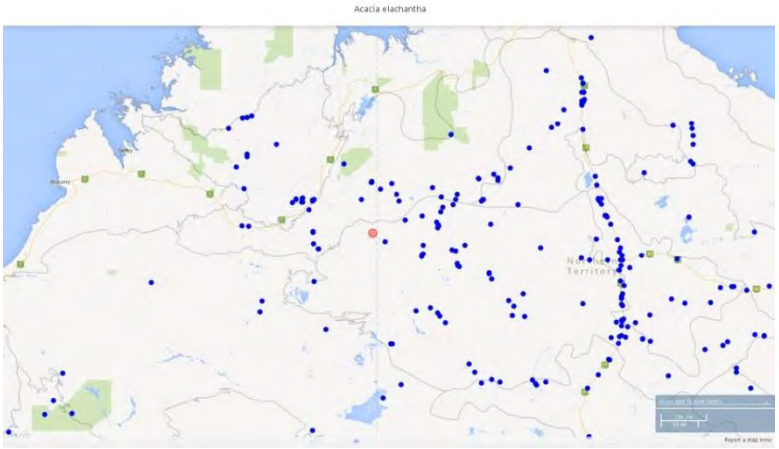
Acacia drepanocarpa subsp. *latifolia*



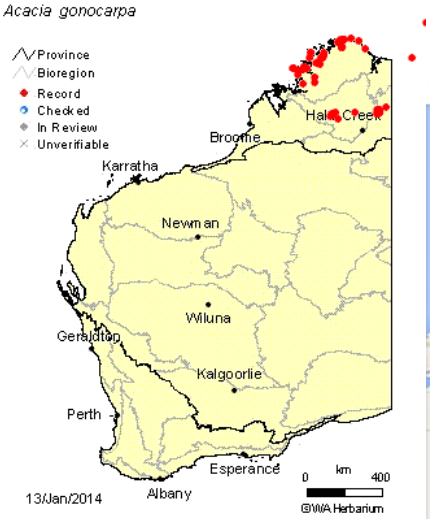


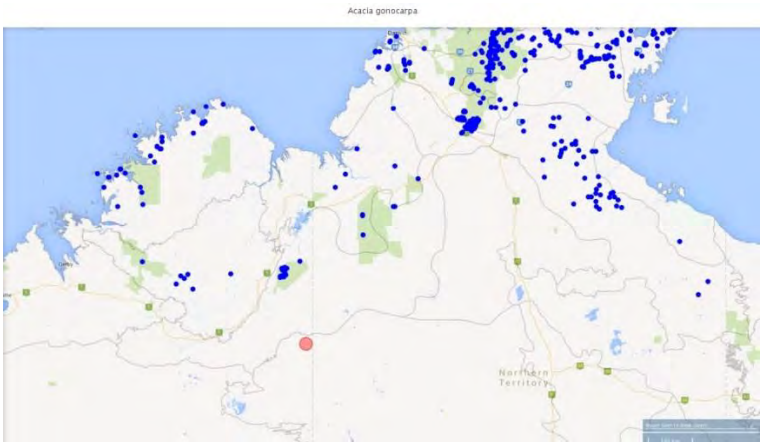
Acacia elachantha



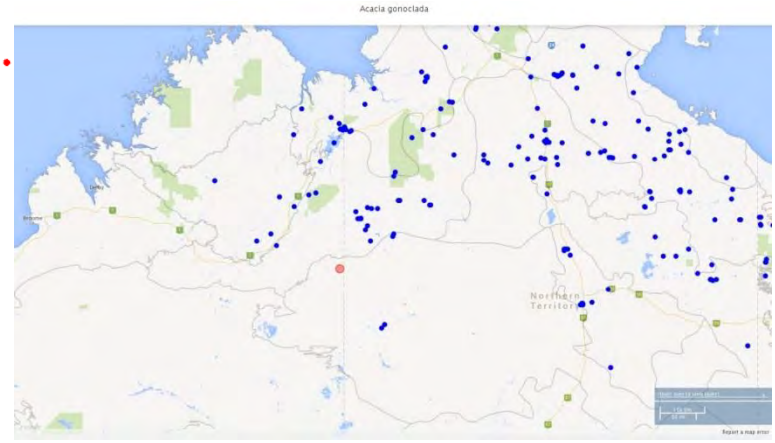


Acacia gonocarpa

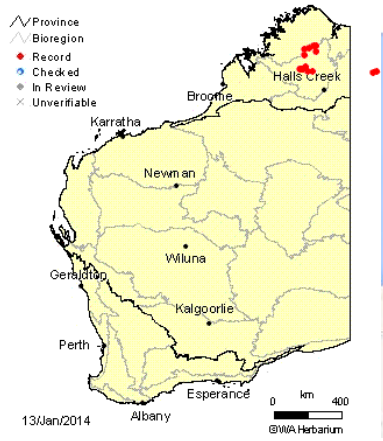


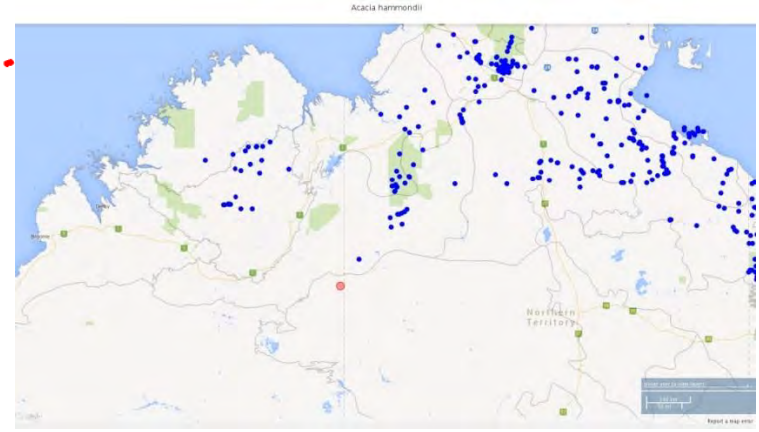


Acacia gonoclada

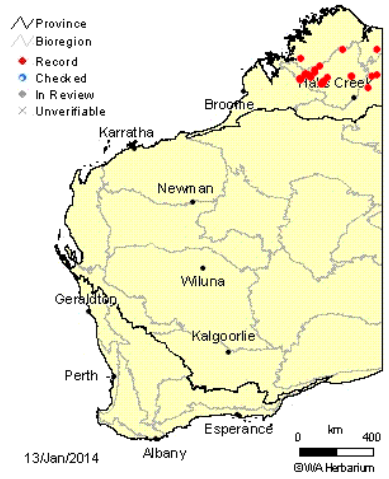


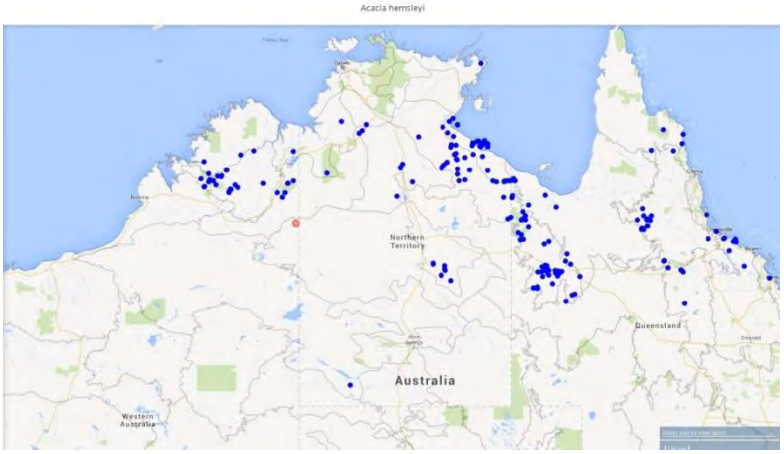
Acacia hammondii



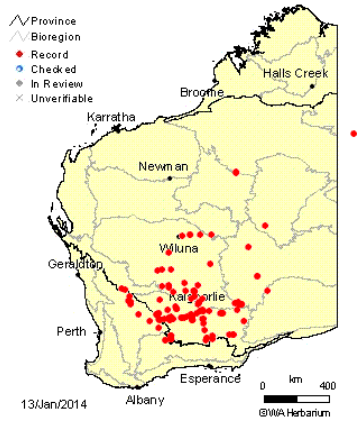


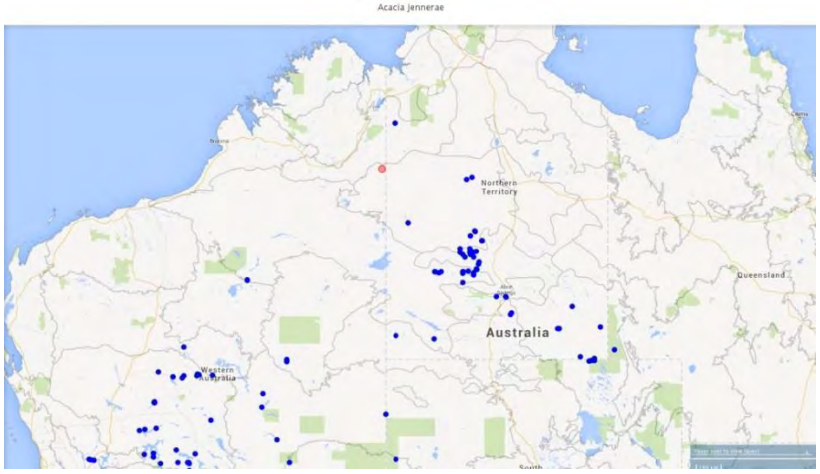
Acacia hemsleyi



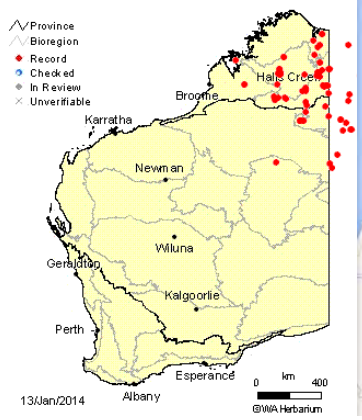


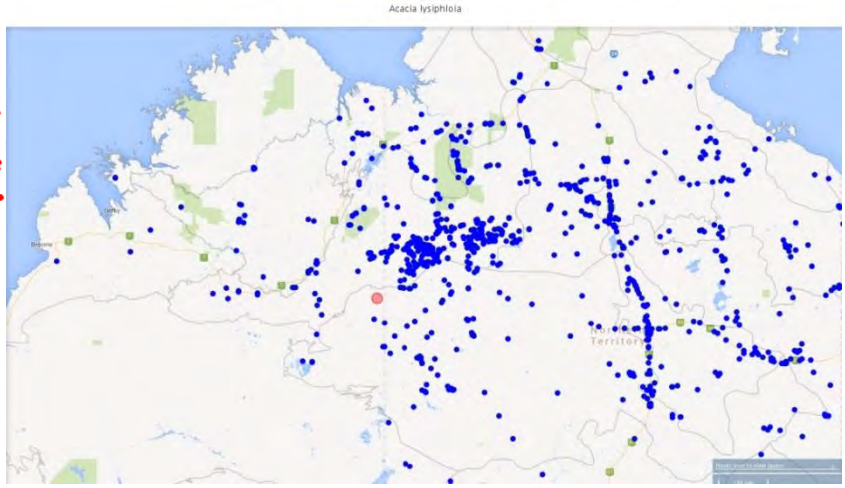
Acacia jennerae



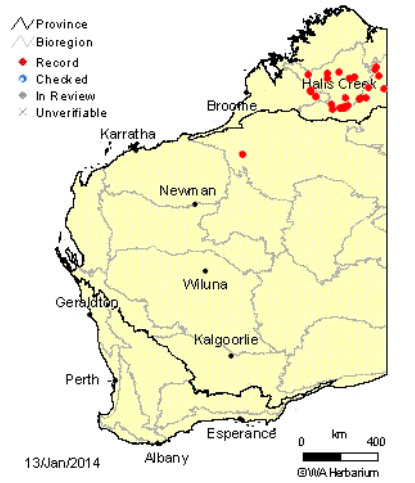


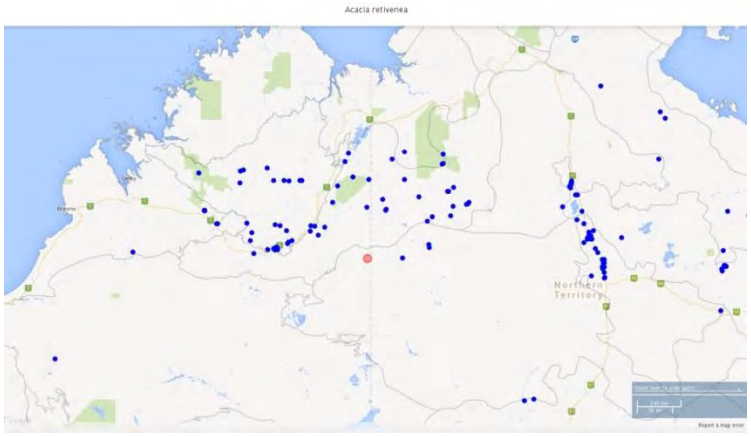
Acacia lysiphloia



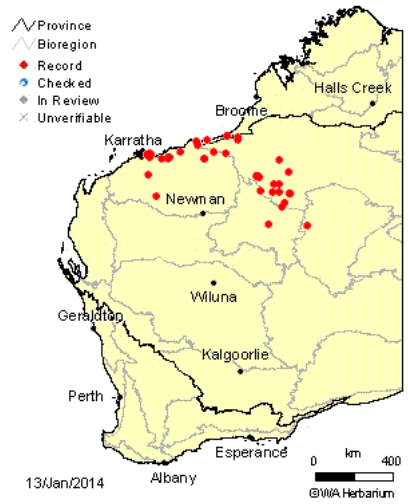


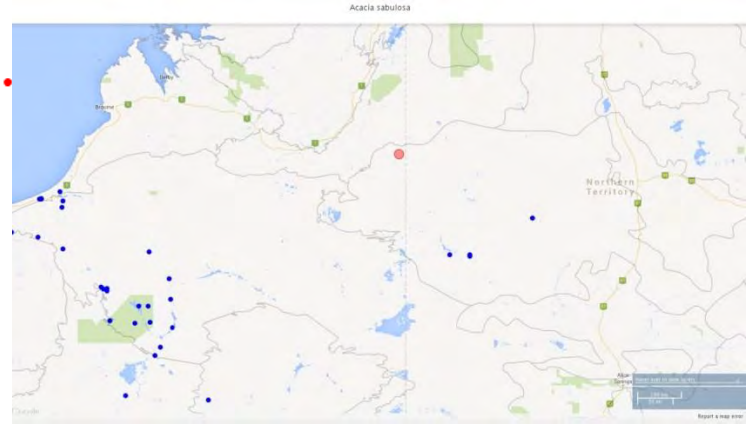
Acacia retivenea subsp. *retivenea*



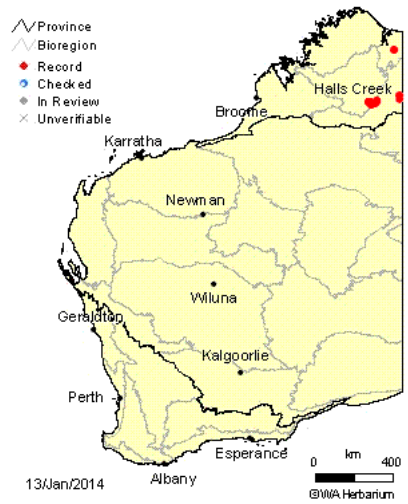


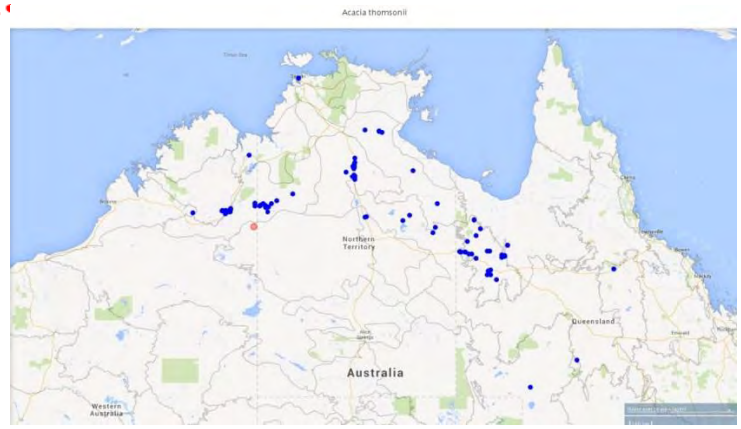
Acacia sabulosa



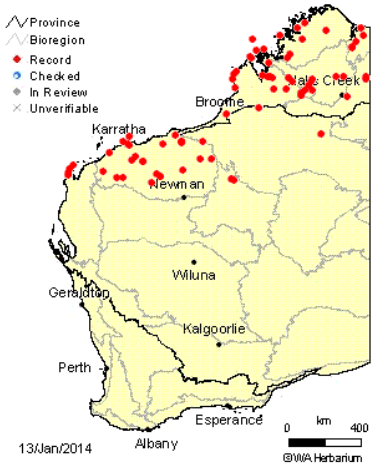


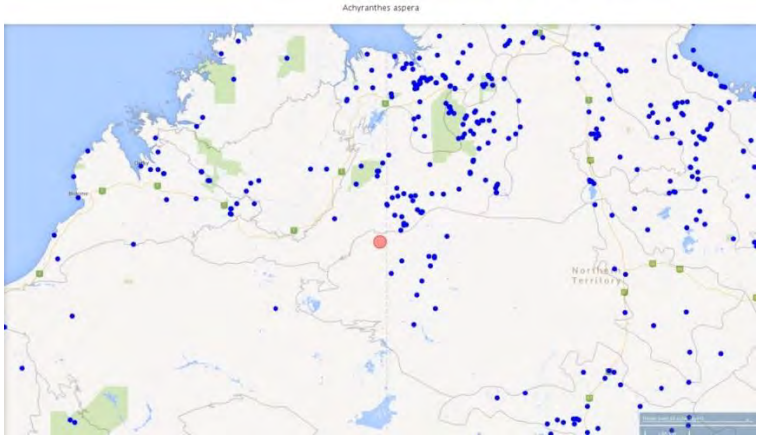
Acacia thomsonii



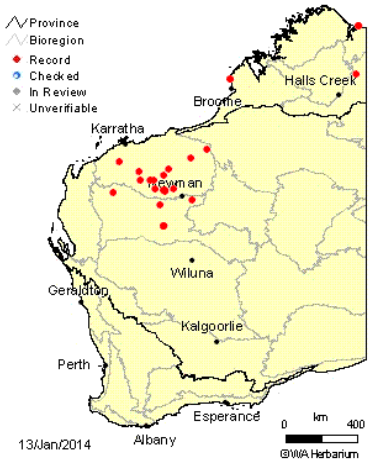


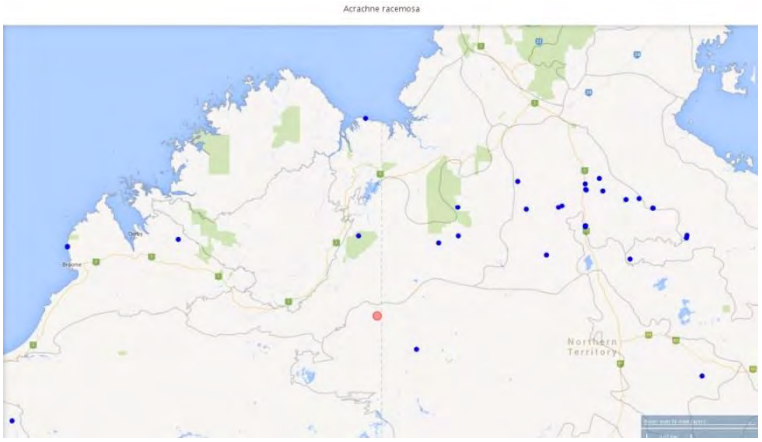
Achyranthes aspera



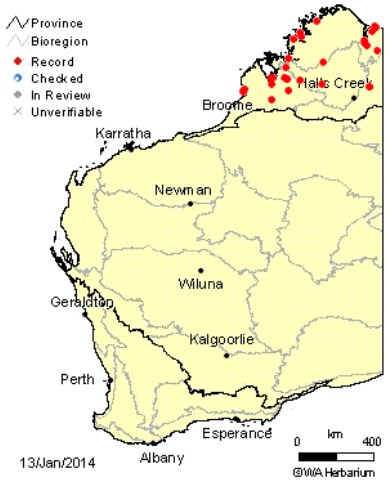


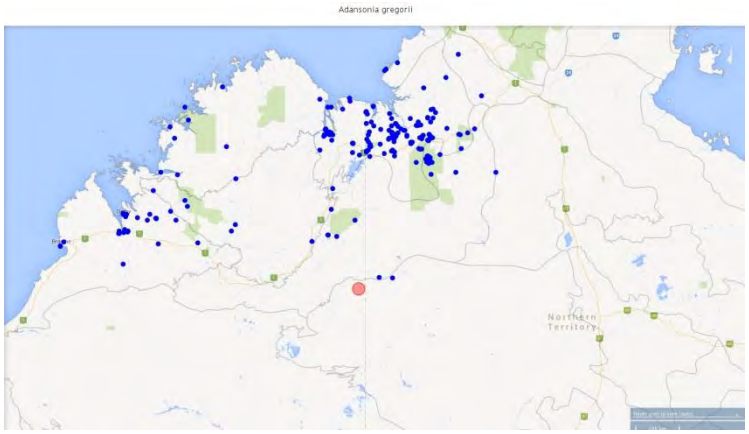
Acrachne racemosa



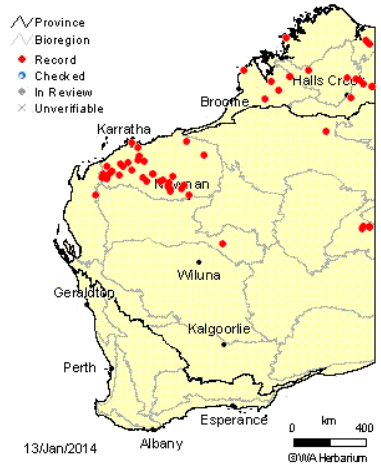


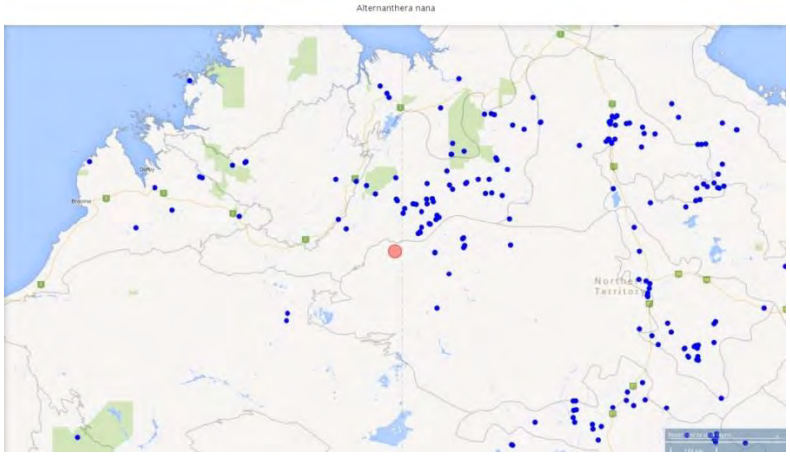
Adansonia gregorii



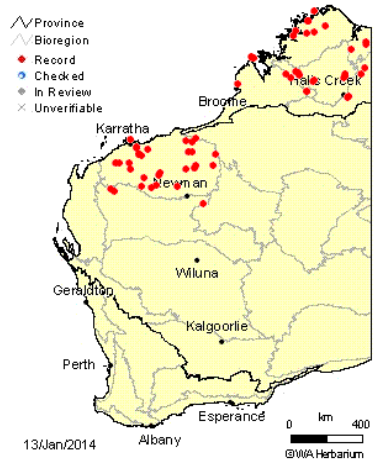


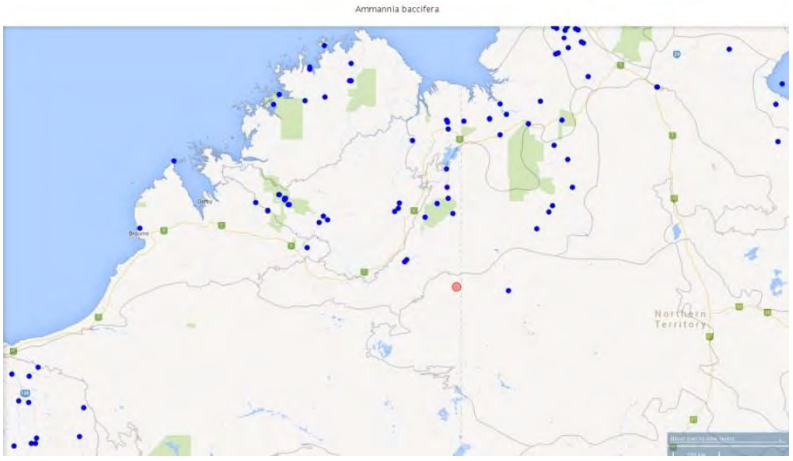
Alternanthera nana



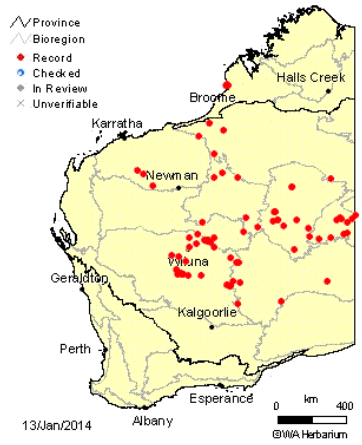


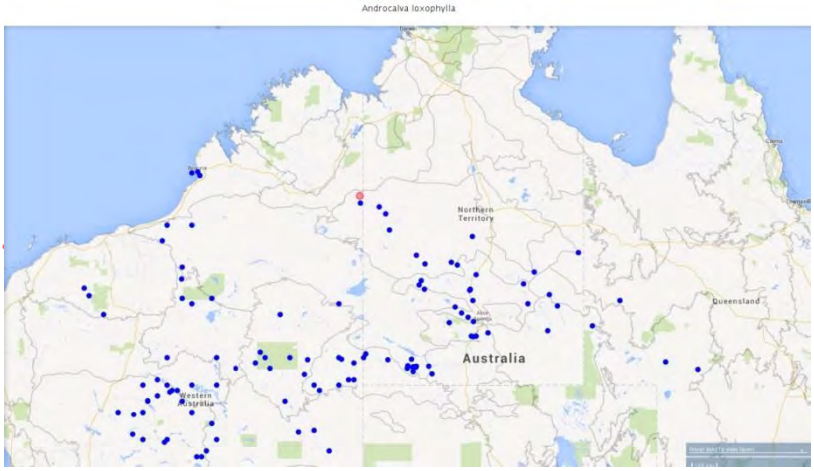
Ammannia baccifera



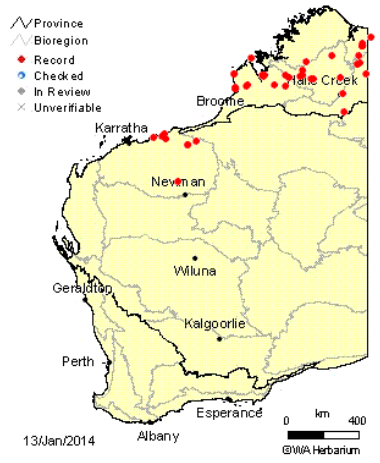


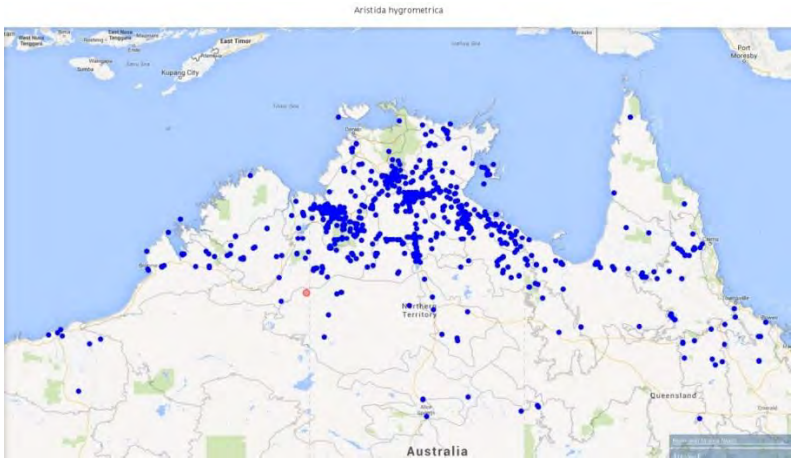
Androcalva loxophylla



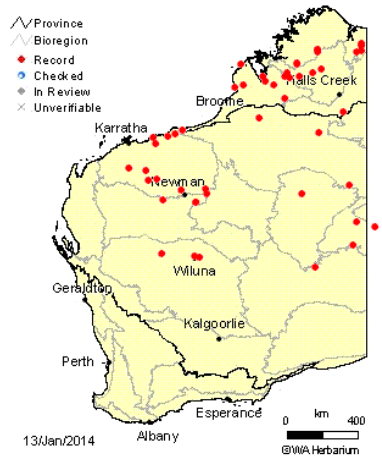


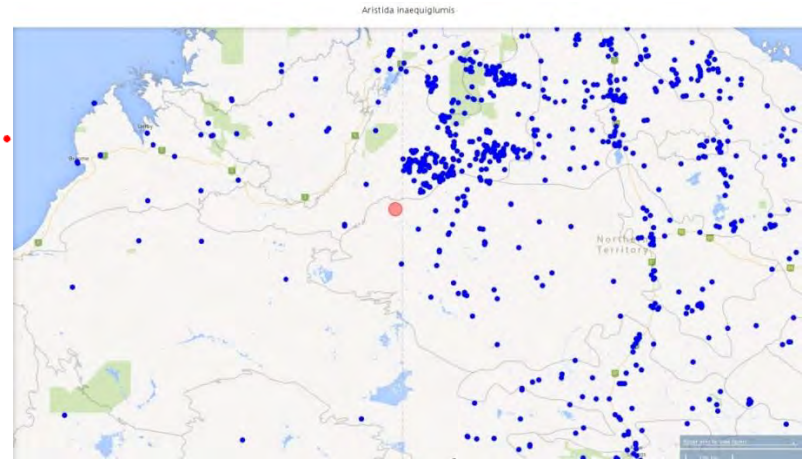
Aristida hygrometrica



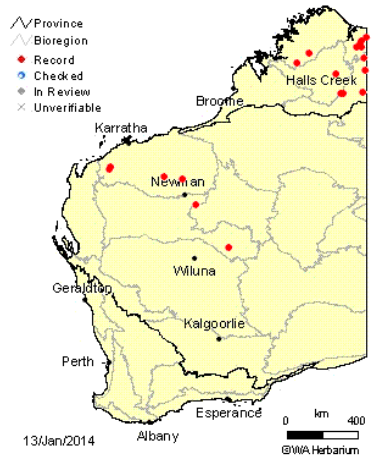


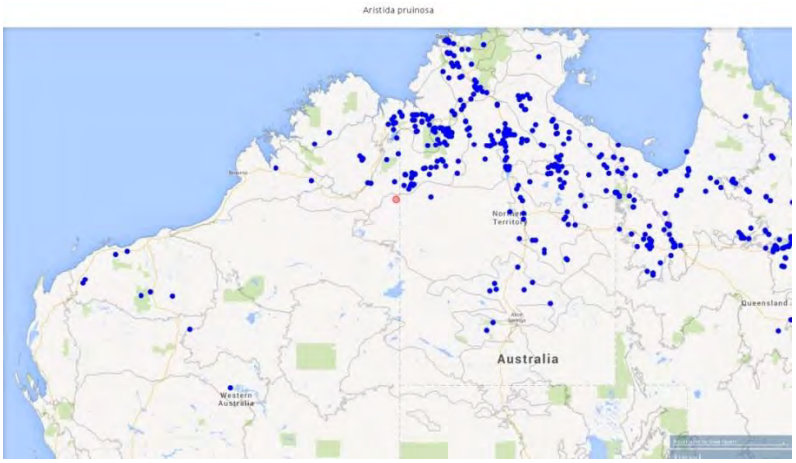
Aristida inaequiglumis



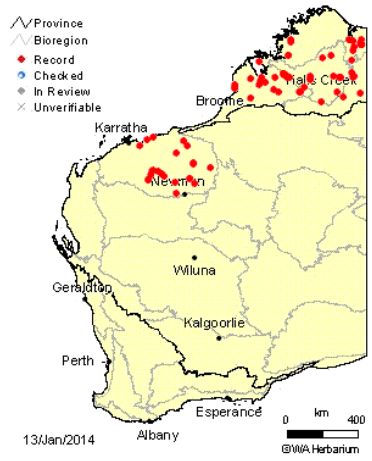


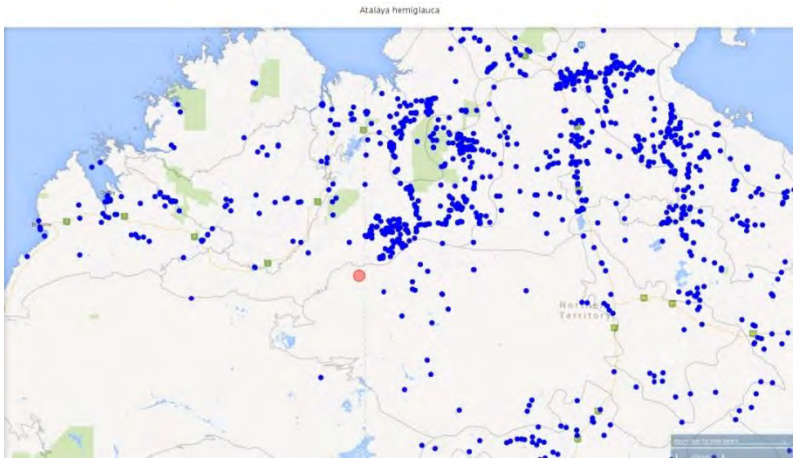
Aristida pruinosa



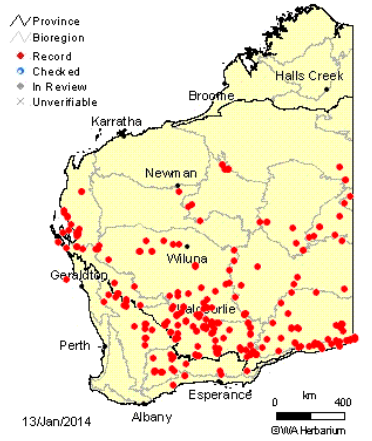


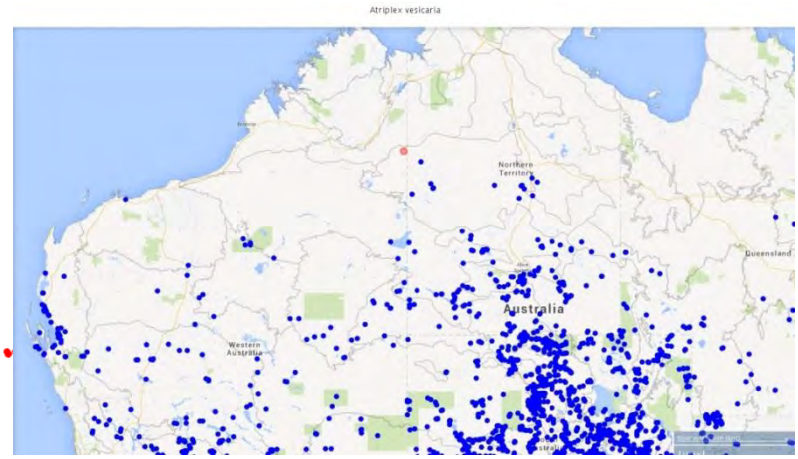
Atalaya hemiglauca



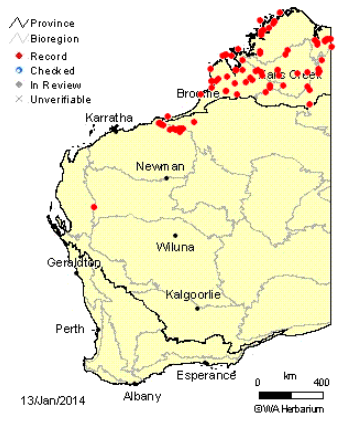


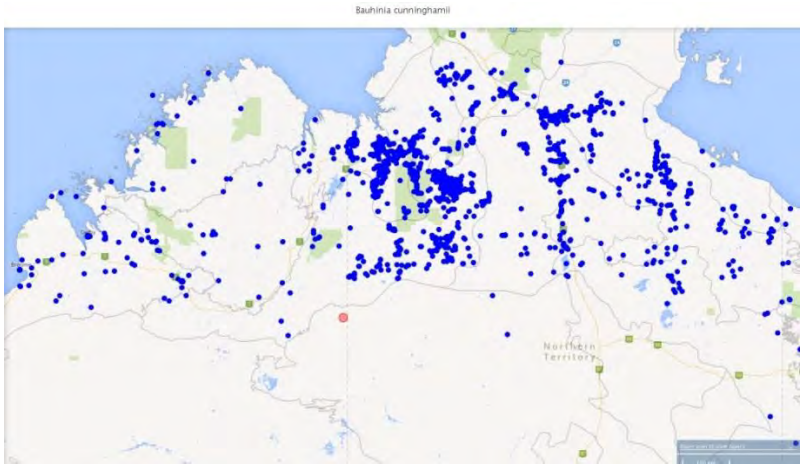
Atriplex vesicaria



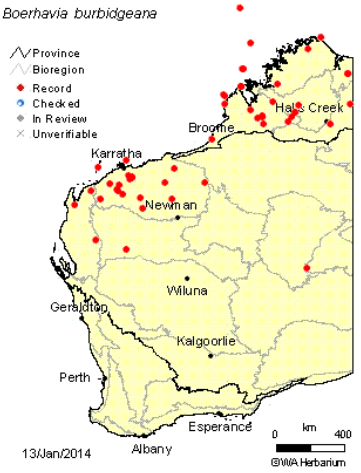


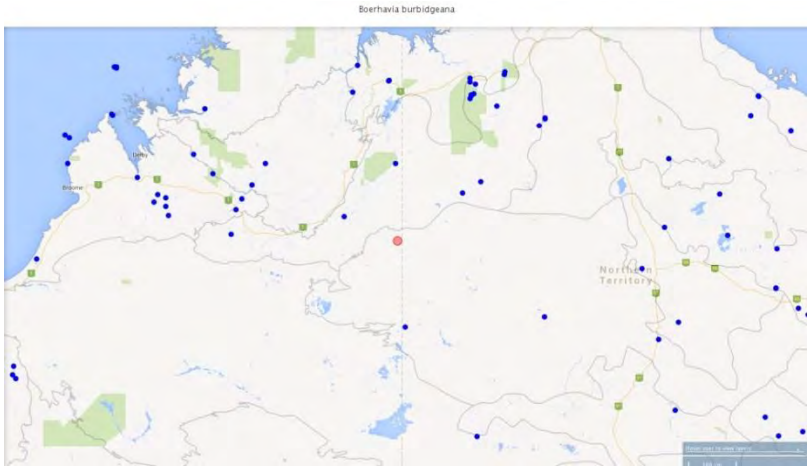
Bauhinia cunninghamii



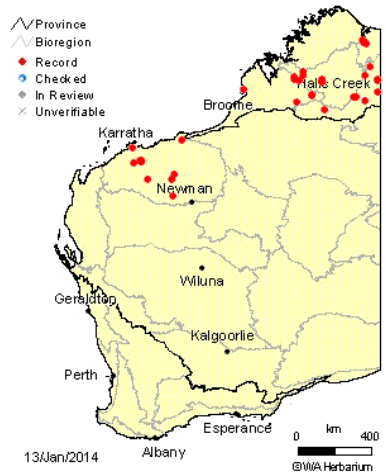


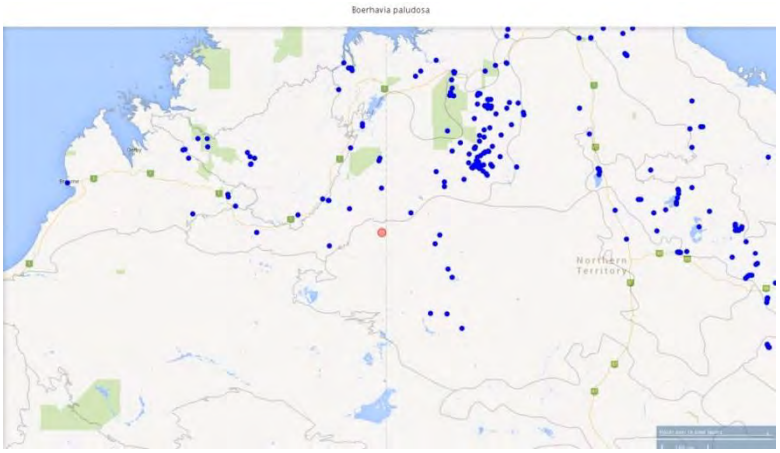
Boerhavia burbidgeana



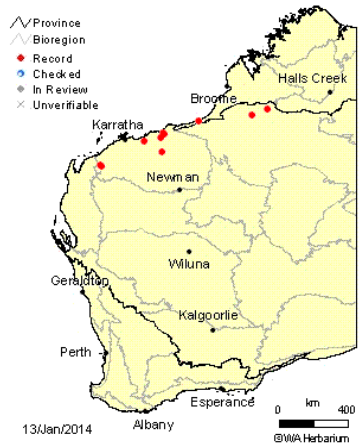


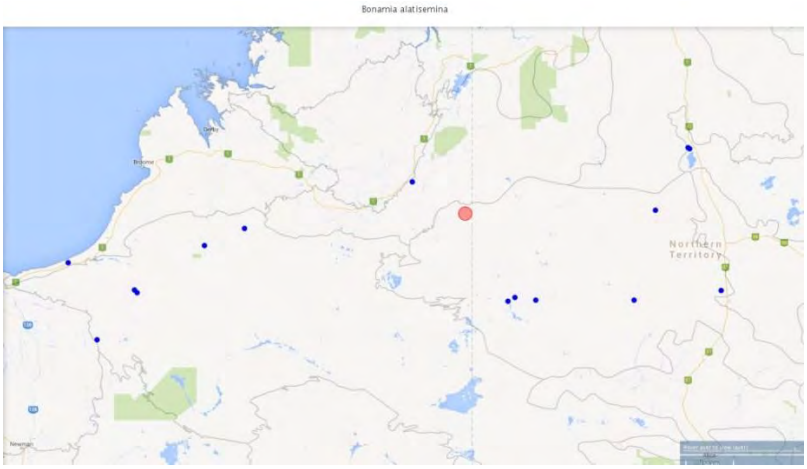
Boerhavia paludosa



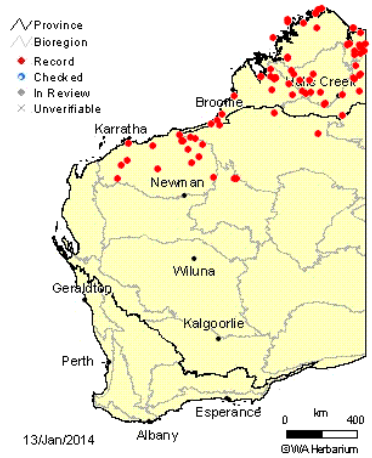


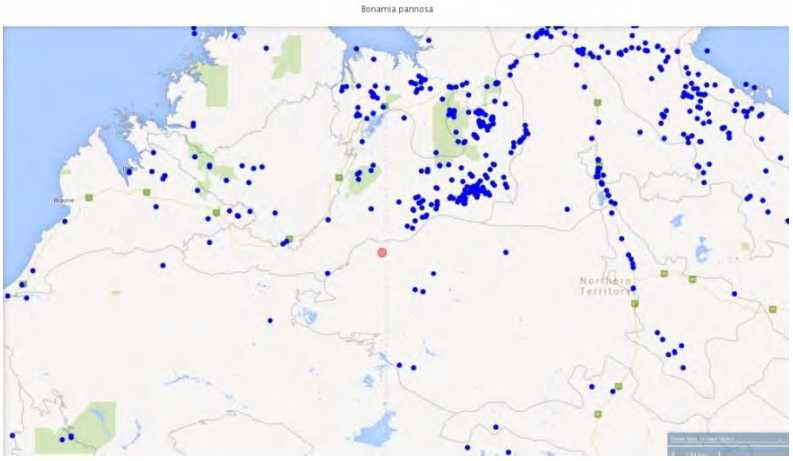
Bonamia alatisemina



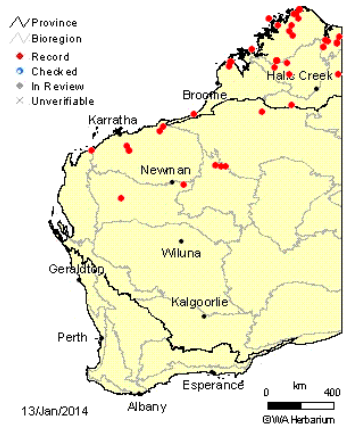


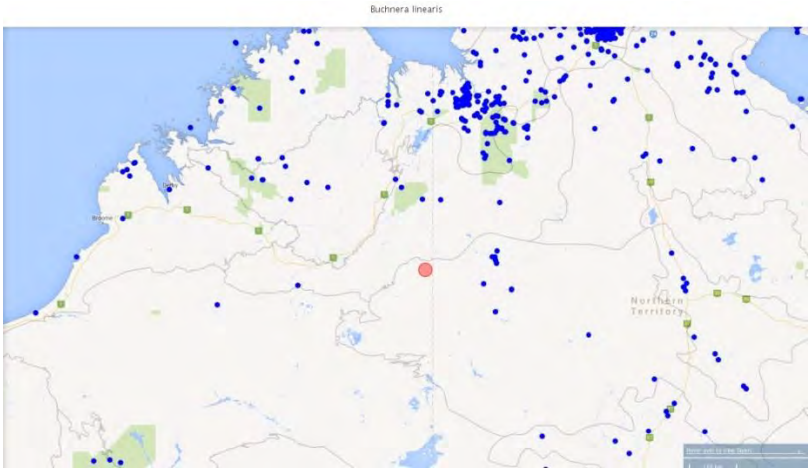
Bonamia pannosa



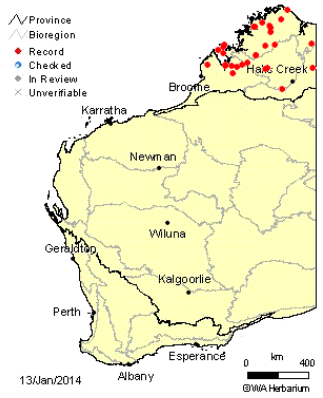


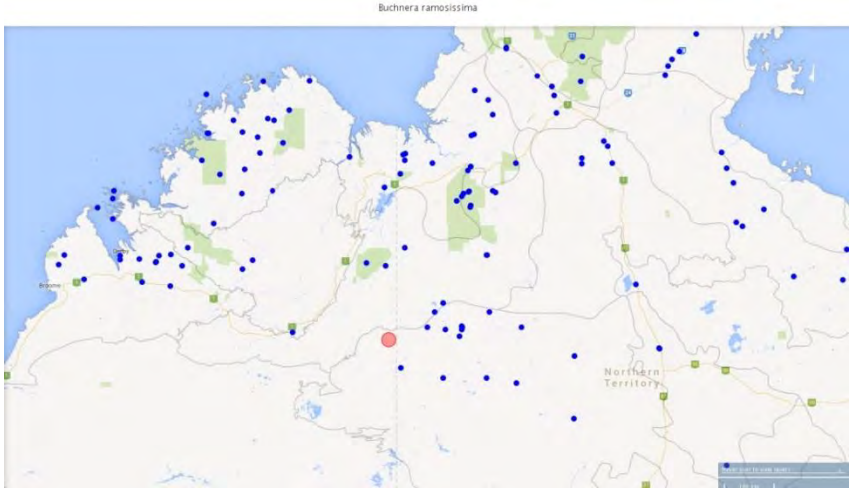
Buchnera linearis



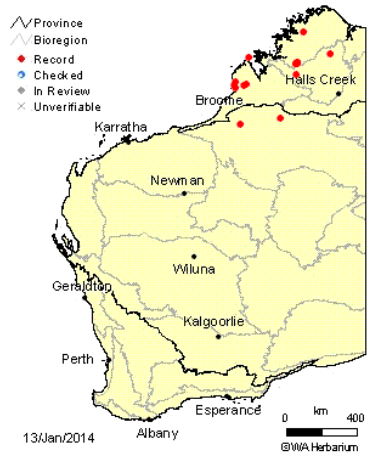


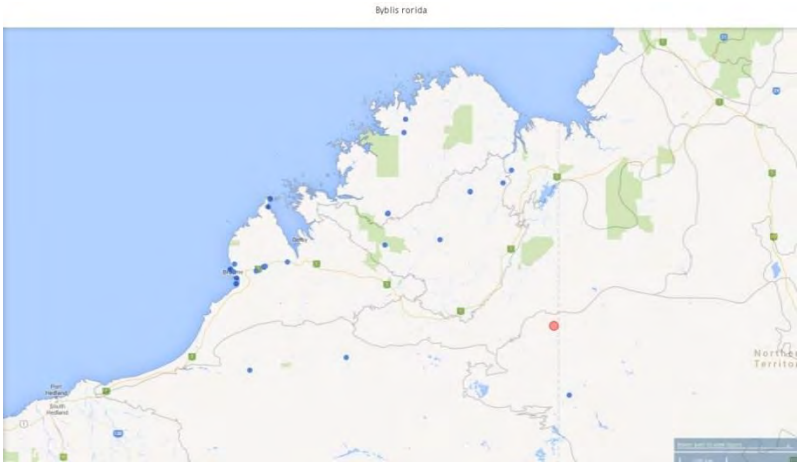
Buchnera ramosissima



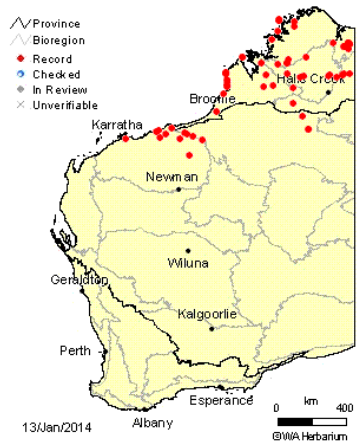


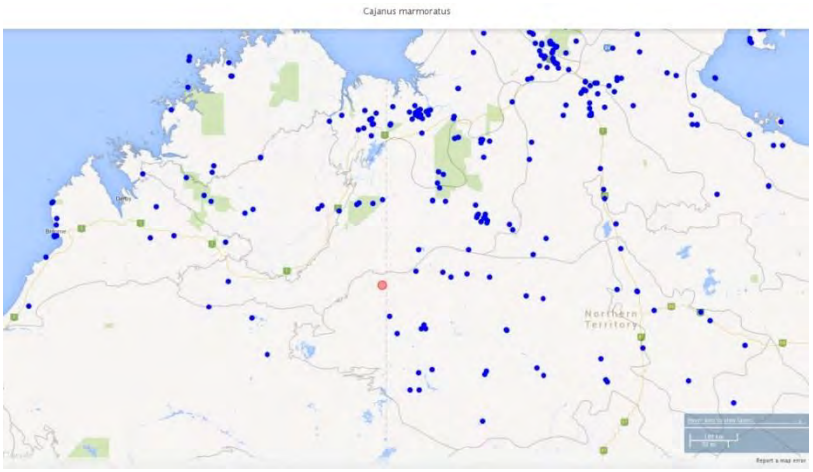
Byblis rorida



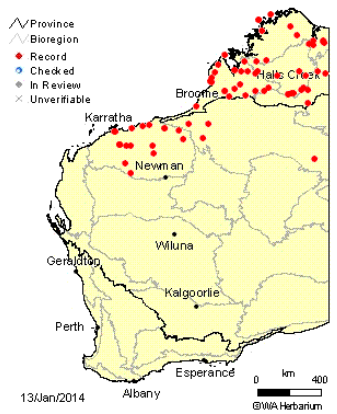


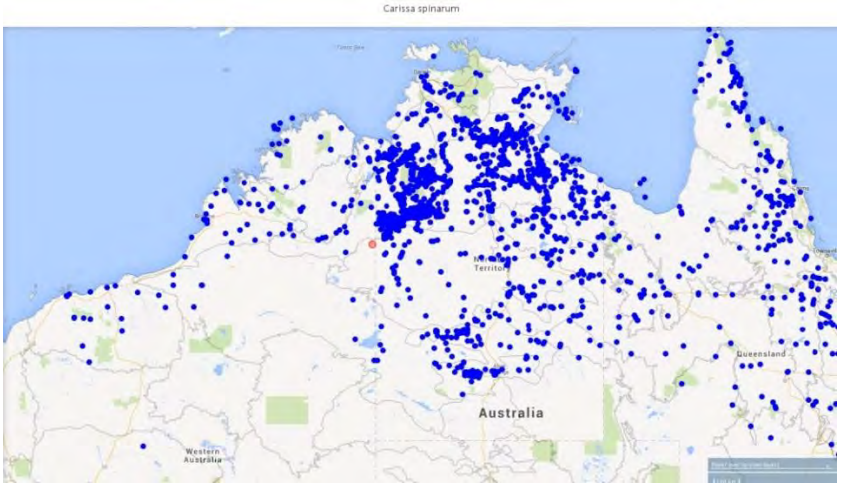
Cajanus marmoratus



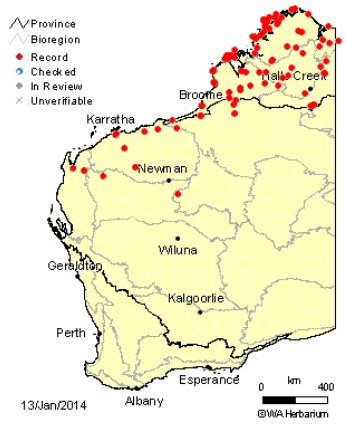


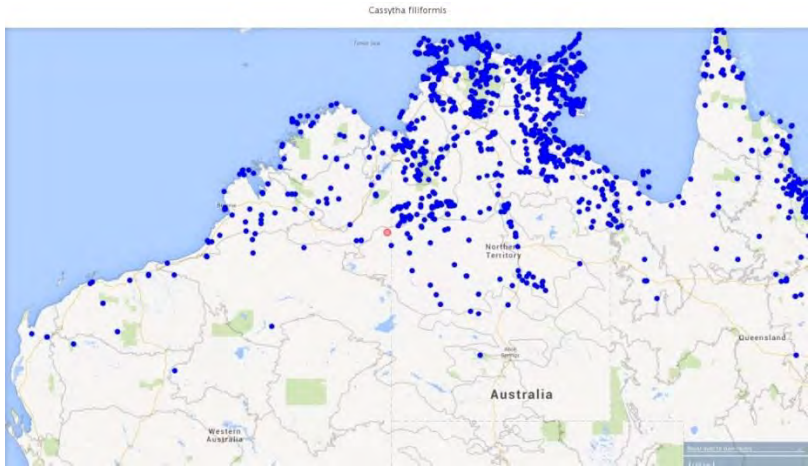
Carissa lanceolata



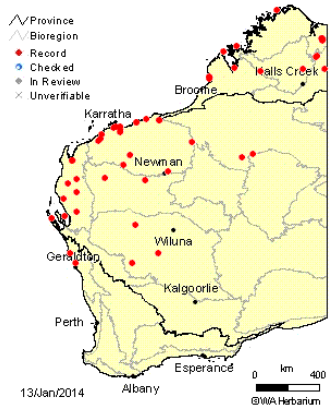


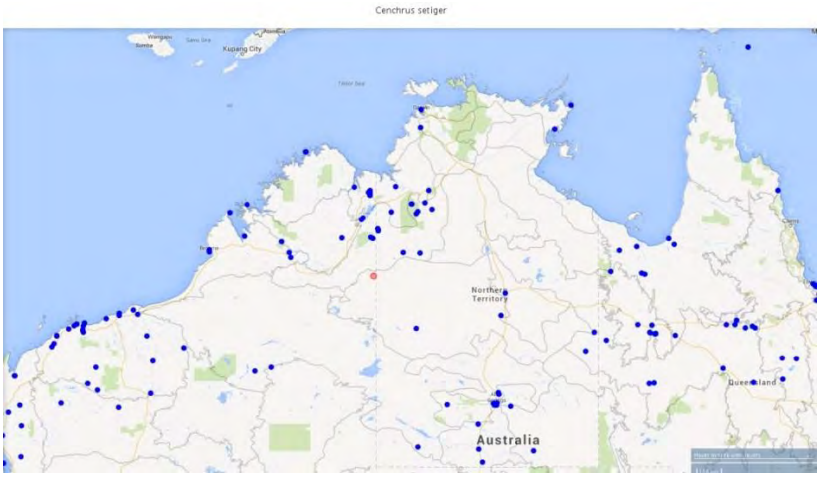
Cassytha filiformis



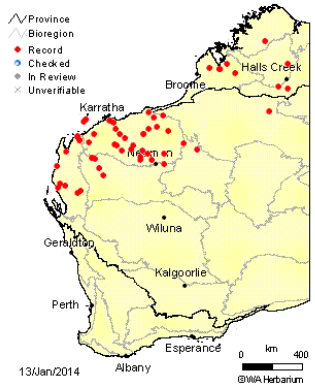


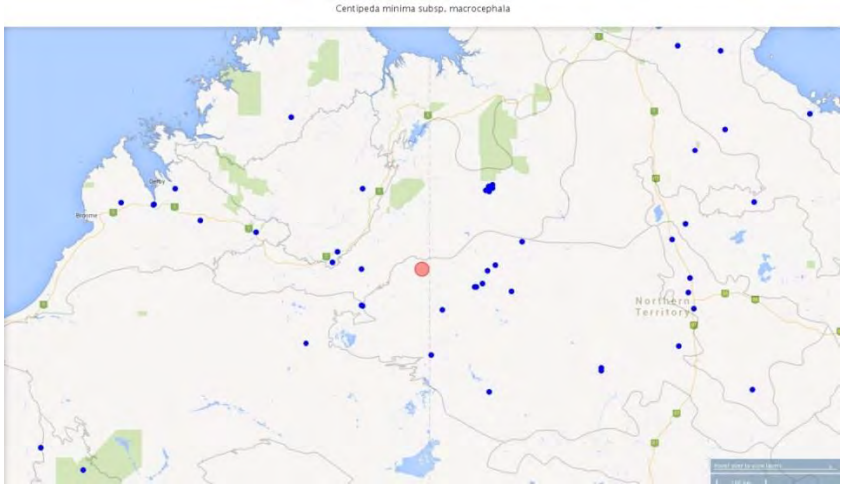
Cenchrus setiger



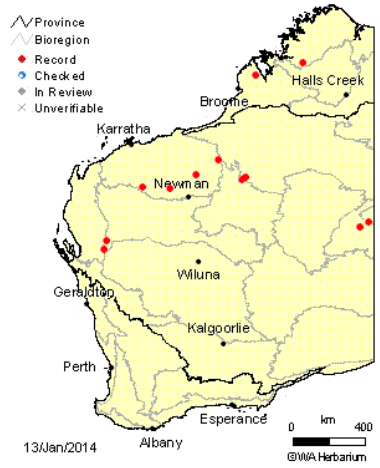


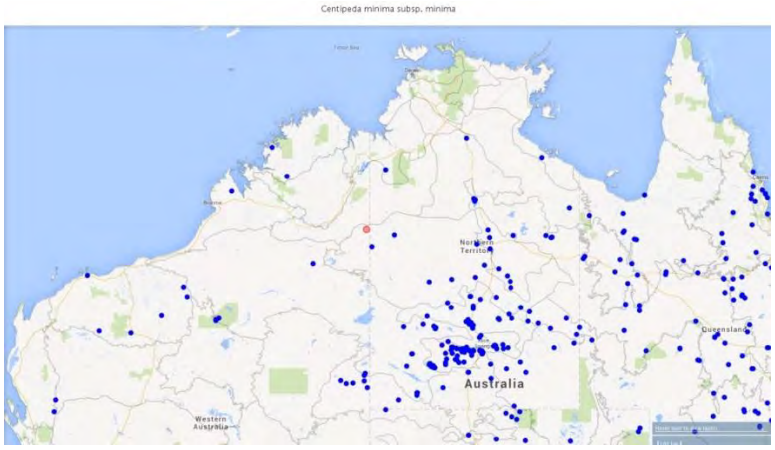
Centipeda minima subsp. *macrocephala*



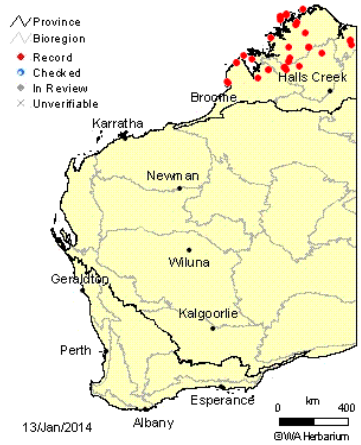


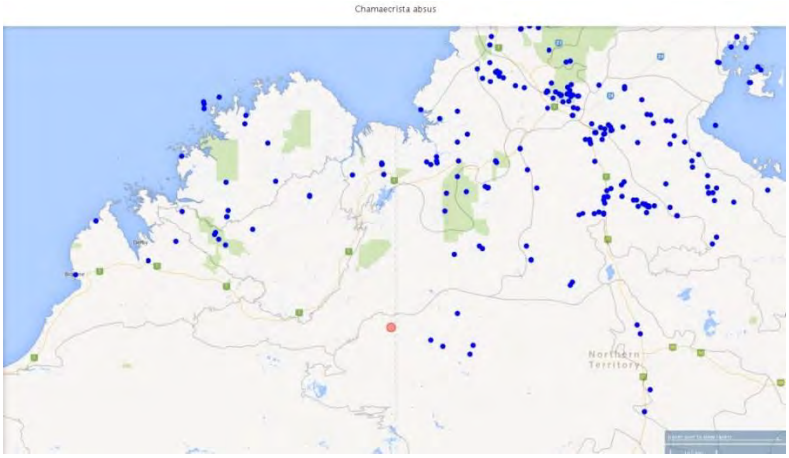
Centipeda minima subsp. *minima*



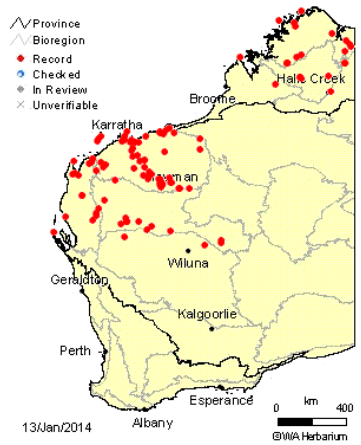


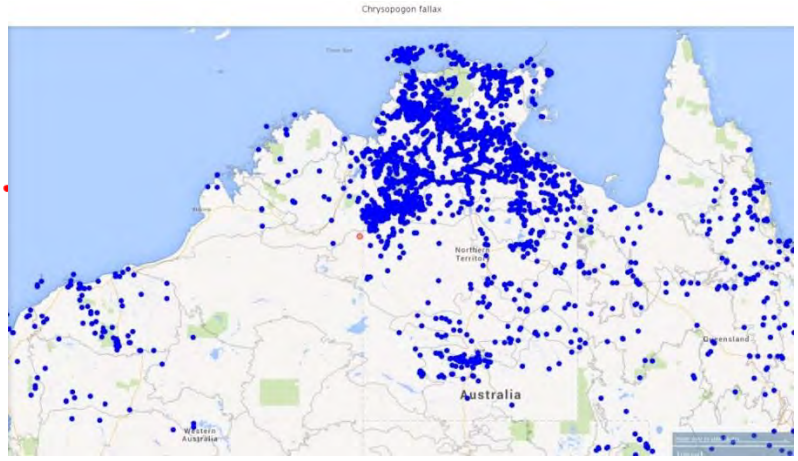
Chamaecrista absus



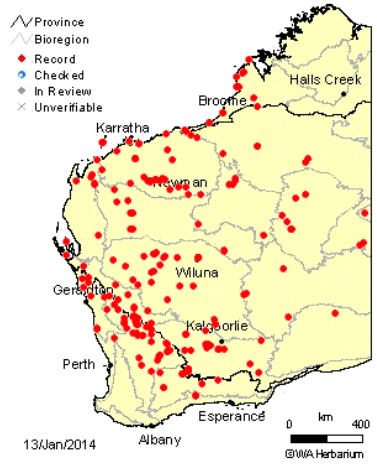


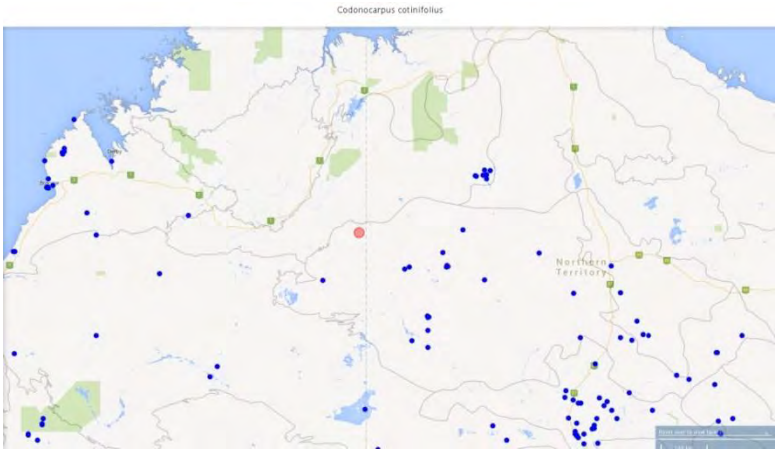
Chrysopogon fallax



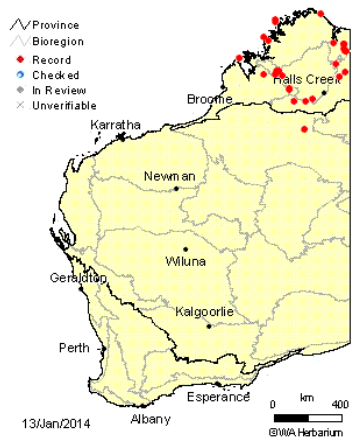


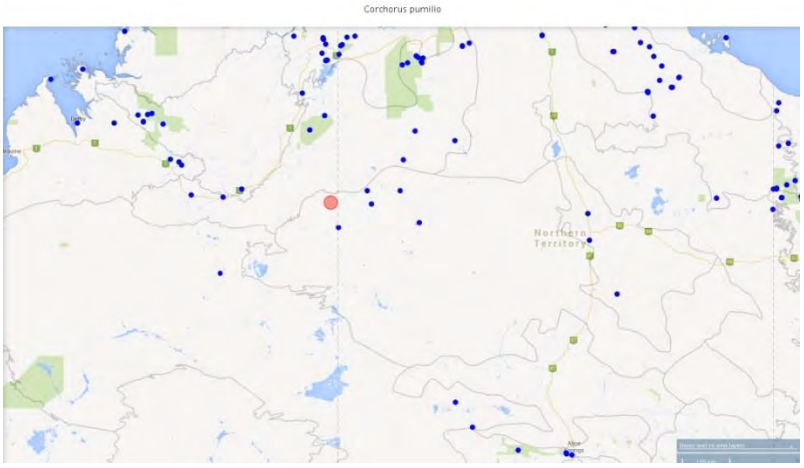
Codonocarpus cotinifolius



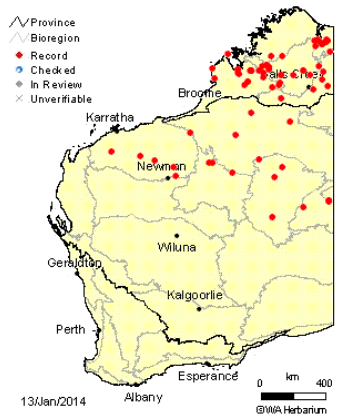


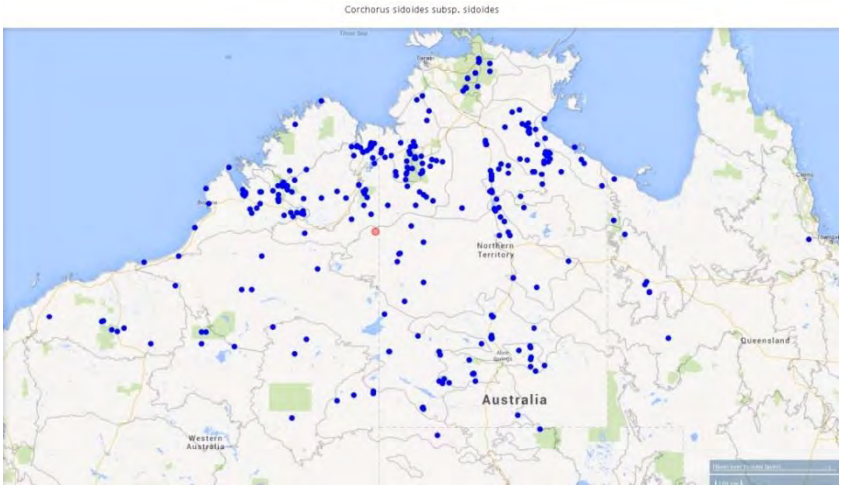
Corchorus pumilio



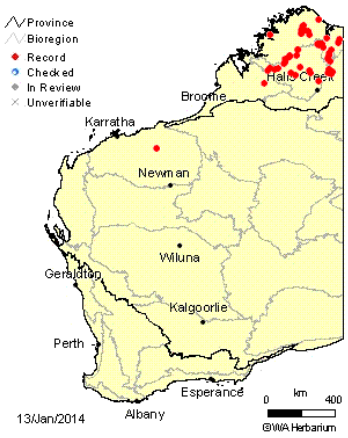


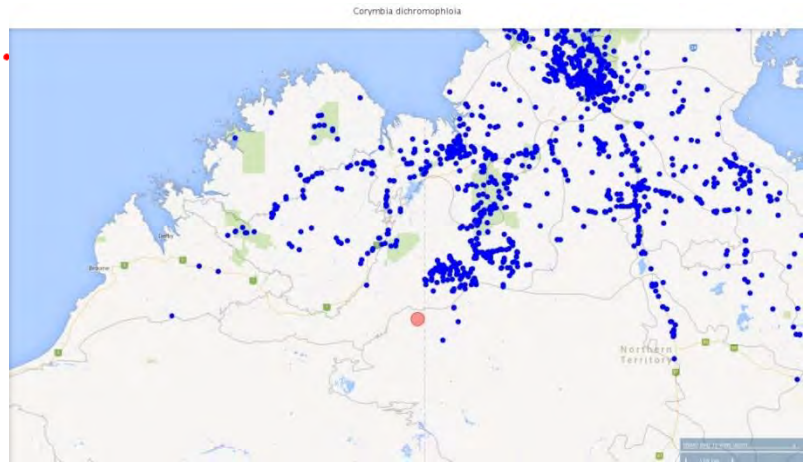
Corchorus sidoides subsp. *sidoides*



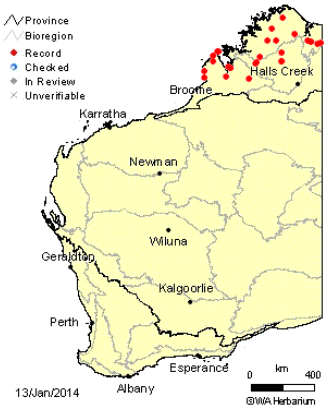


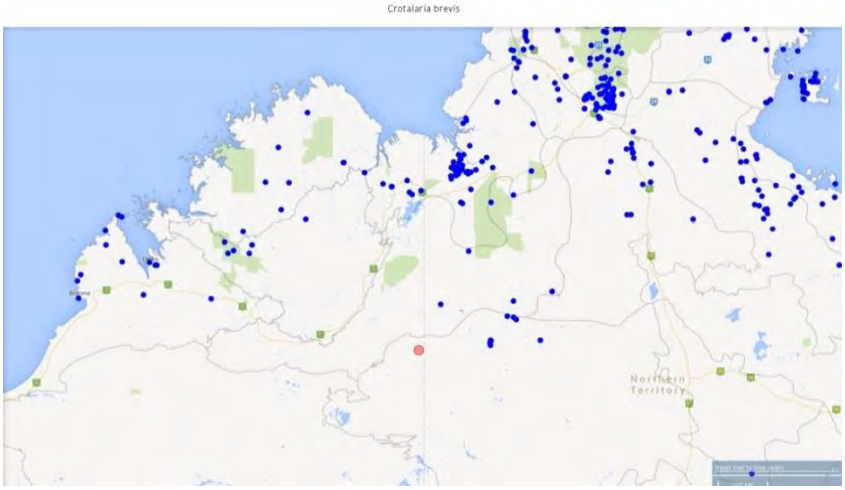
Corymbia dichromophloia



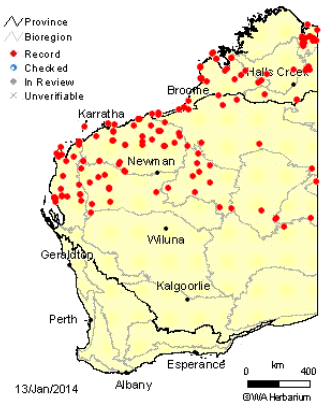


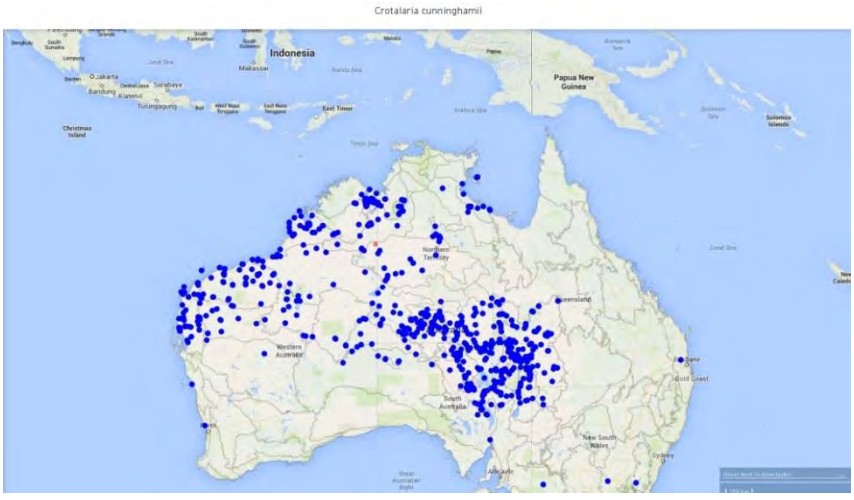
Crotalaria brevis



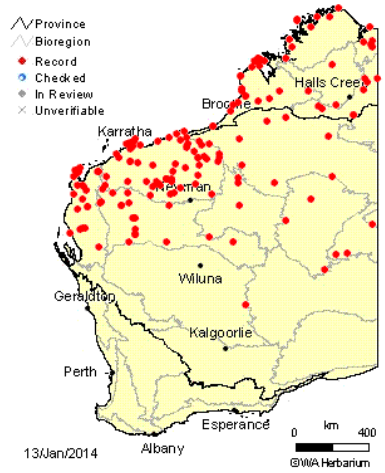


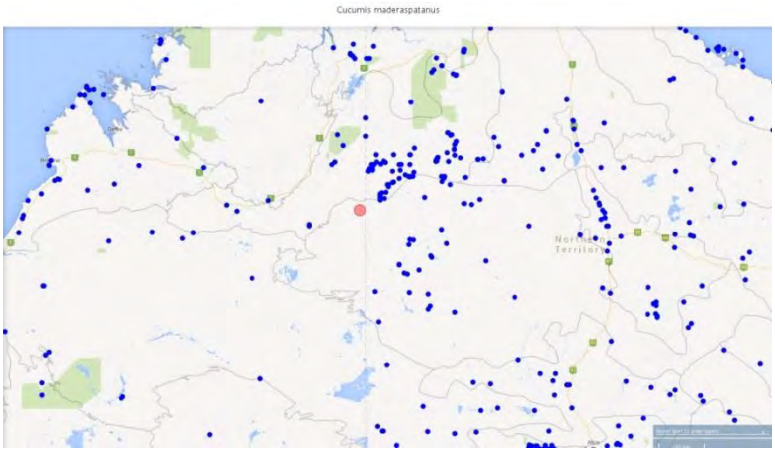
Crotalaria cunninghamii



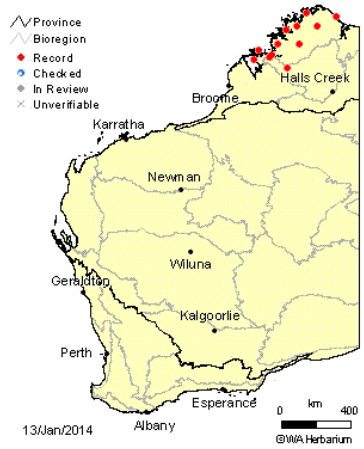


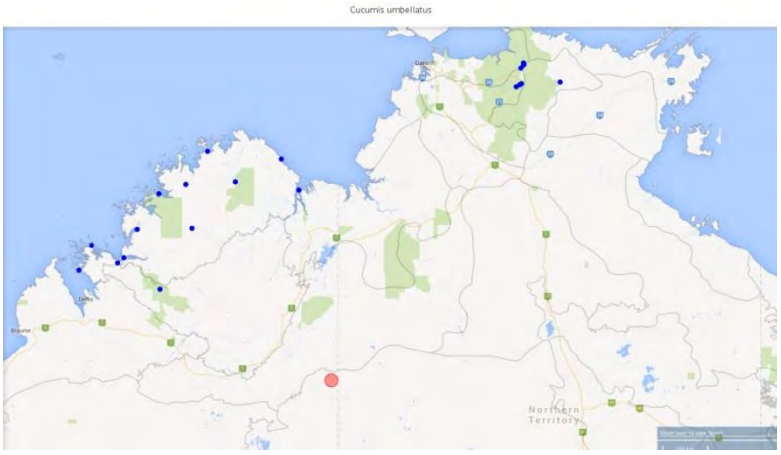
Cucumis maderaspatanus



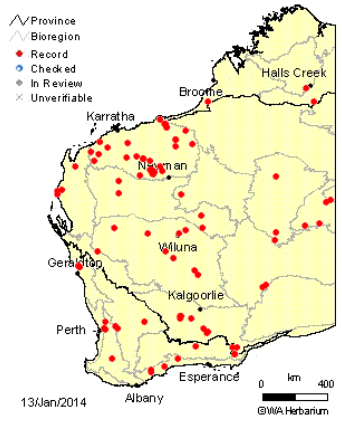


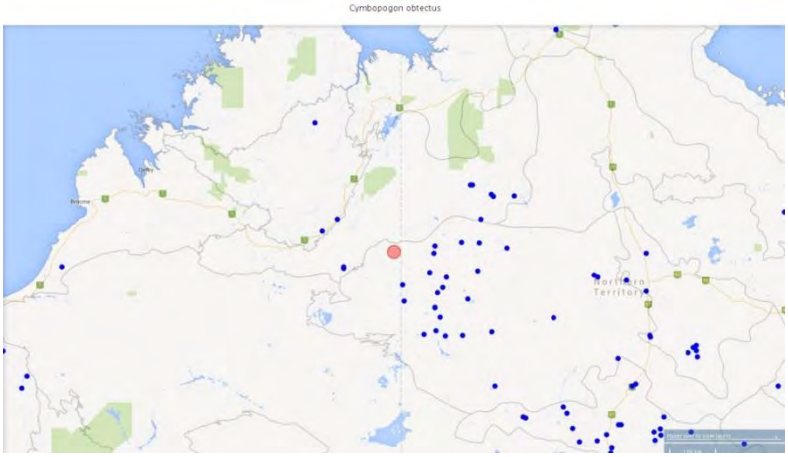
Cucumis umbellatus



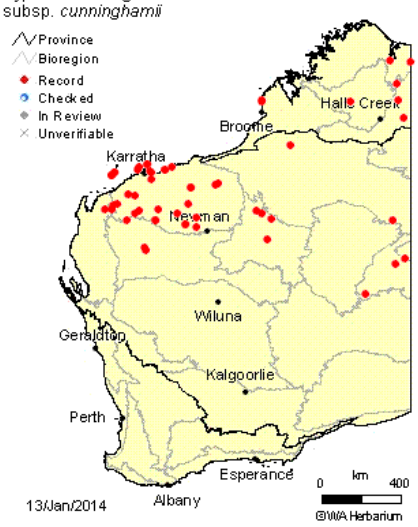


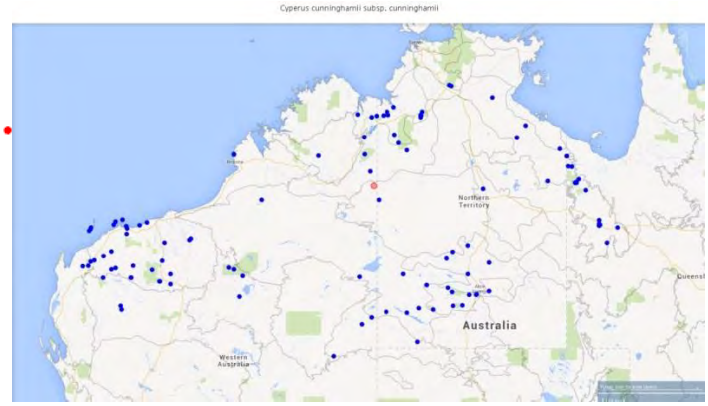
Cymbopogon obtectus



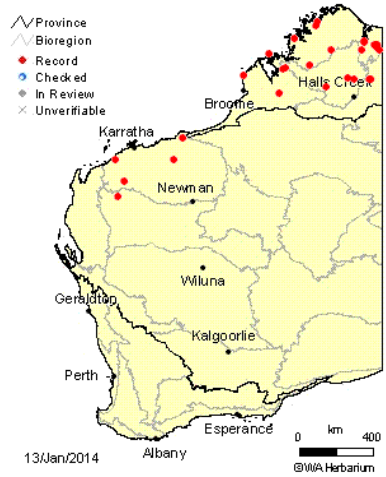


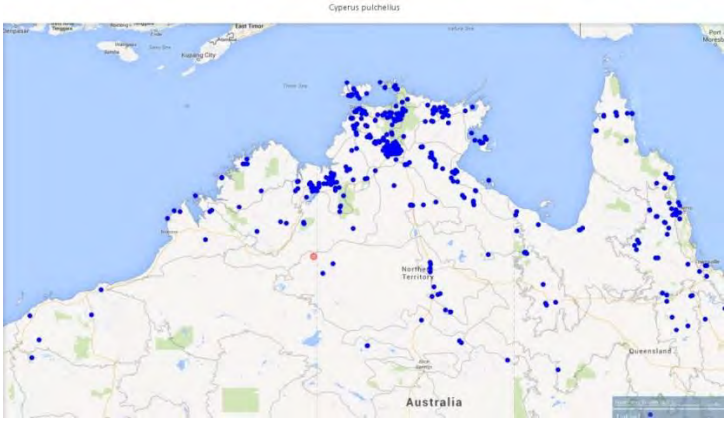
Cyperus cunninghamii subsp. *cunninghamii*



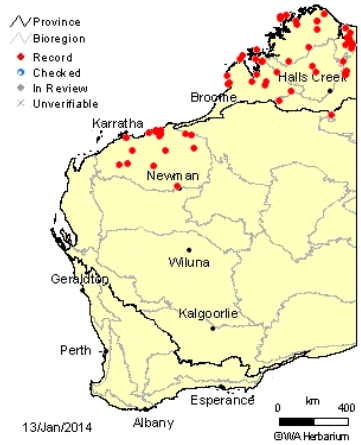


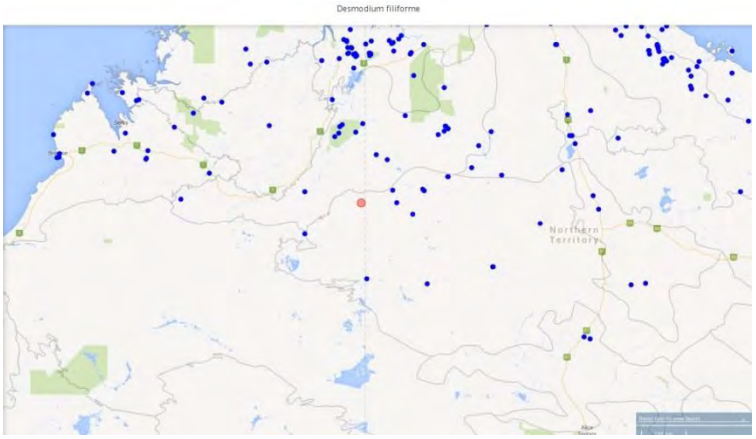
Cyperus pulchellus



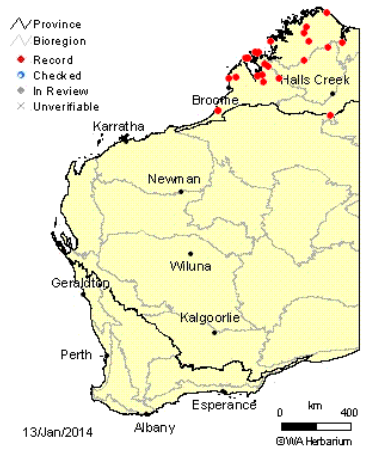


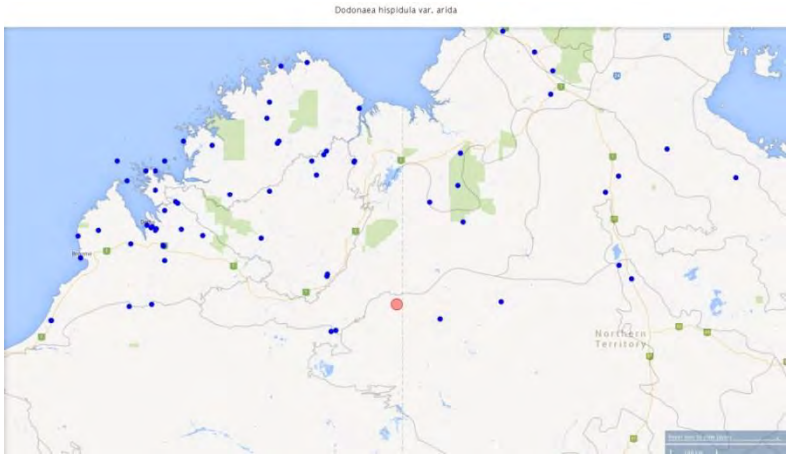
Desmodium filiforme



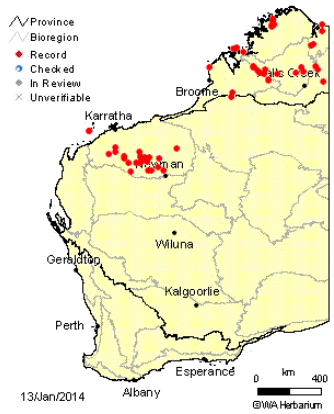


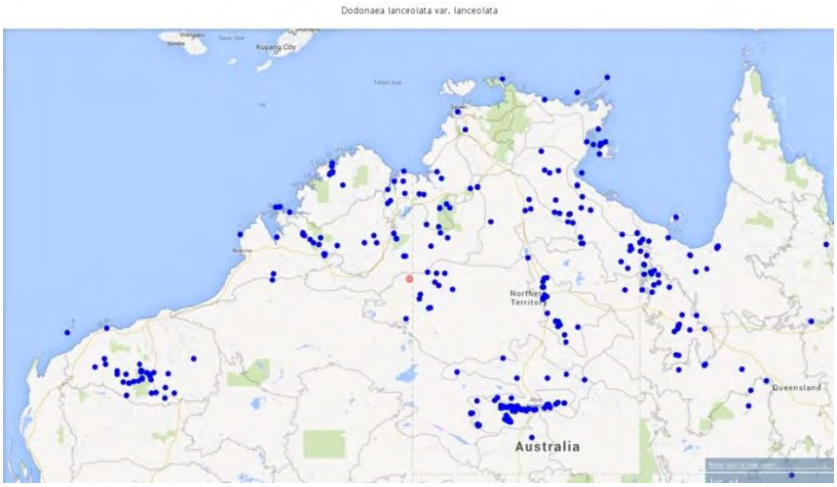
Dodonaea hispidula var. *arida*



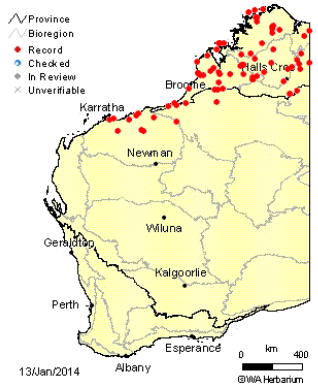


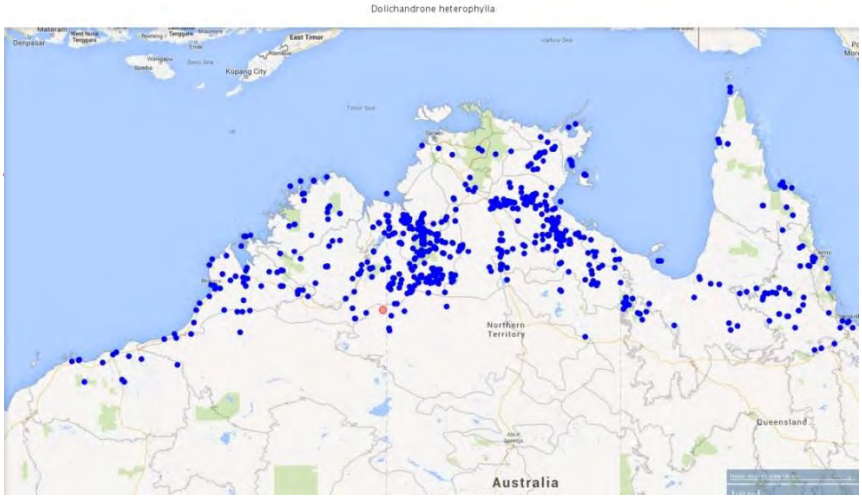
Dodonaea lanceolata var. *lanceolata*



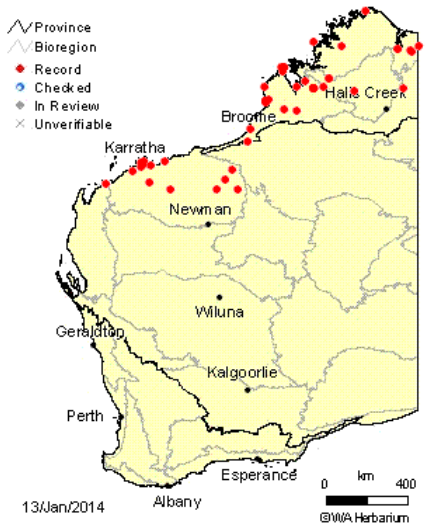


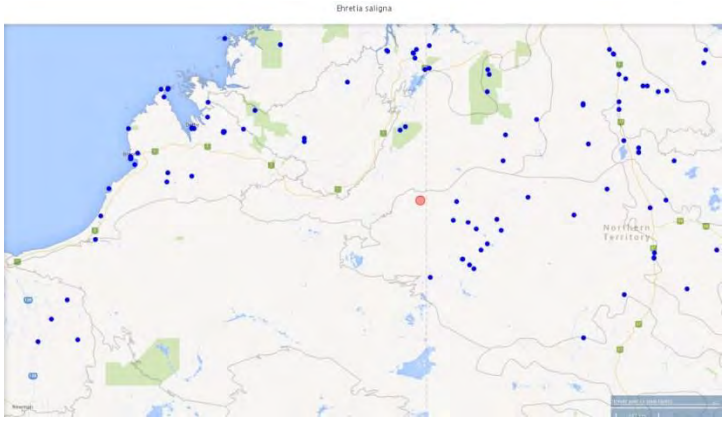
Dolichandrone heterophylla



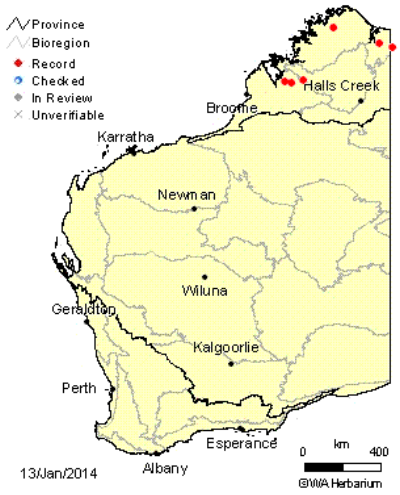


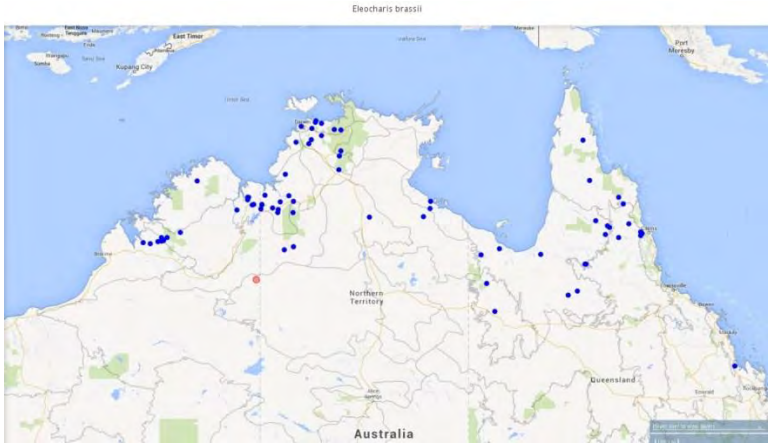
Ehretia saligna



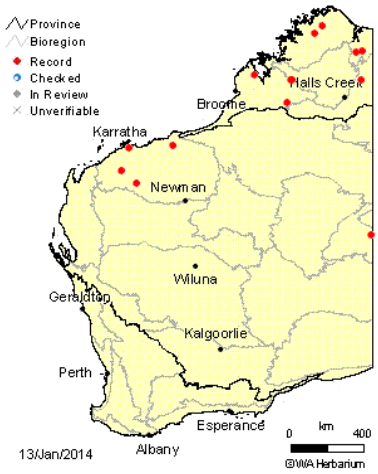


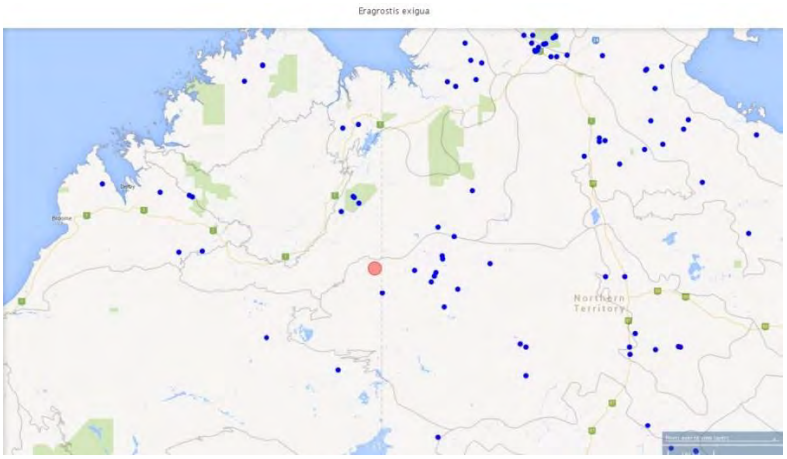
Eleocharis brassii



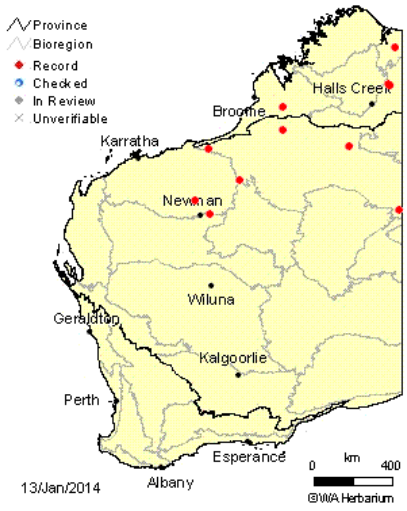


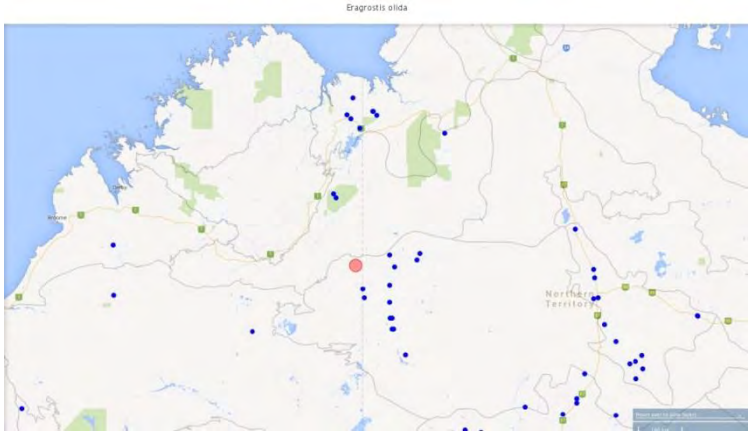
Eragrostis exigua



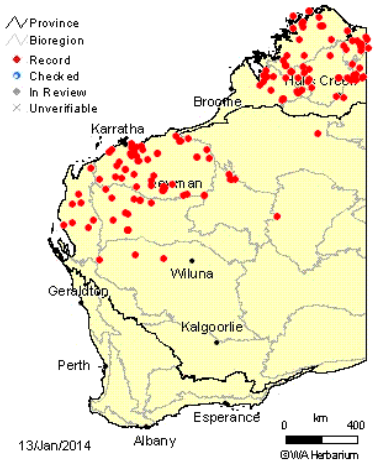


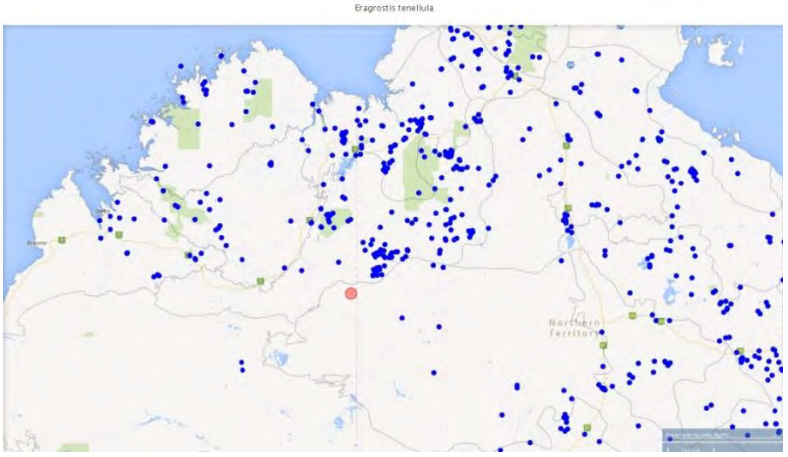
Eragrostis olida



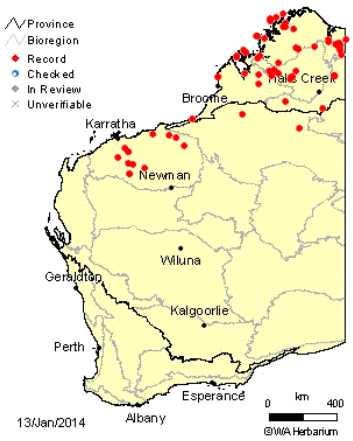


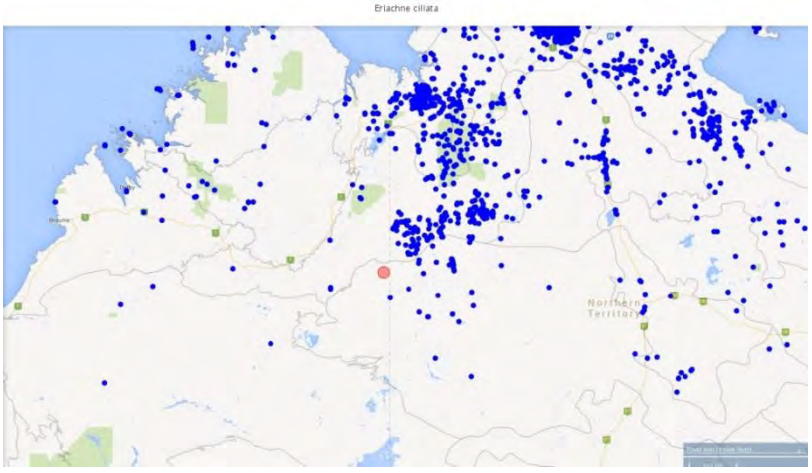
Eragrostis tenellula



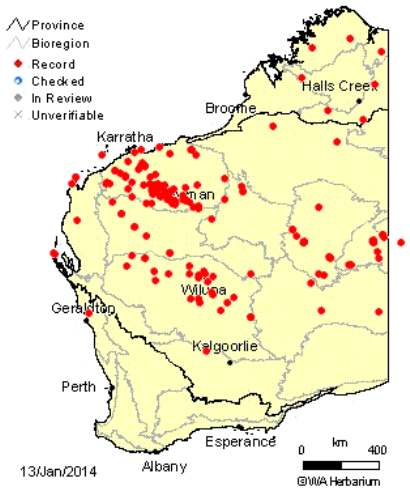


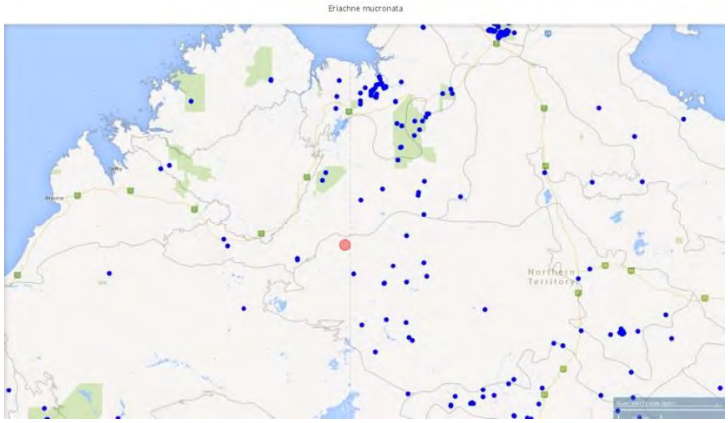
Eriachne ciliata



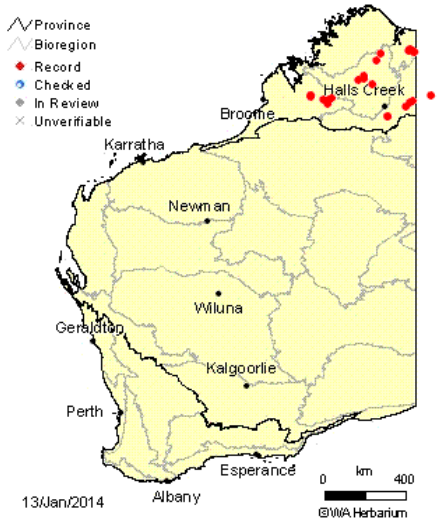


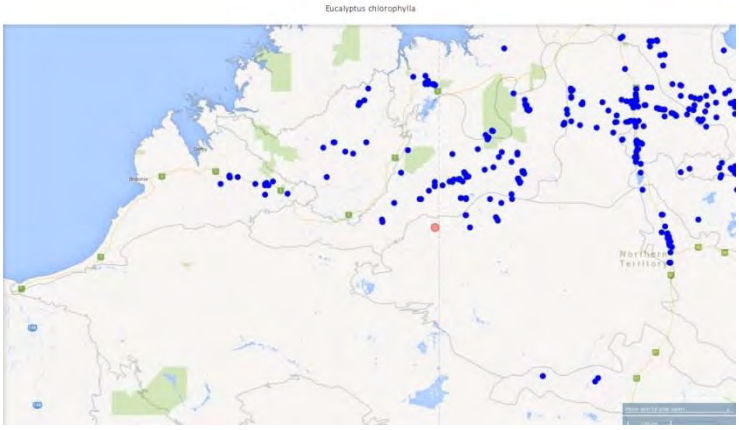
Eriachne mucronata



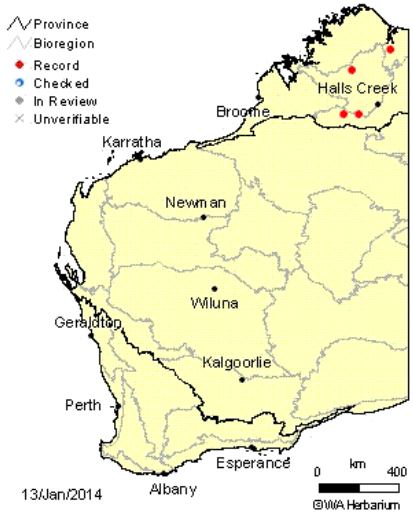


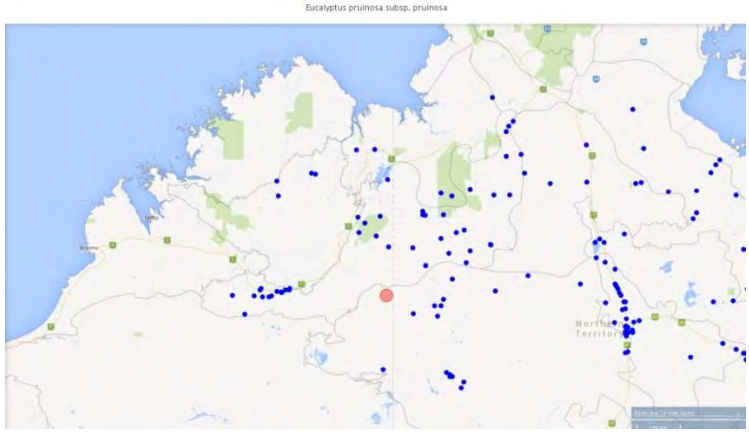
Eucalyptus chlorophylla



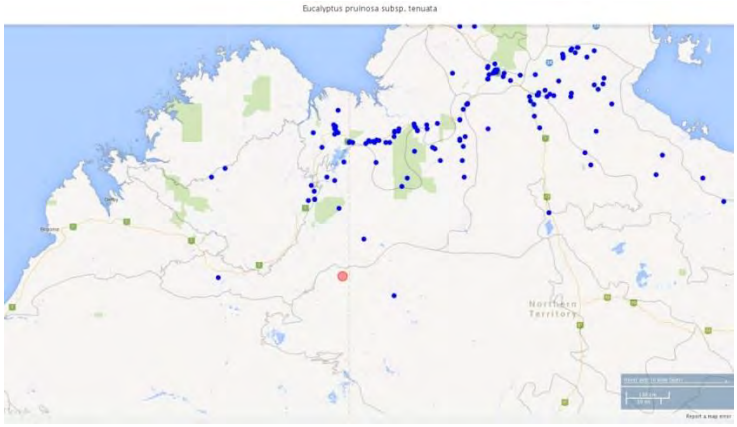


Eucalyptus pruinosa subsp. *pruinosa*

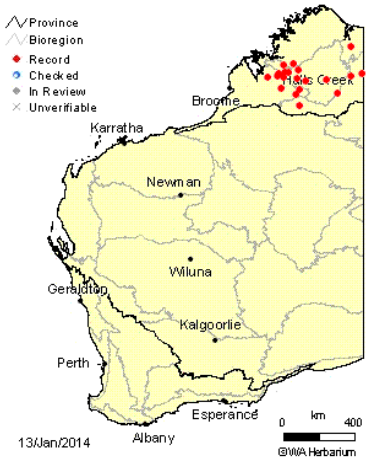




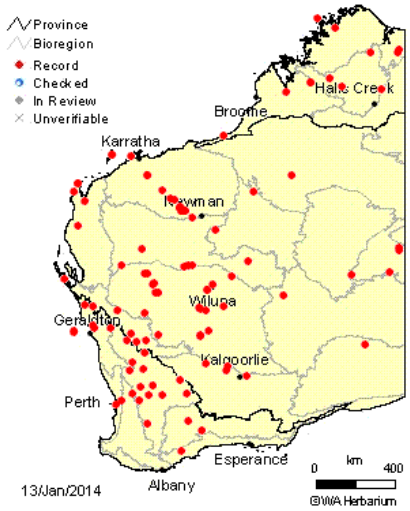
Eucalyptus pruinosa subsp. *tenuata*

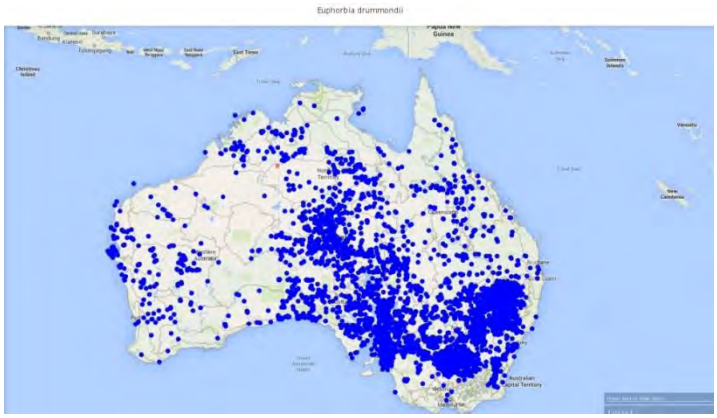


Euphorbia cinerea

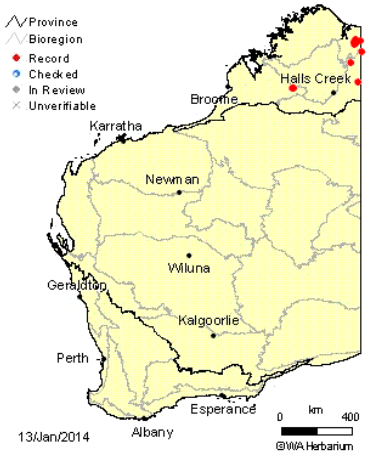


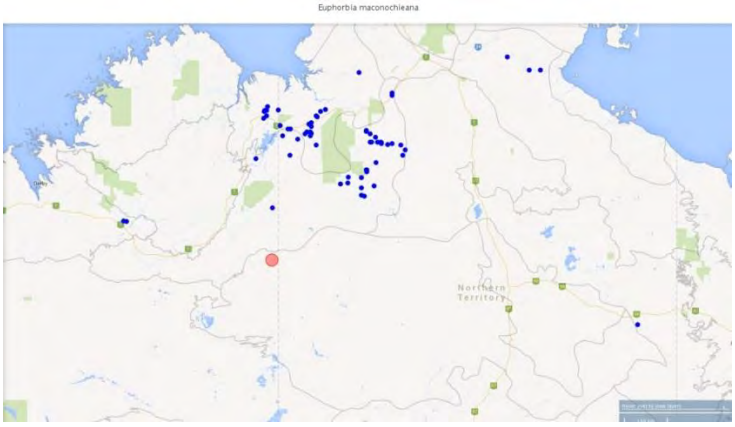
Euphorbia drummondii



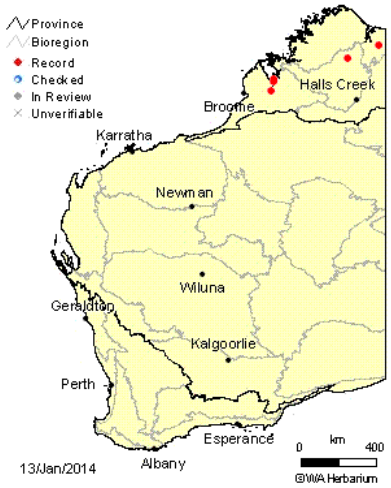


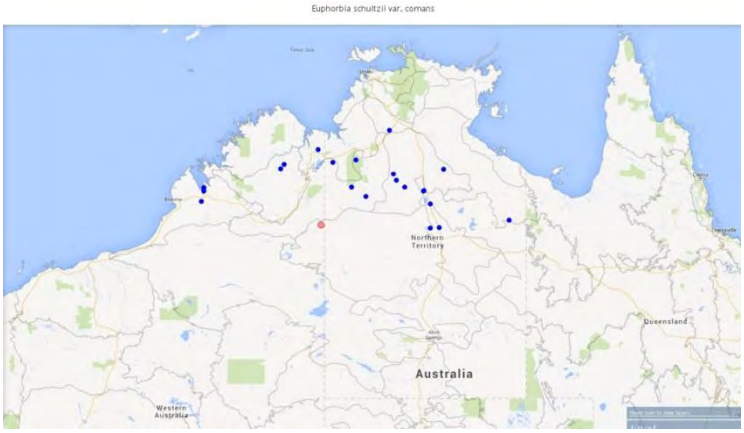
Euphorbia maconochieana



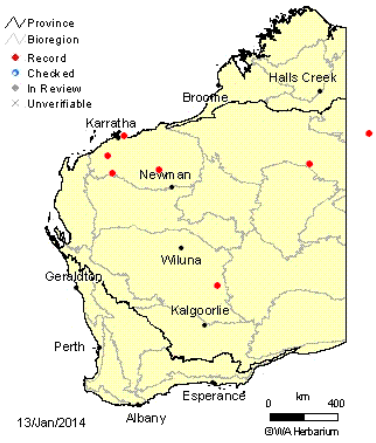


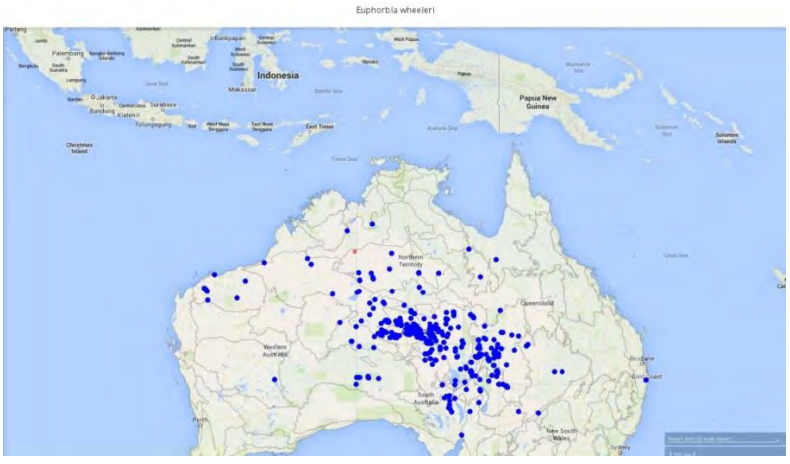
Euphorbia schultzii var. *comans*



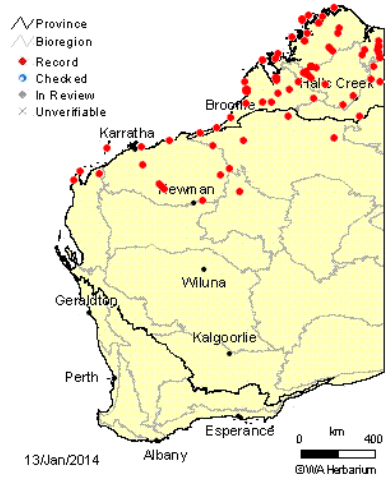


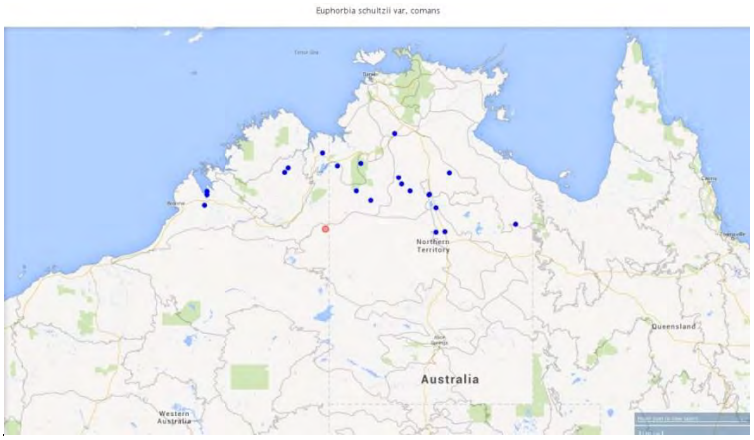
Euphorbia wheeleri



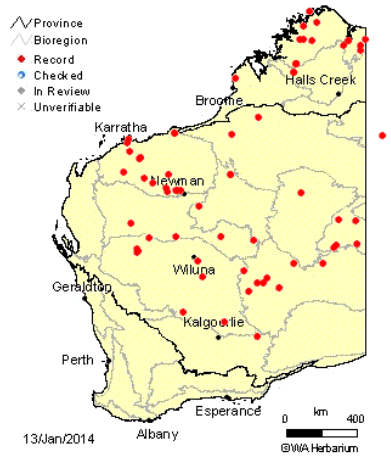


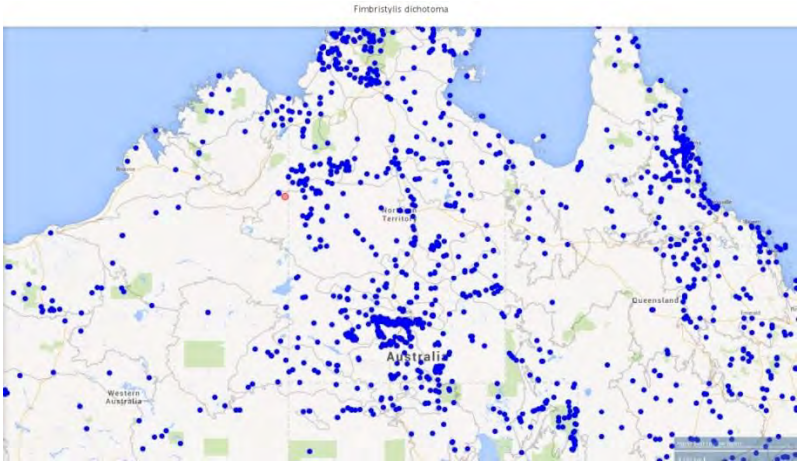
Evolvulus alsinoides var. *decumbens*



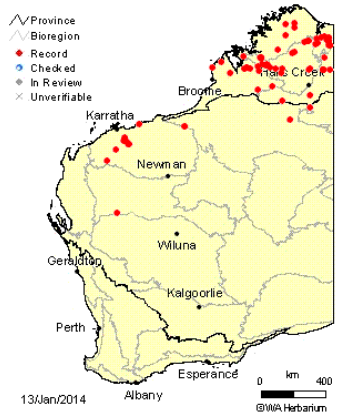


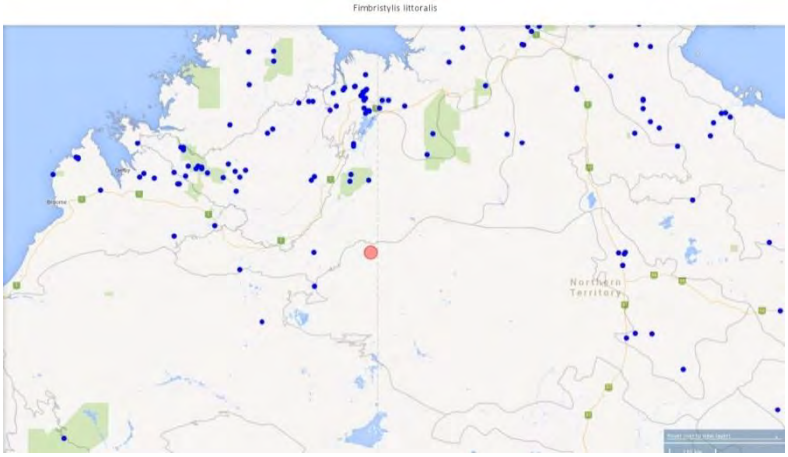
Fimbristylis dichotoma



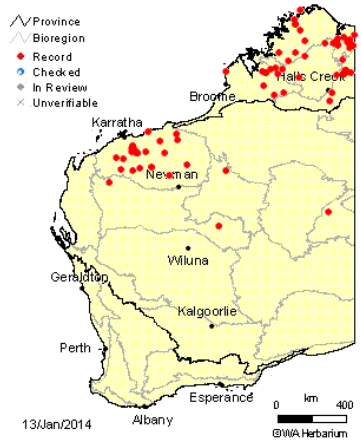


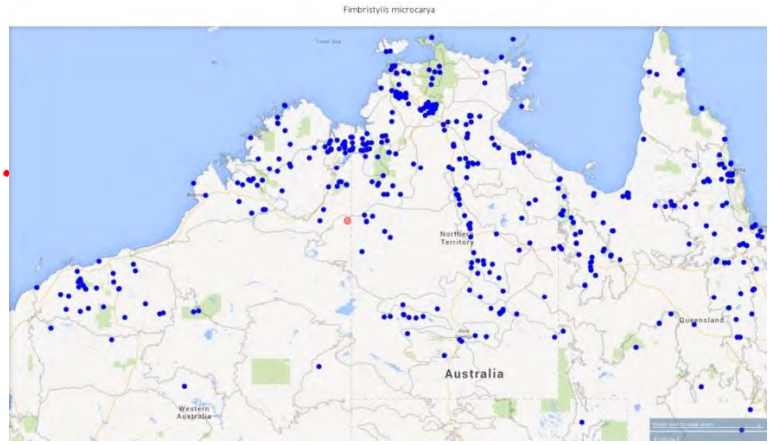
Fimbristylis littoralis



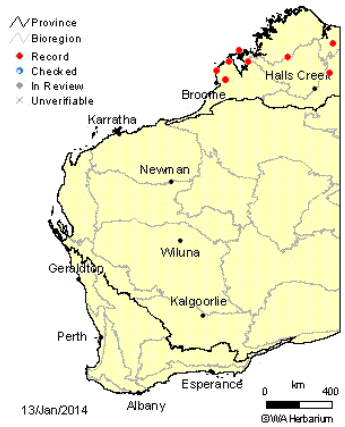


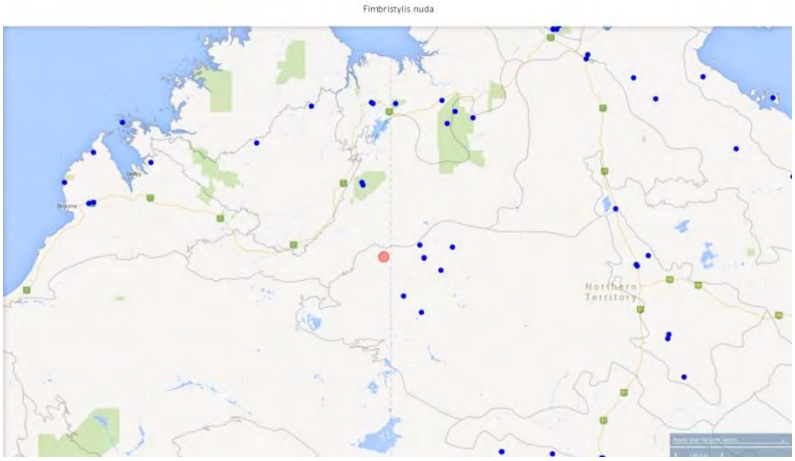
Fimbristylis microcarya



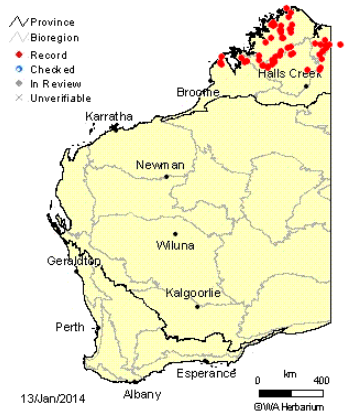


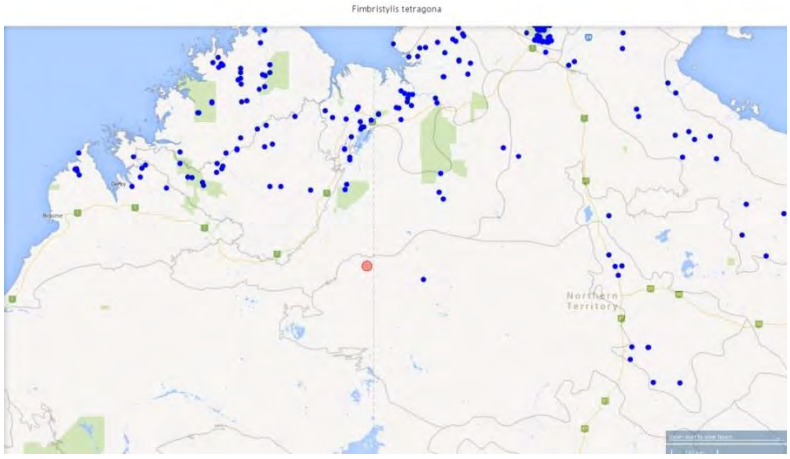
Fimbristylis nuda



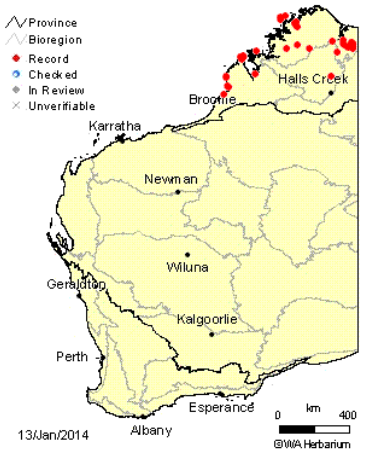


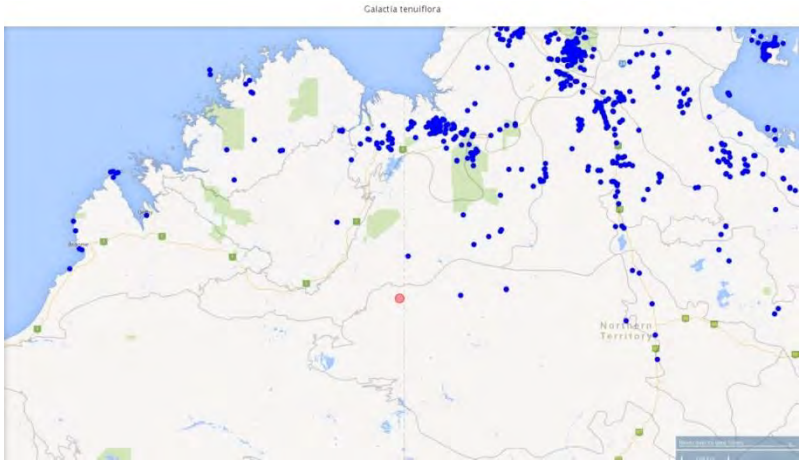
Fimbristylis tetragona



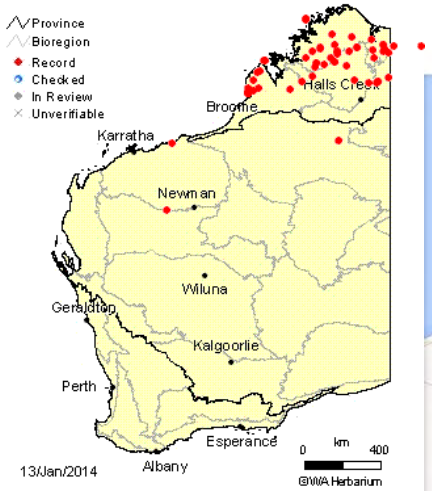


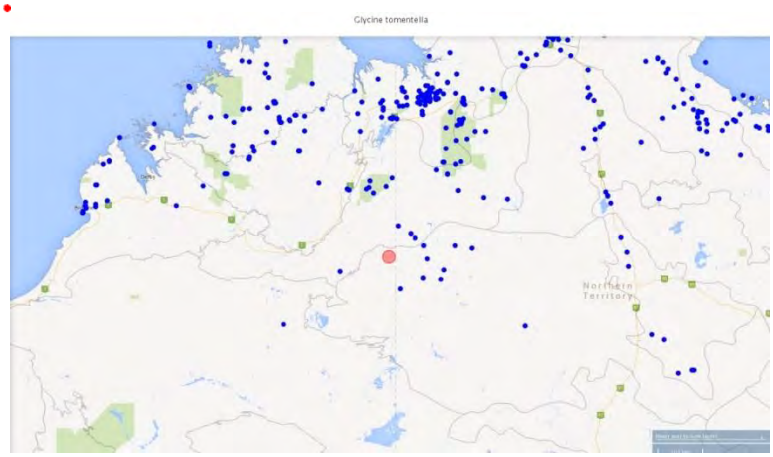
Galactia tenuiflora



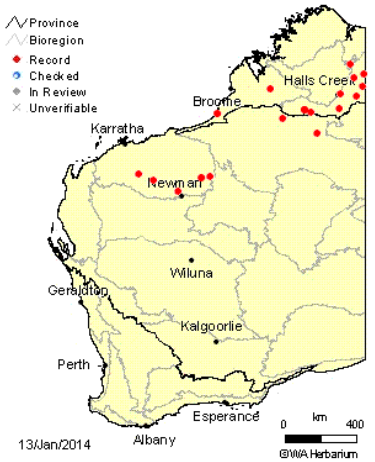


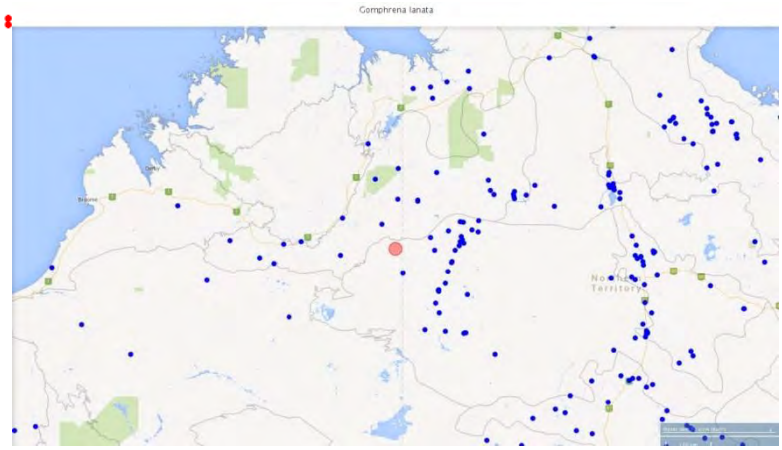
Glycine tomentella



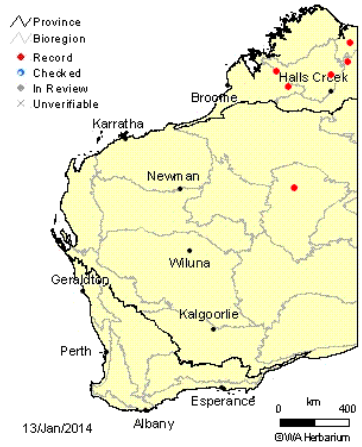


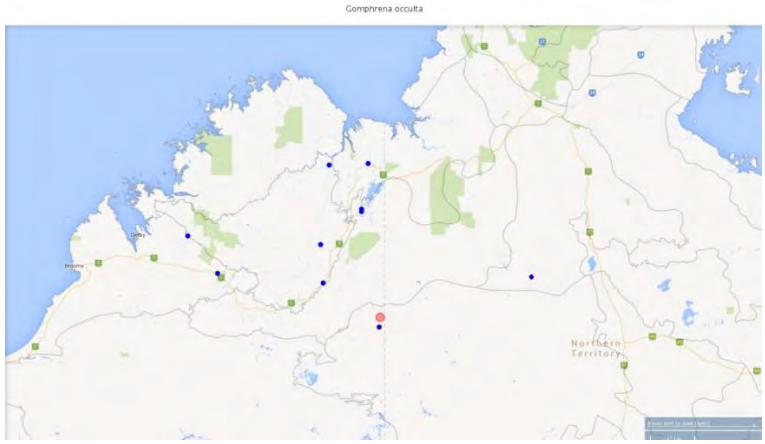
Gomphrena lanata



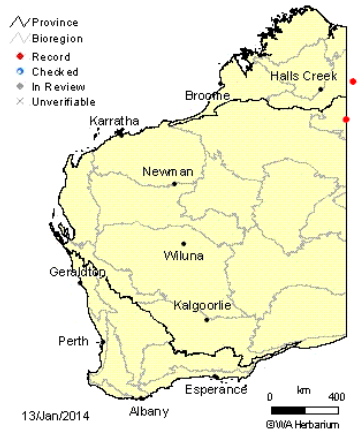


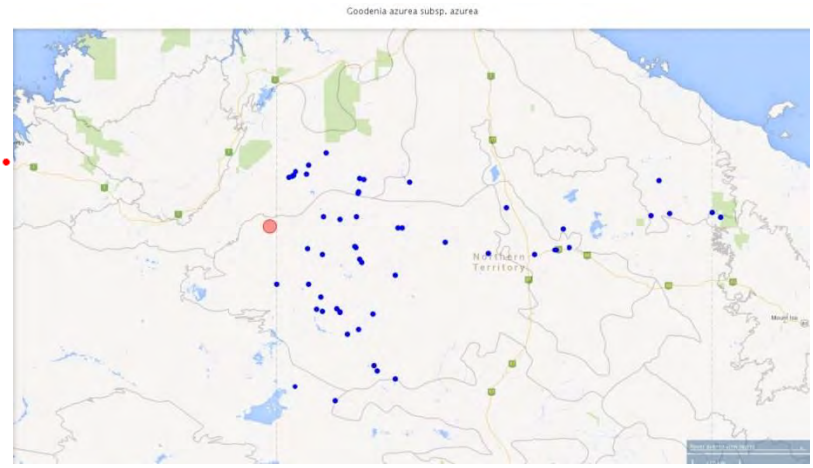
Gomphrena occulta



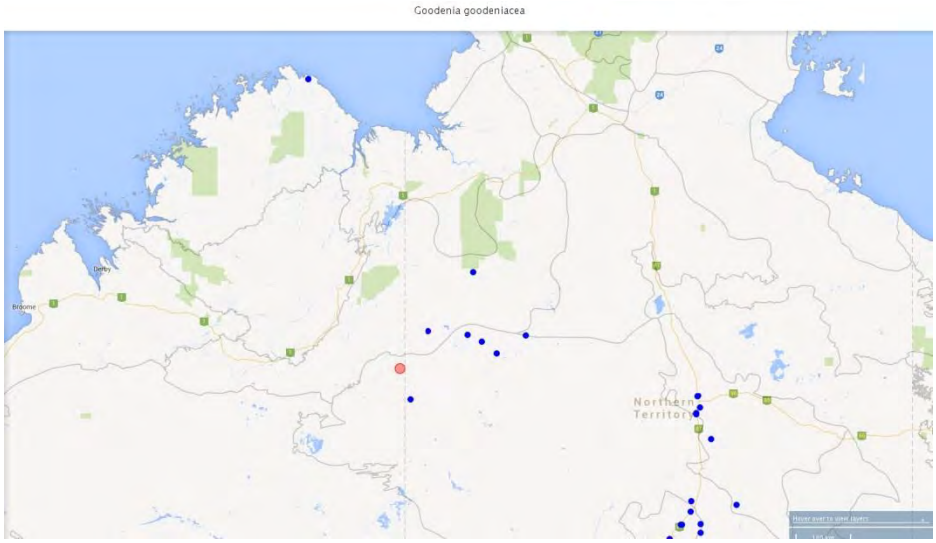


Goodenia azurea subsp. *azurea*

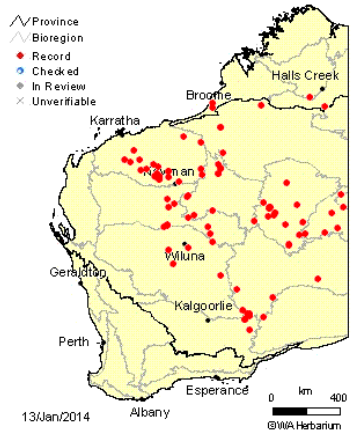


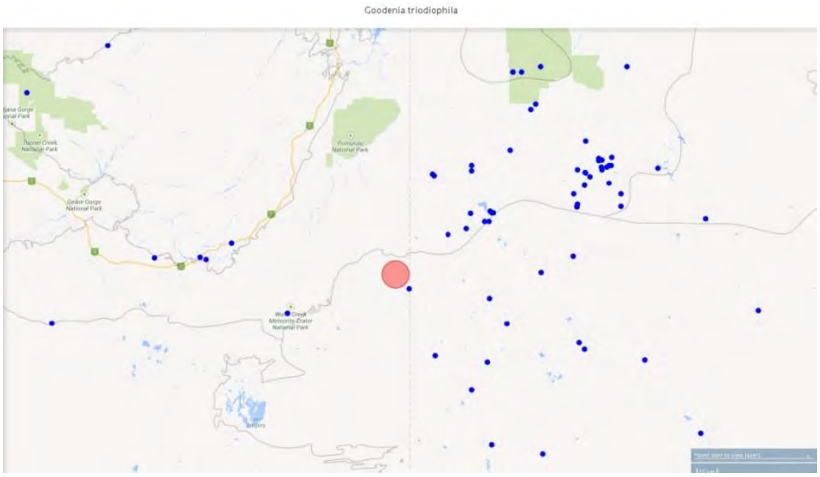


Goodenia goodeniacea

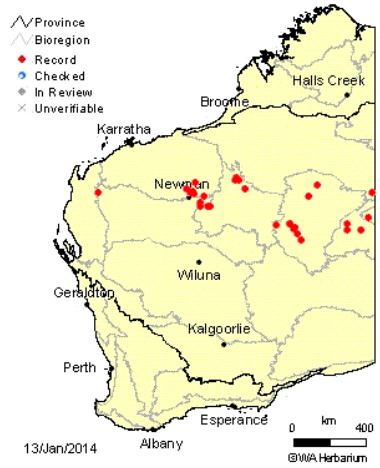


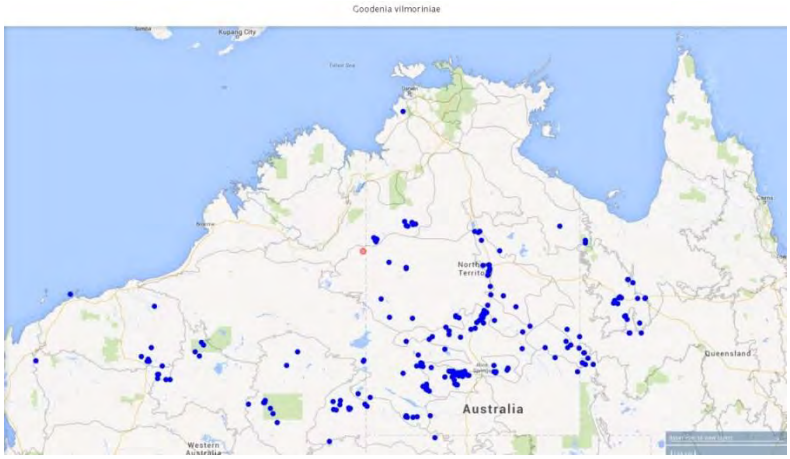
Goodenia triodiophila



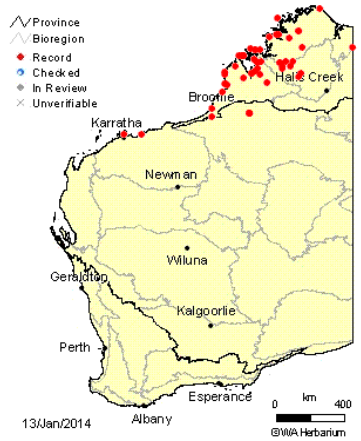


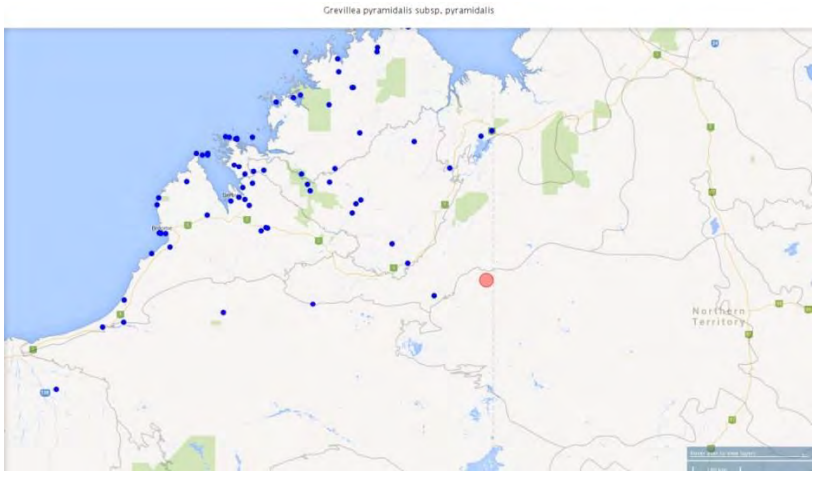
Goodenia vilmoriniae



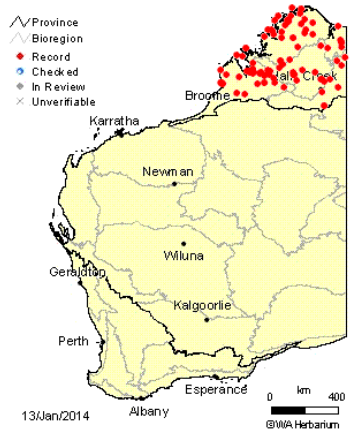


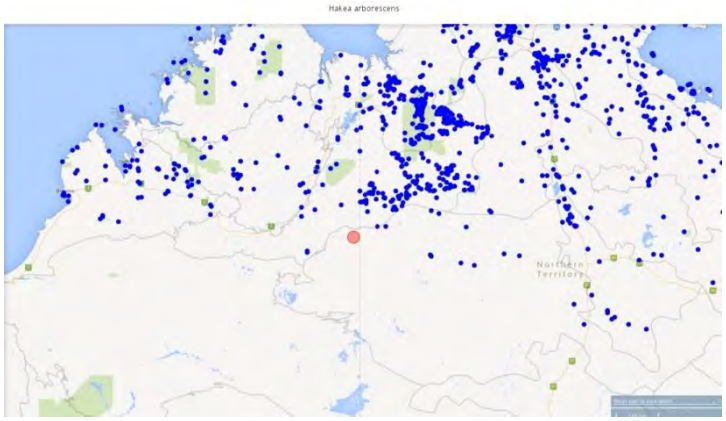
Grevillea pyramidalis subsp. *pyramidalis*



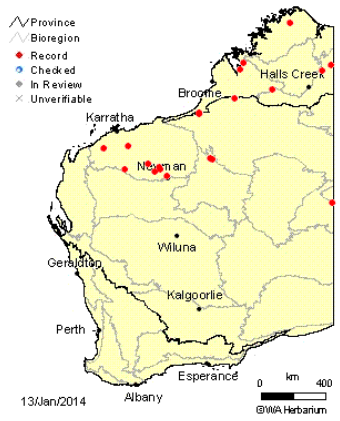


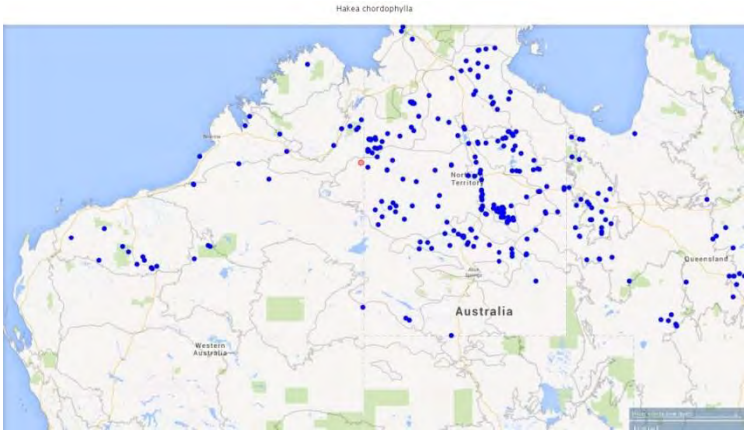
Hakea arborescens



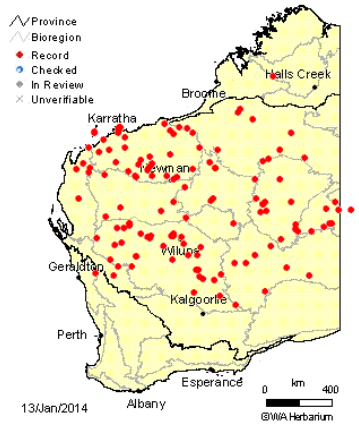


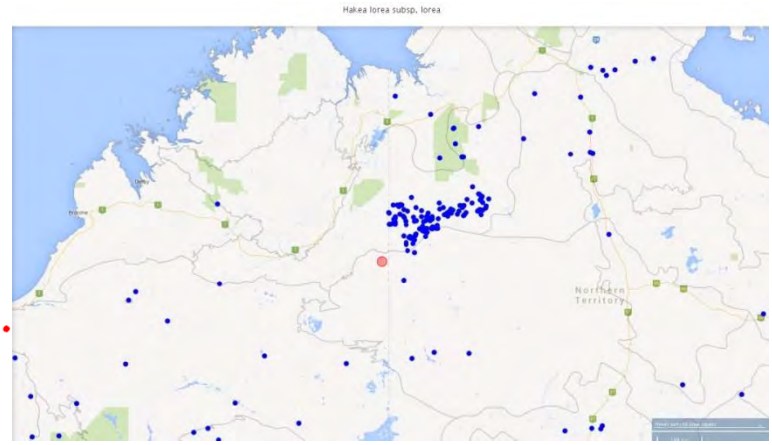
Hakea chordophylla



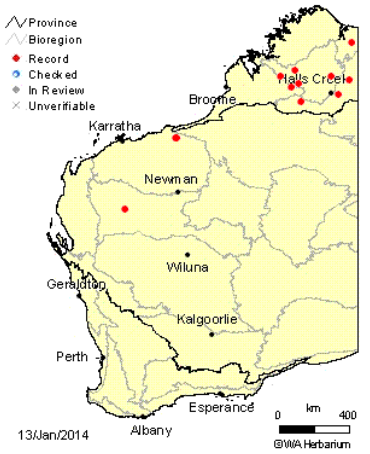


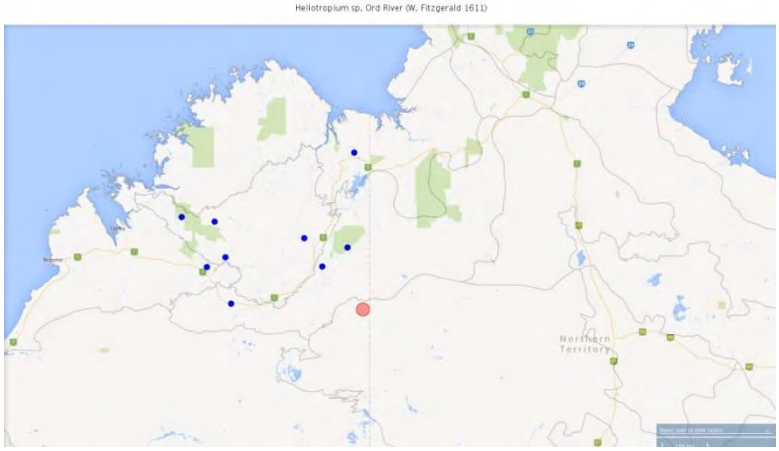
Hakea lorea subsp. *lorea*



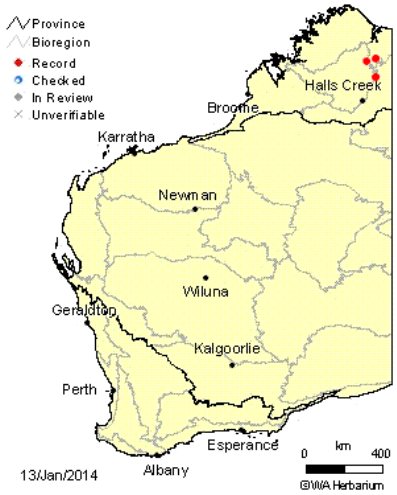


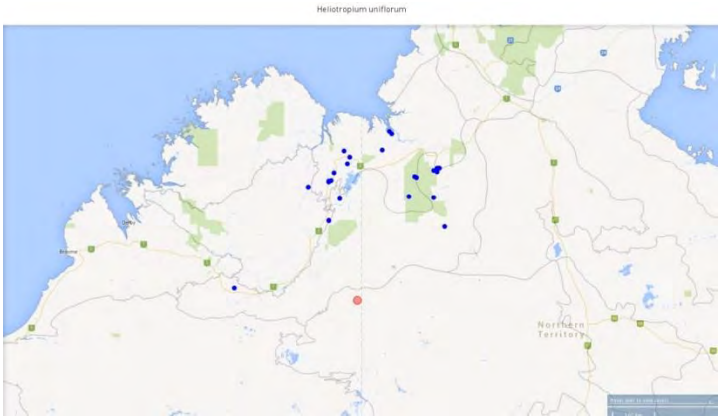
Heliotropium sp. Ord River (W. Fitzgerald 1611)



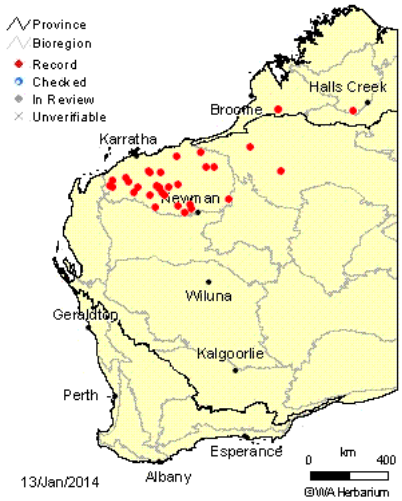


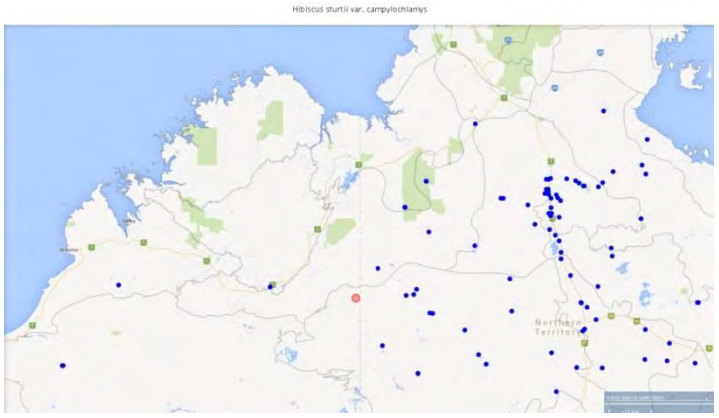
Heliotropium uniflorum



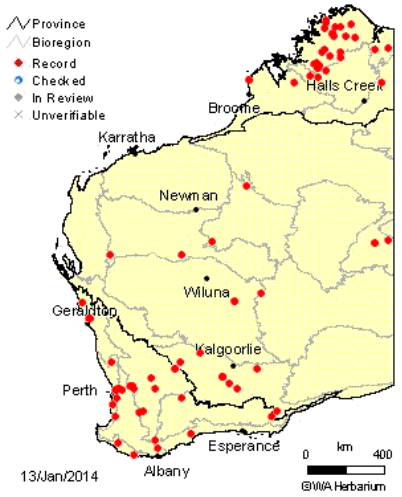


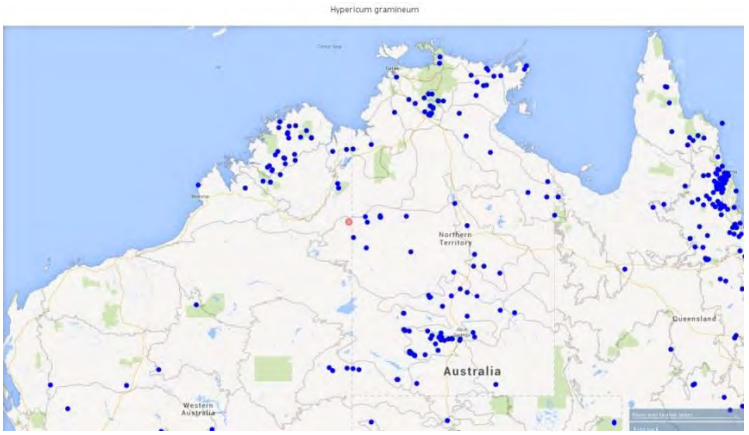
Hibiscus sturtii var. *campylochlamys*



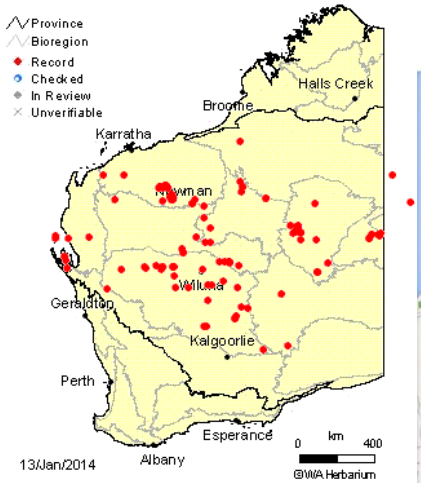


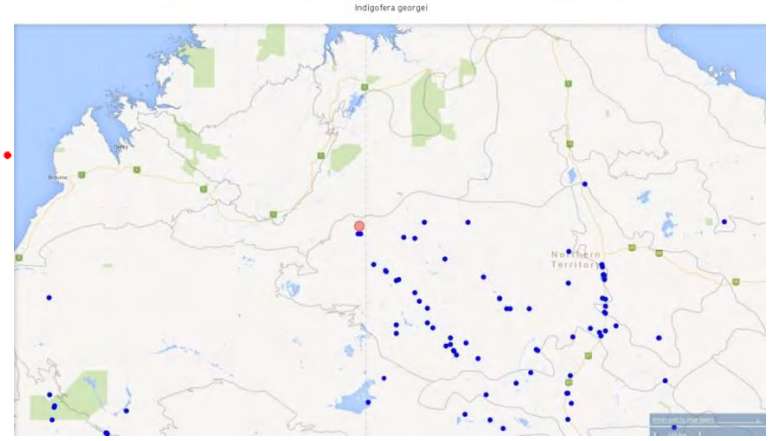
Hypericum gramineum



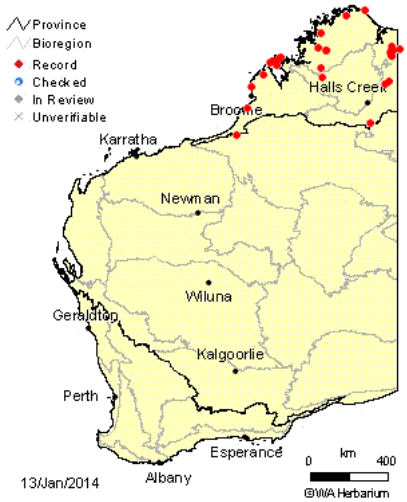


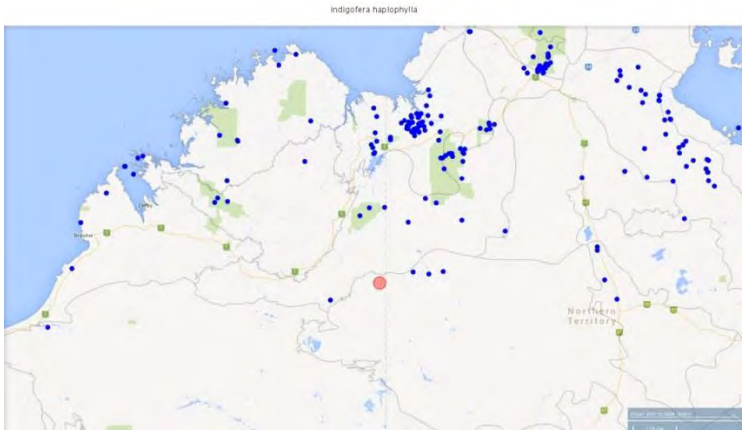
Indigofera georgei



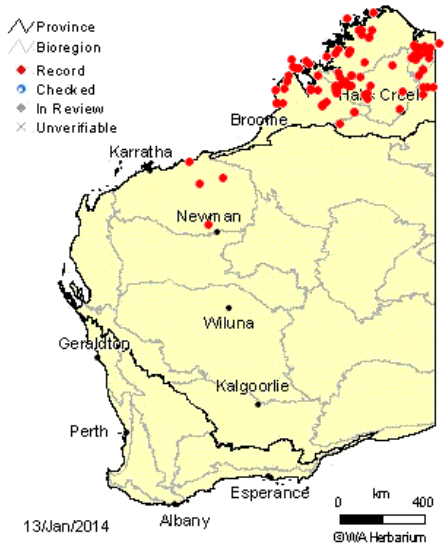


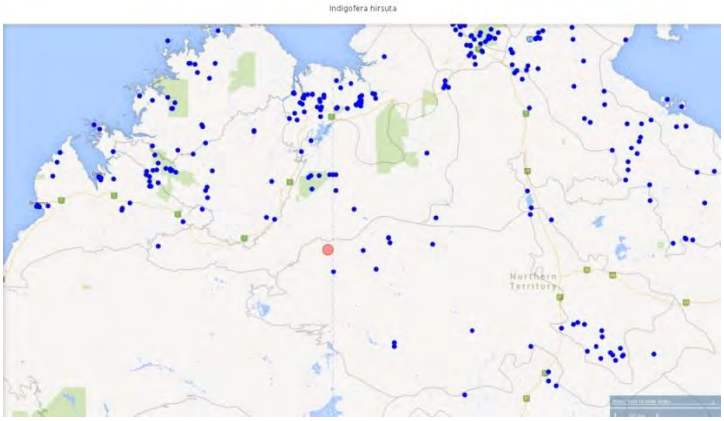
Indigofera haplophylla



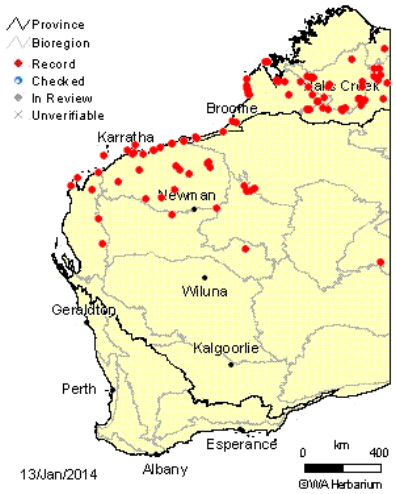


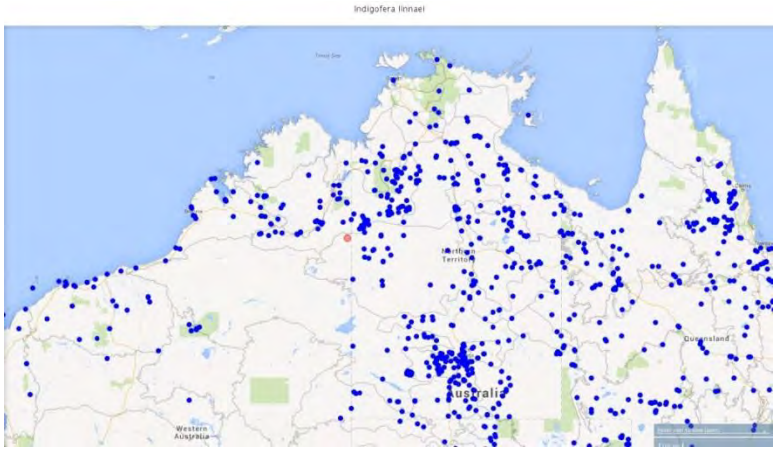
Indigofera hirsuta



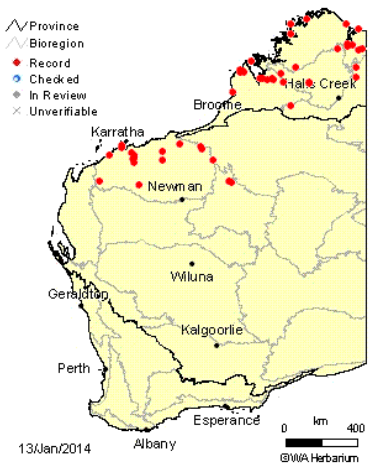


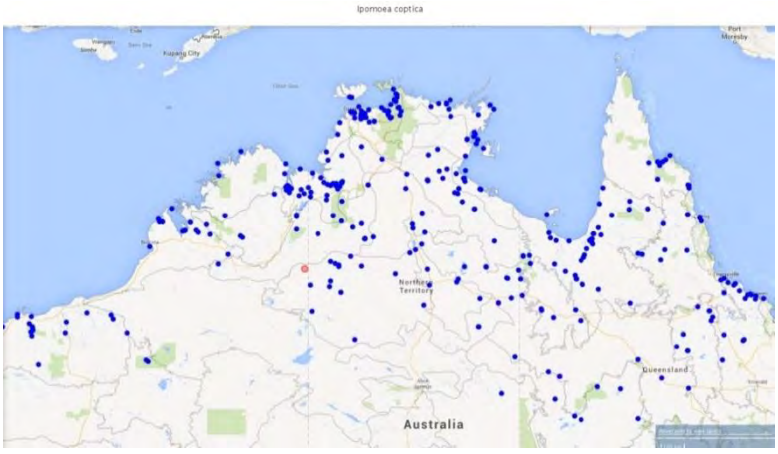
Indigofera linnaei



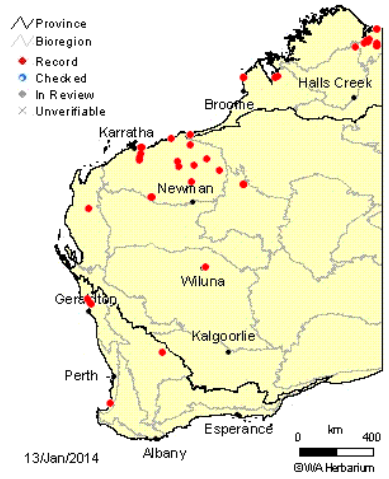


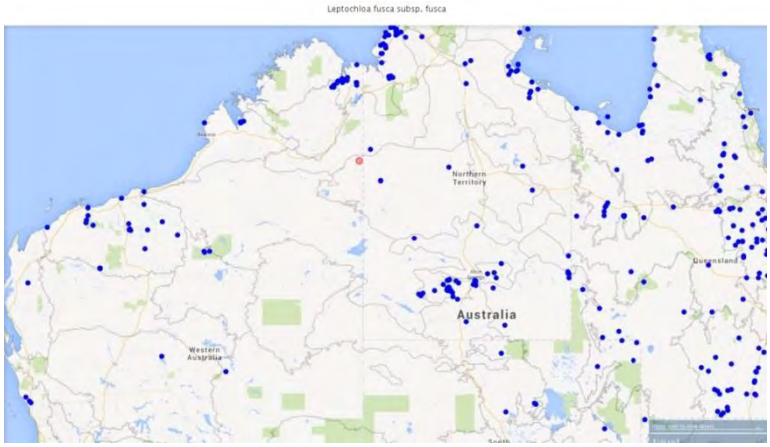
Ipomoea coptica



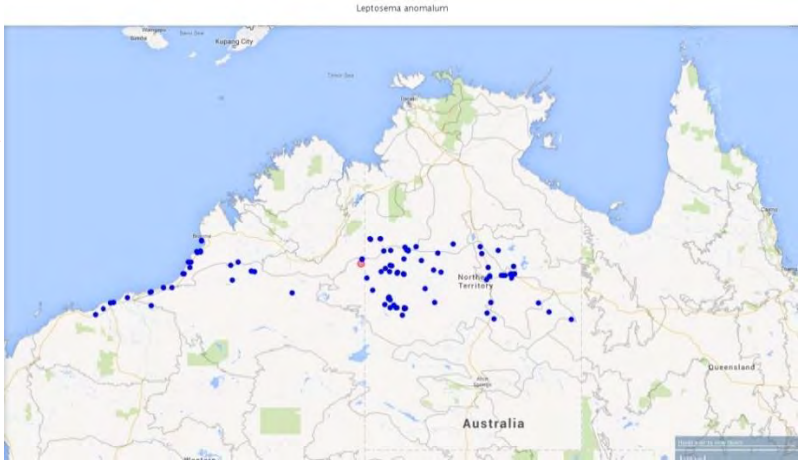


Leptochloa fusca subsp. *fusca*

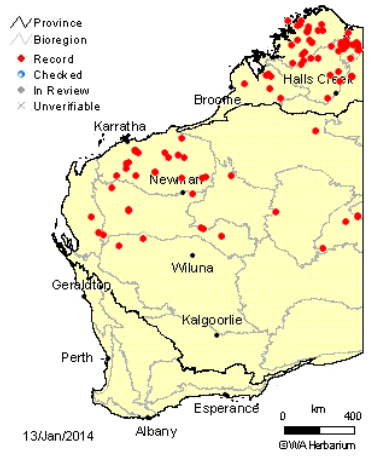


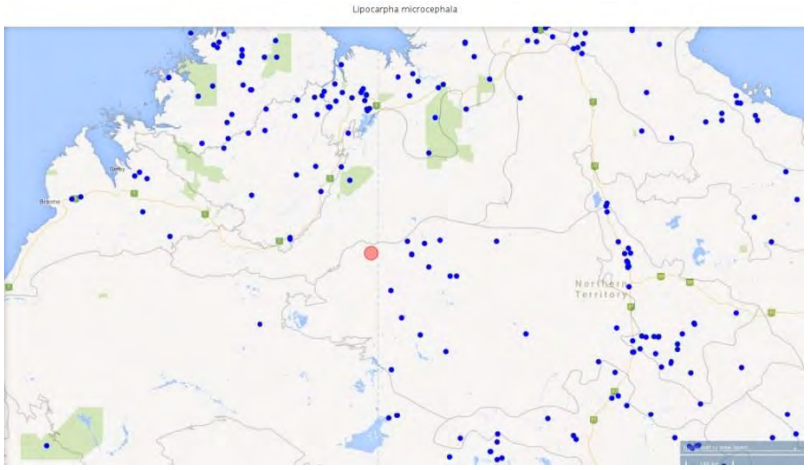


Leptosema anomalum

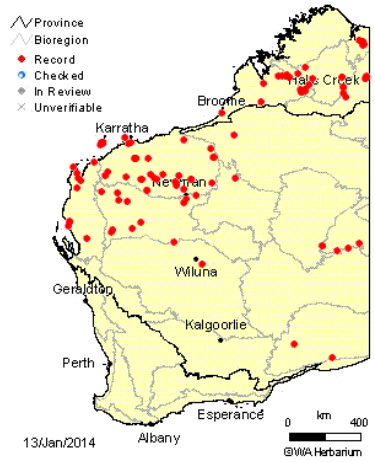


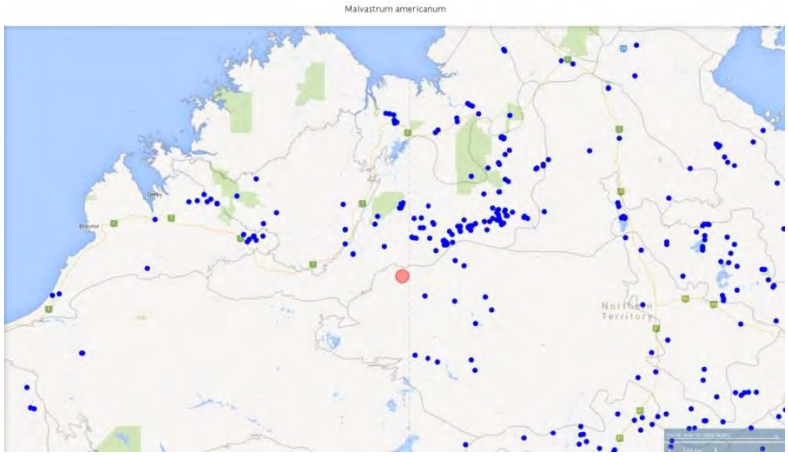
Lipocarpha microcephala



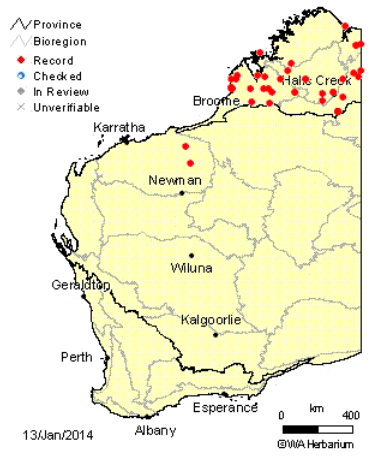


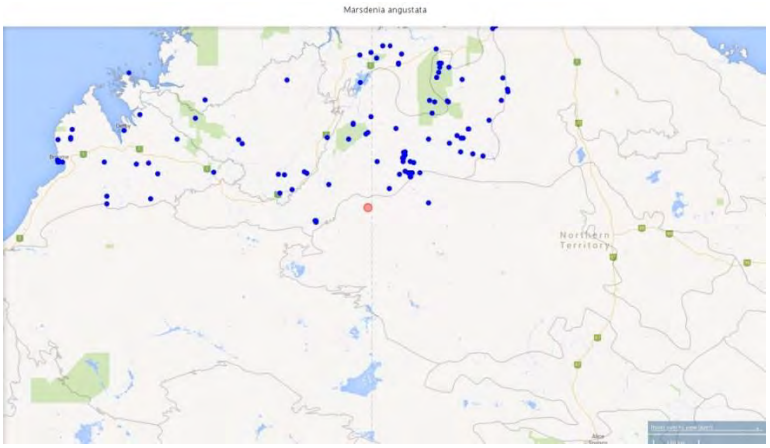
Malvastrum americanum



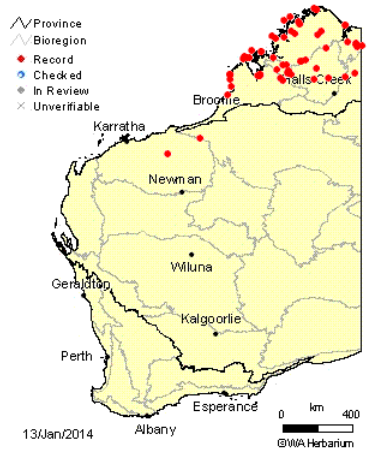


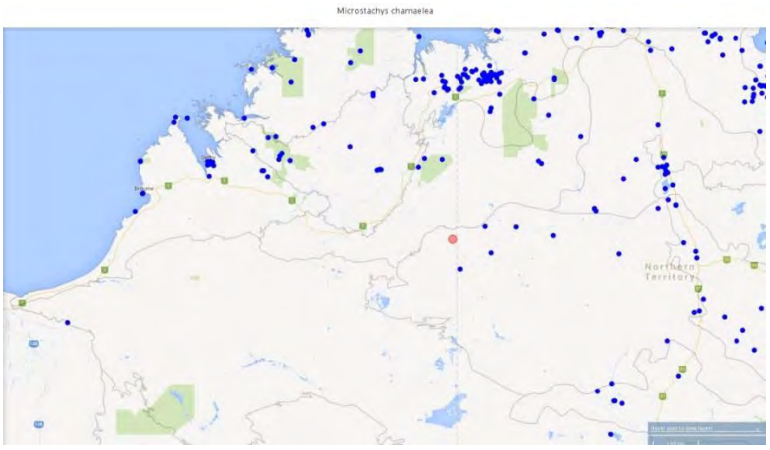
Marsdenia angustata



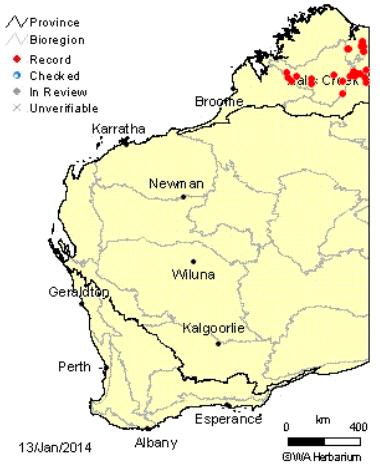


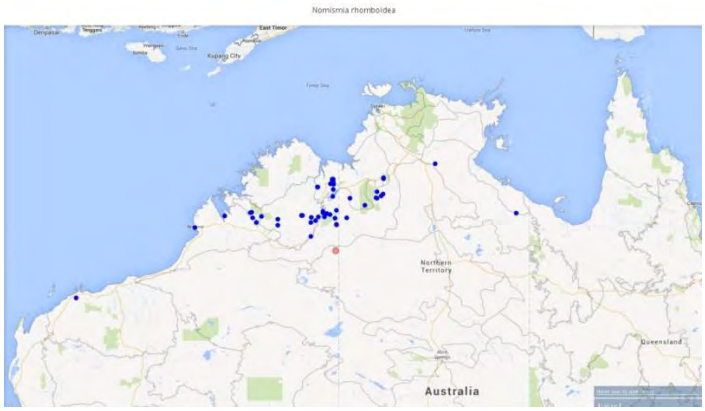
Microstachys chamaelea



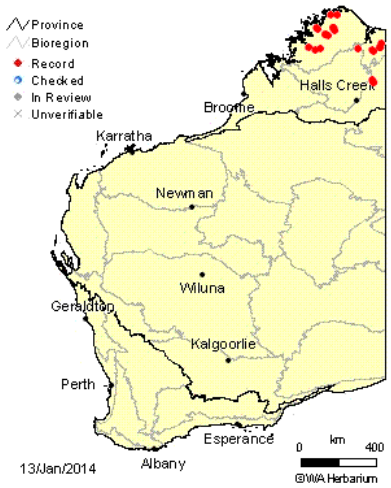


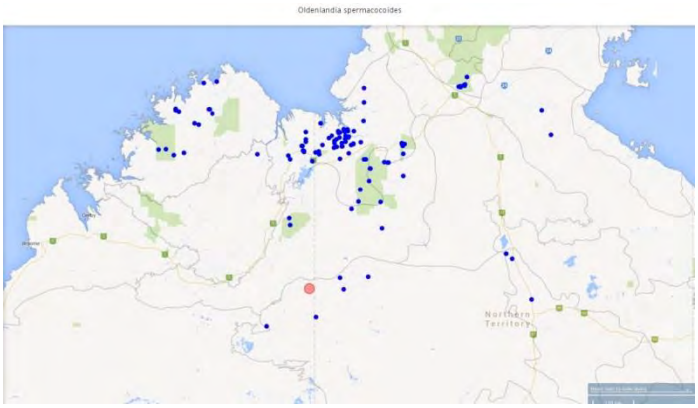
Nomismia rhomboidea



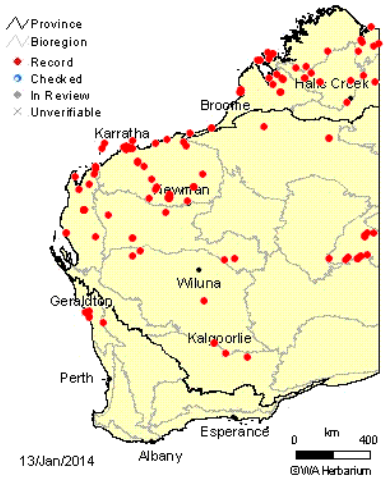


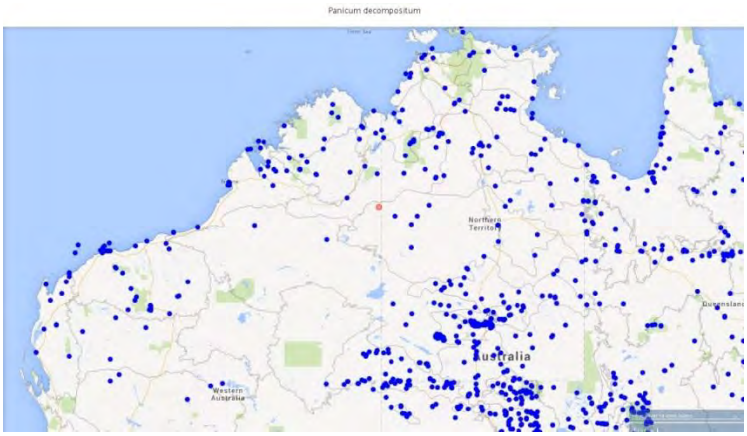
Oldenlandia spermacocoides



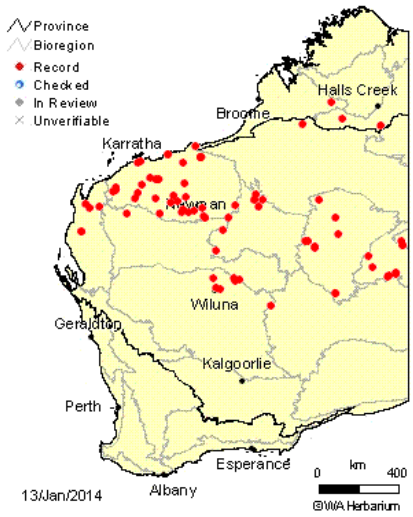


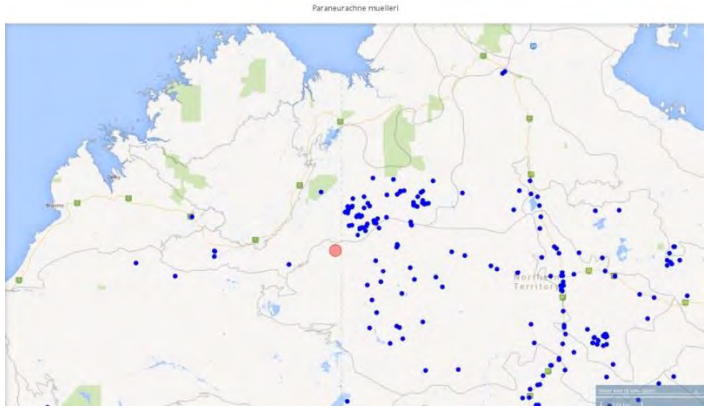
Panicum decompositum



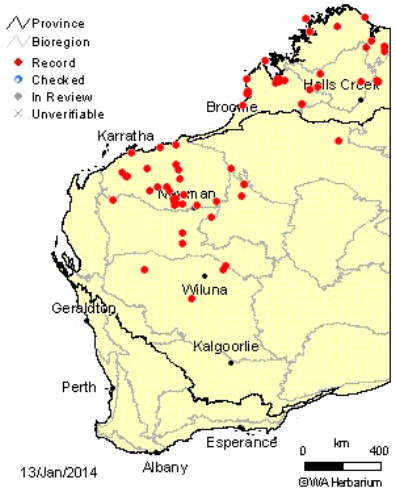


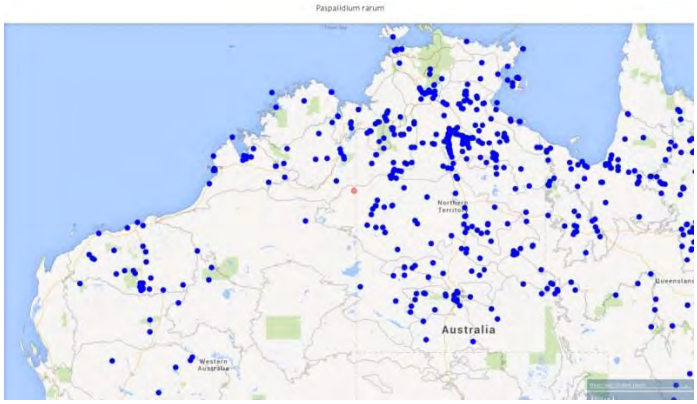
Paraneurachne muelleri



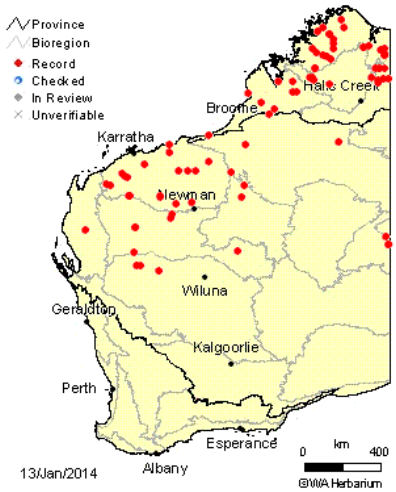


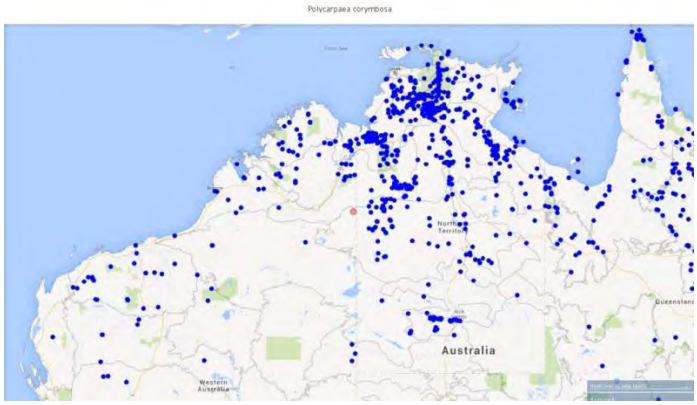
Paspalidium rarum



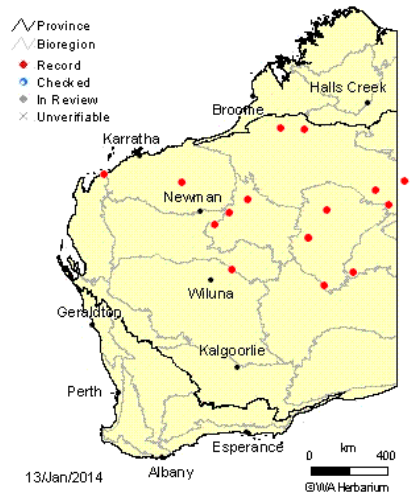


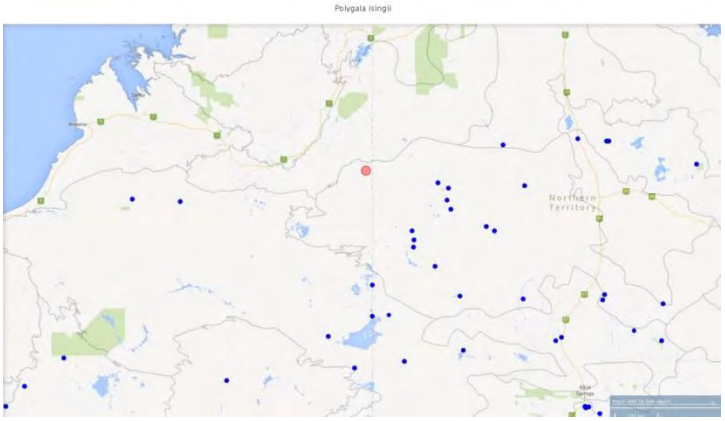
Polycarpaea corymbosa



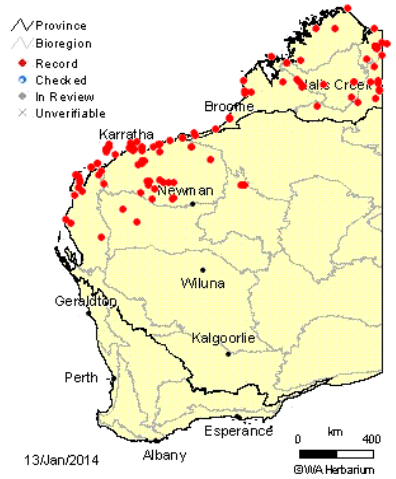


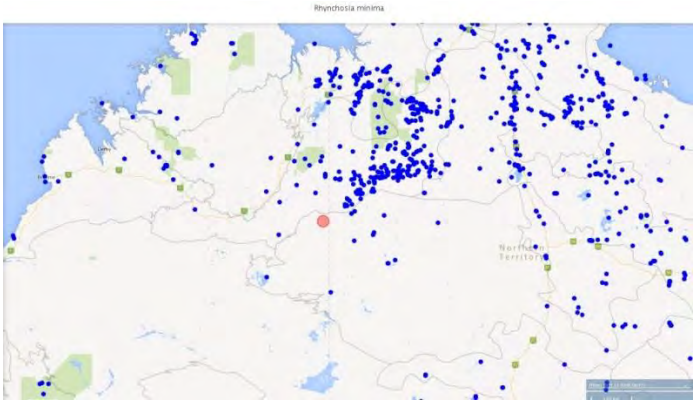
Polygala isingii



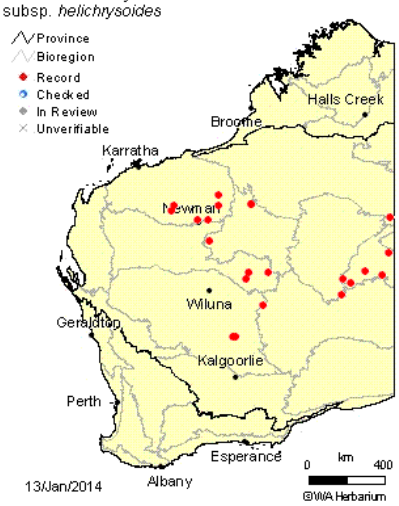


Rhynchosia minima

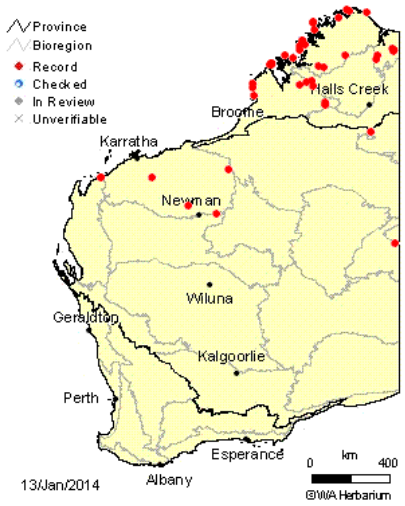


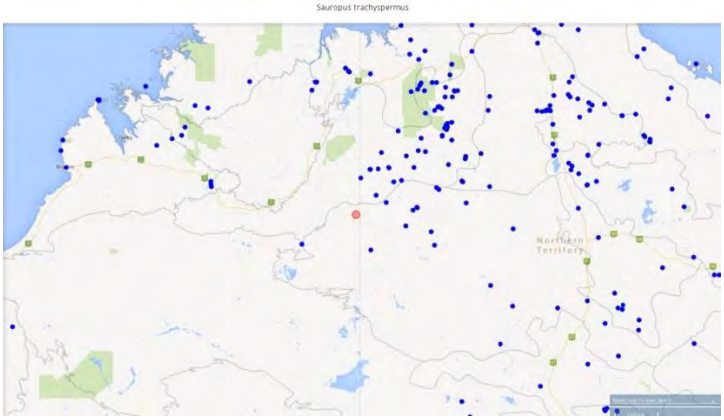


Rutidosis helichrysoides subsp. *helichrysoides*

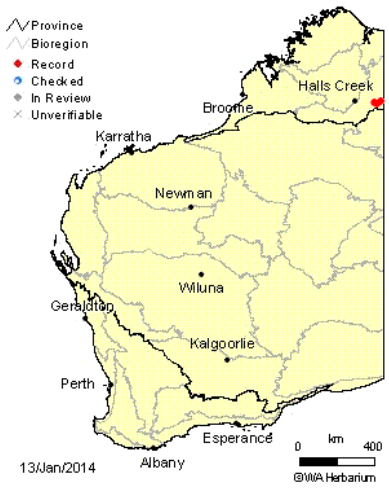


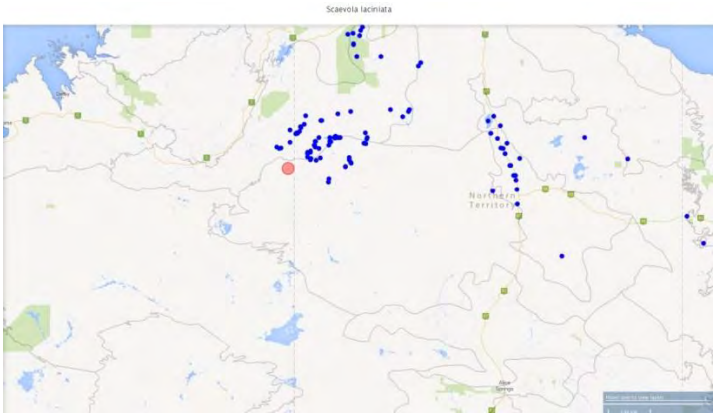
Sauropus trachyspermus



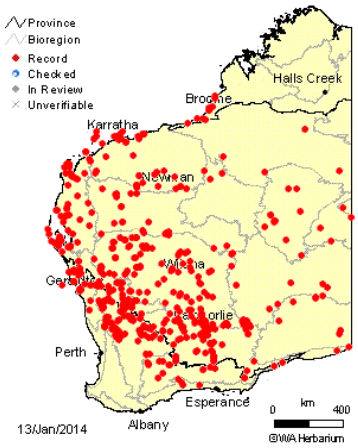


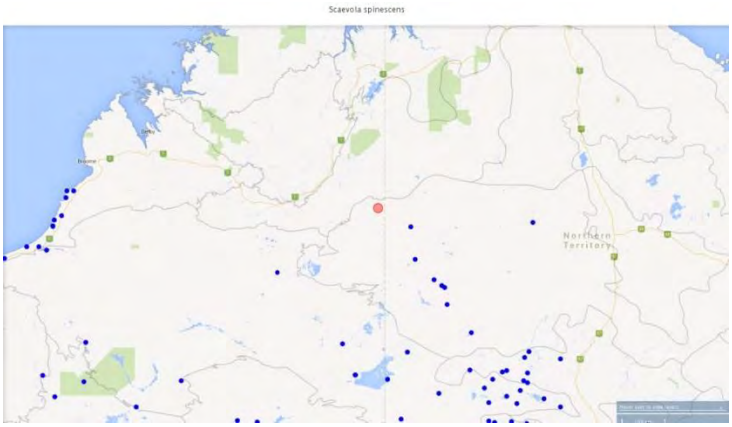
Scaevola laciniata



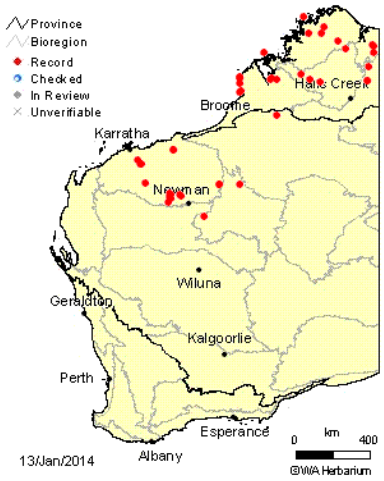


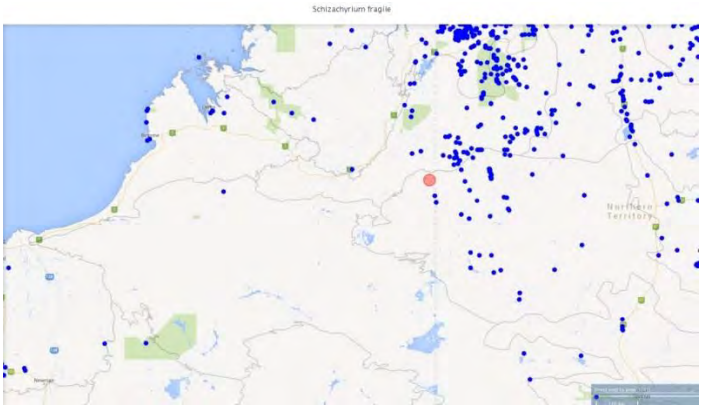
Scaevola spinescens



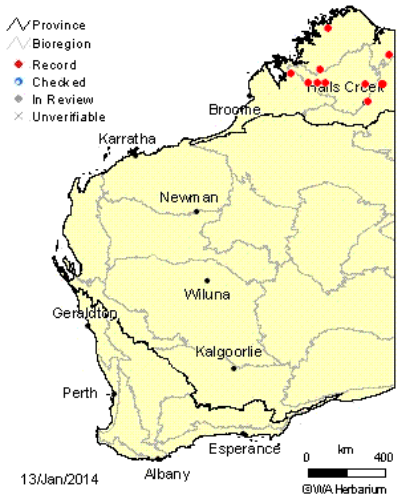


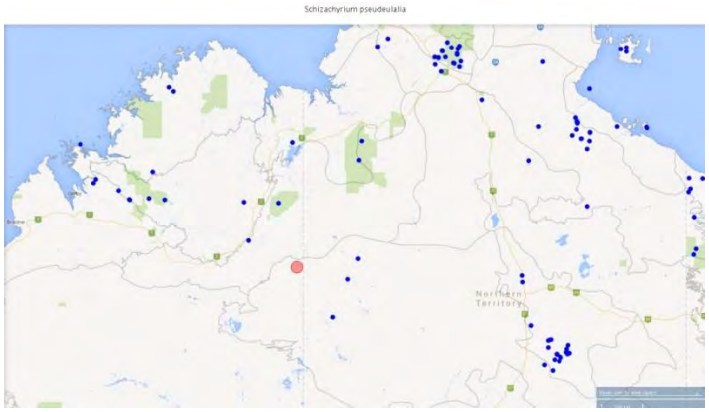
Schizachyrium fragile



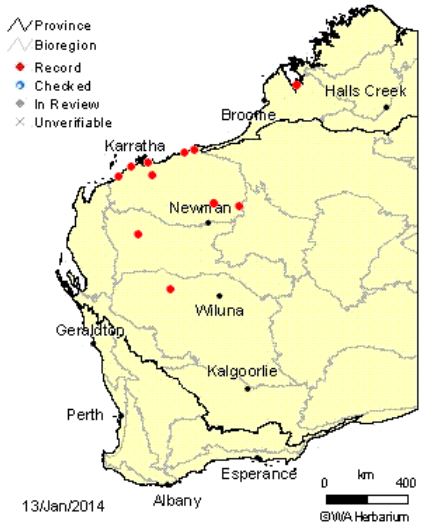


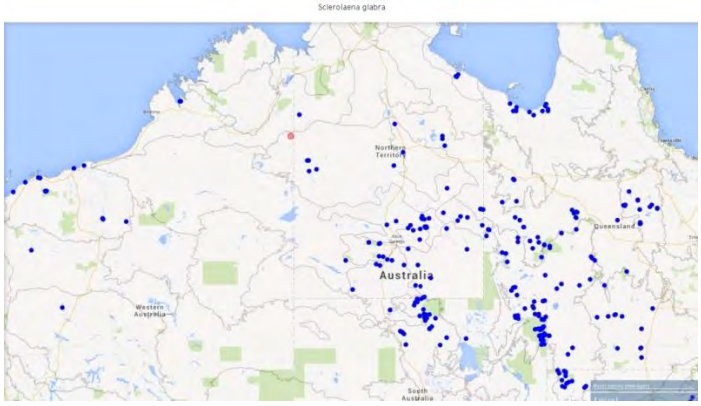
Schizachyrium pseudeulalia



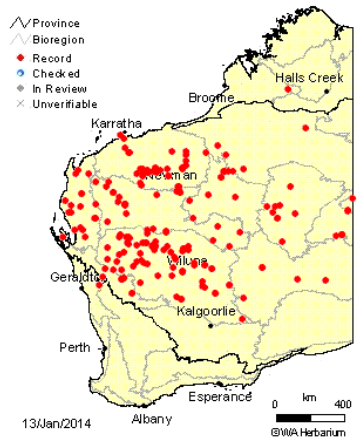


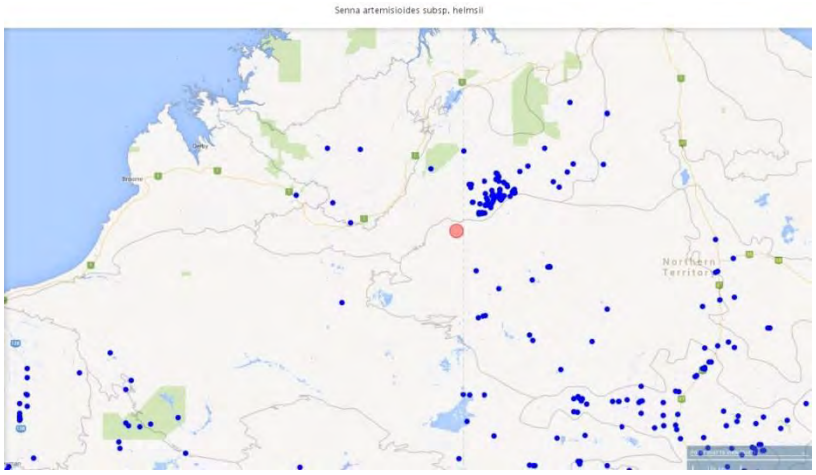
Sclerolaena glabra



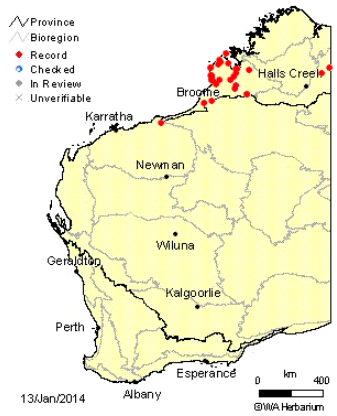


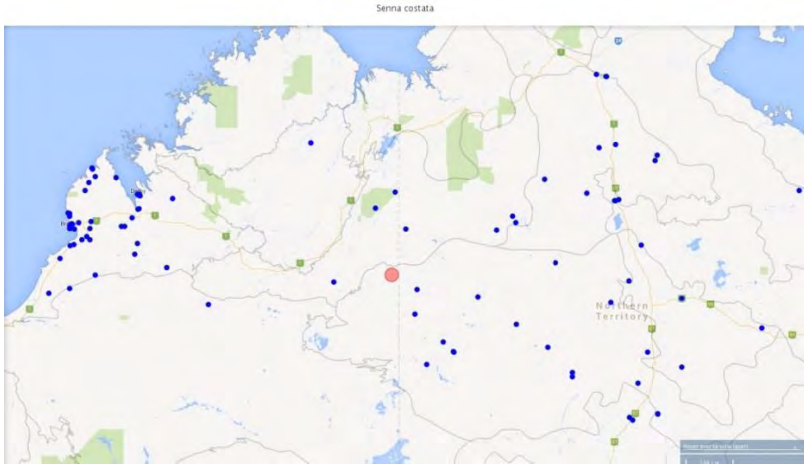
Senna artemisioides subsp. *helmsii*



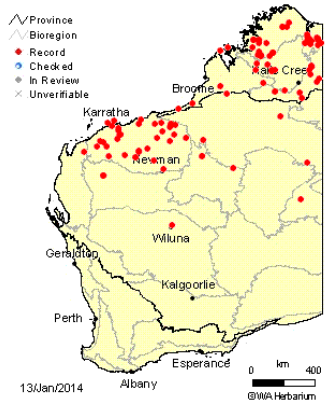


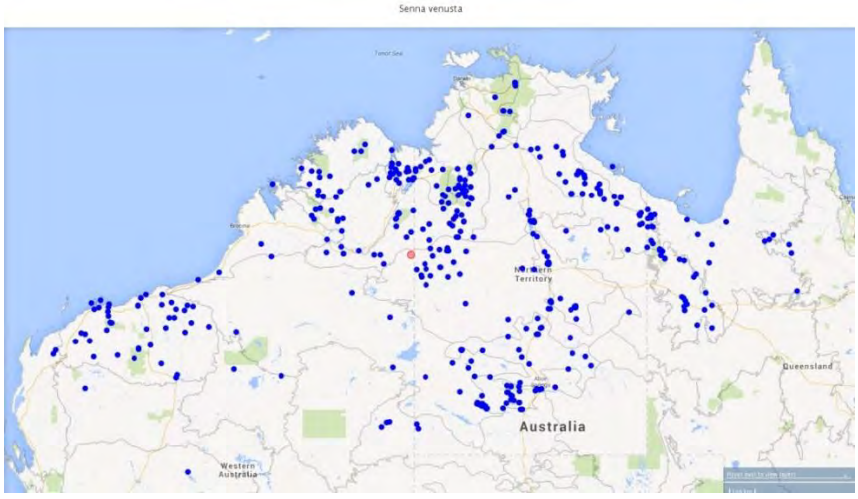
Senna costata



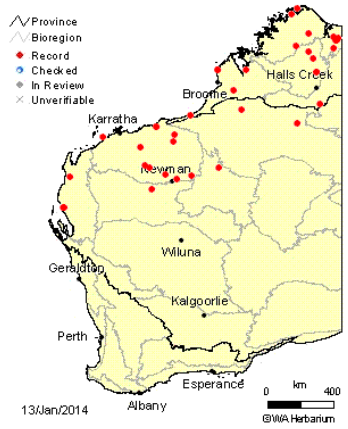


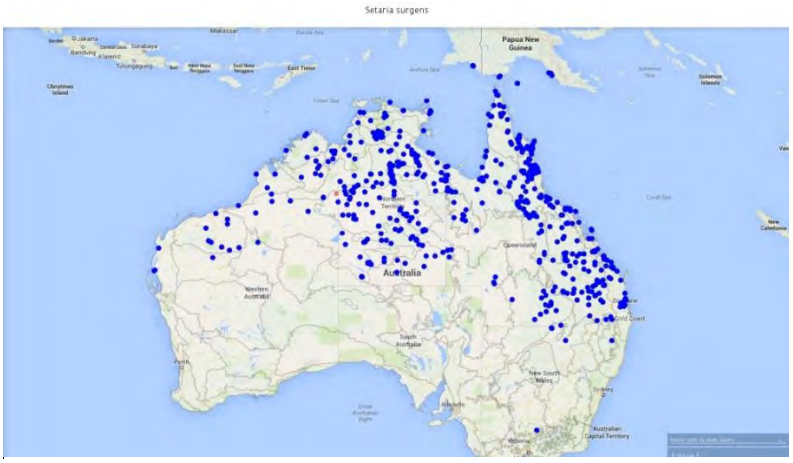
Senna venusta



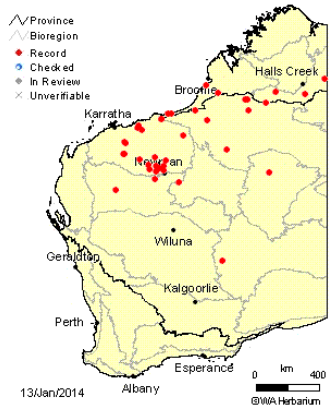


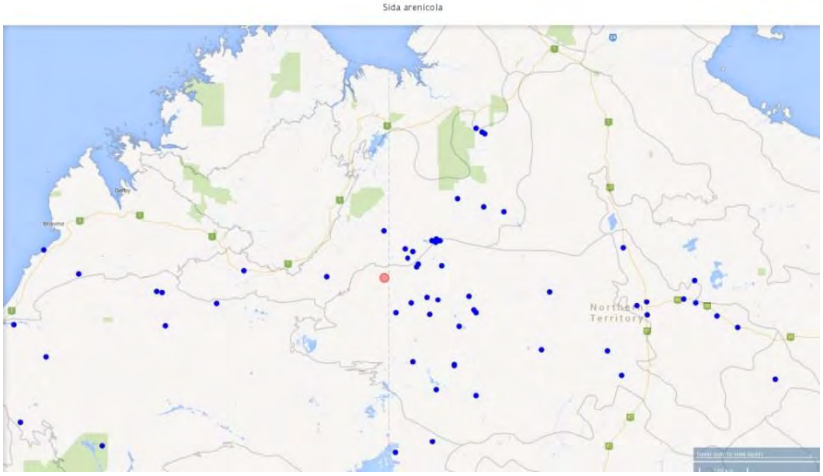
Setaria surgens



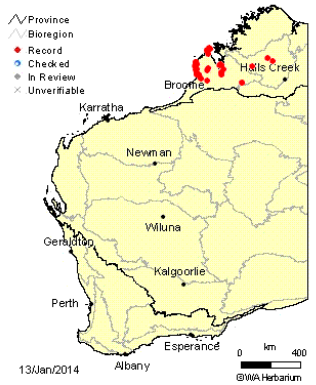


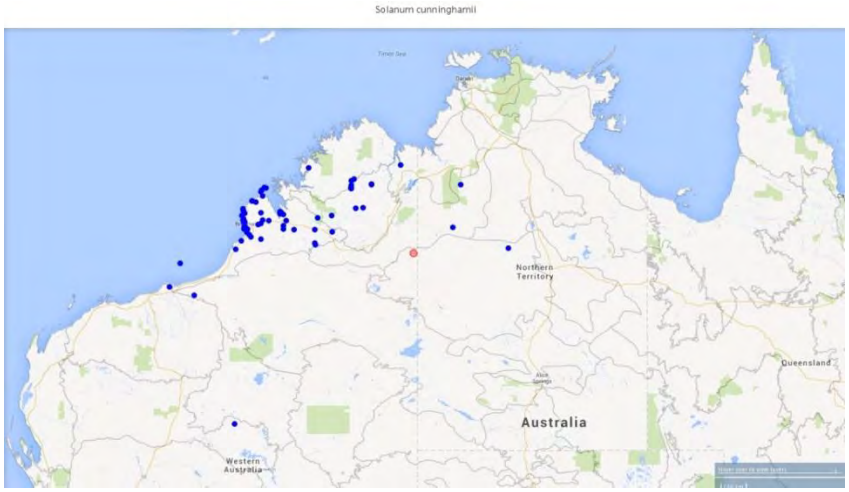
Sida arenicola





Solanum cunninghamii





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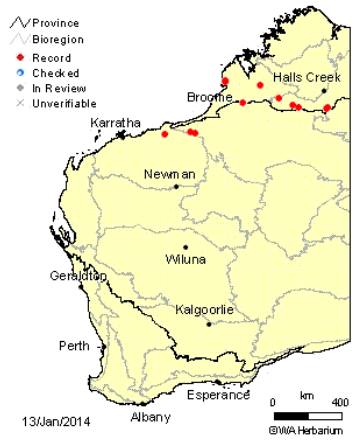
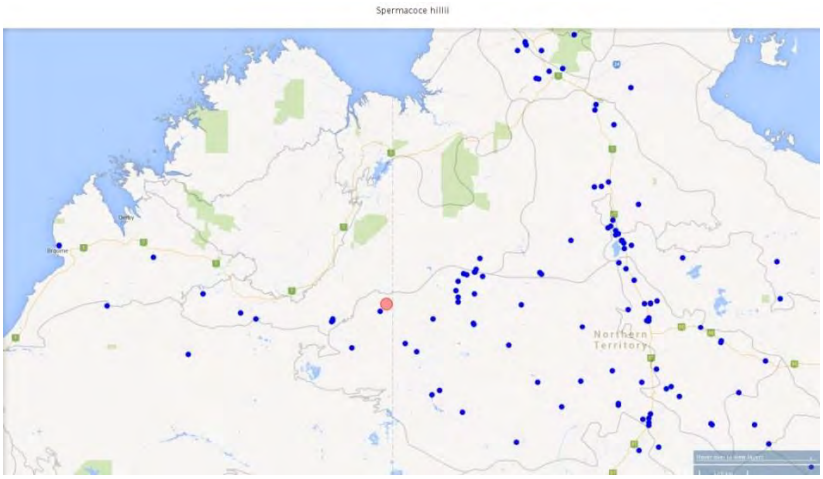
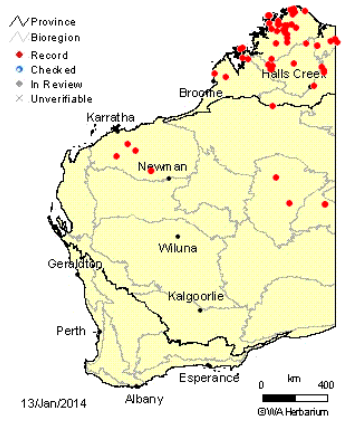
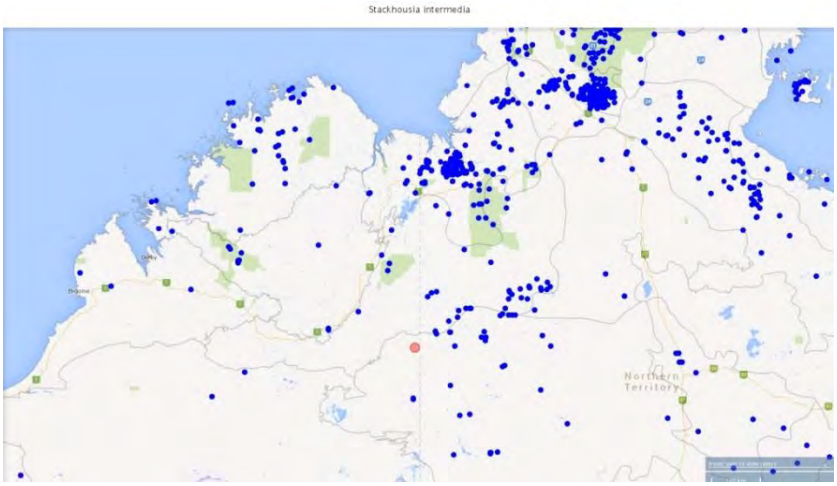


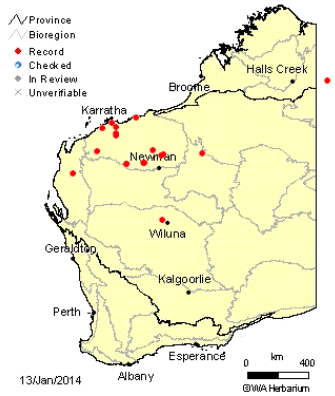


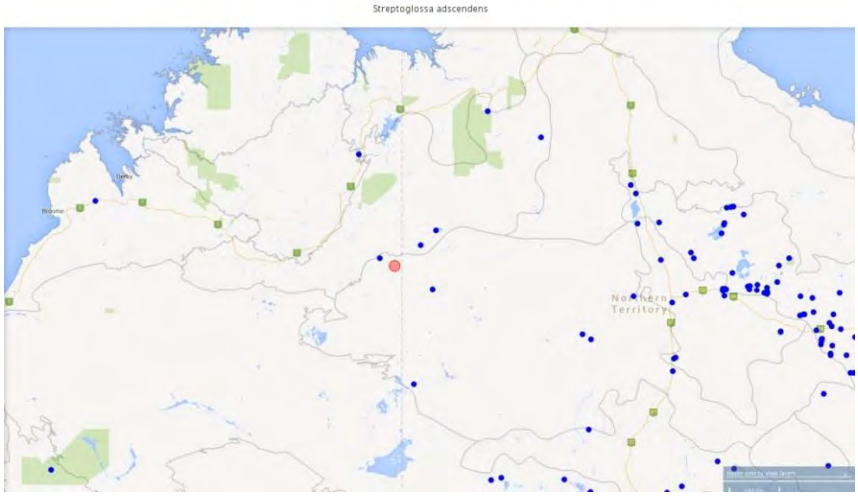
Stackhousia intermedia



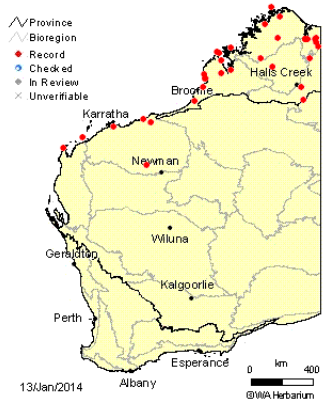


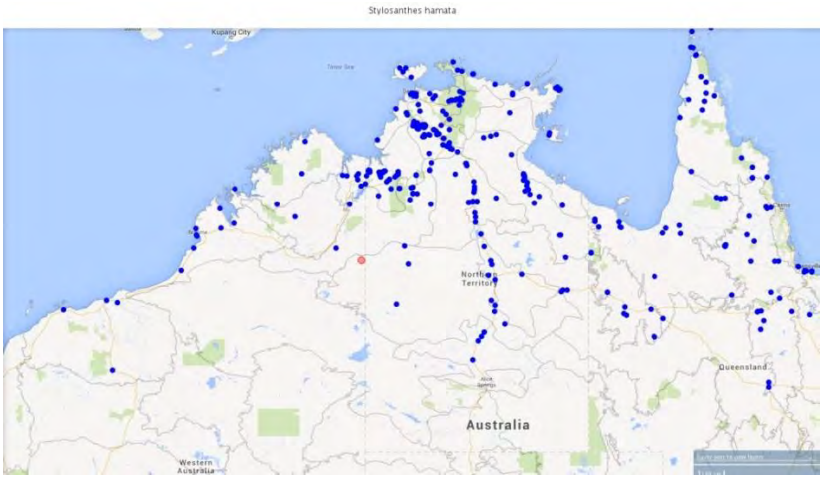
Streptoglossa adscendens



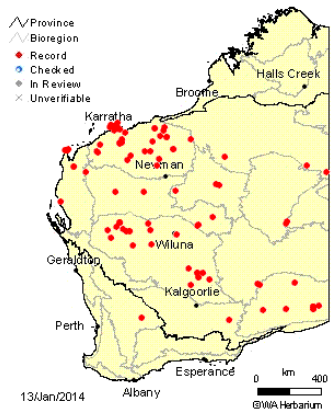


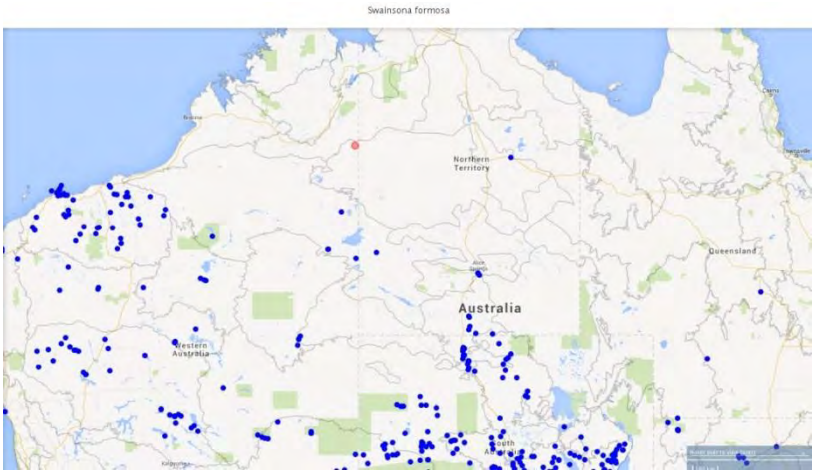
Stylosanthes hamata



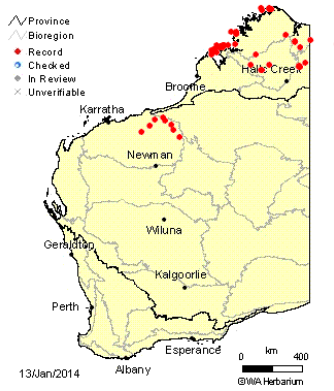


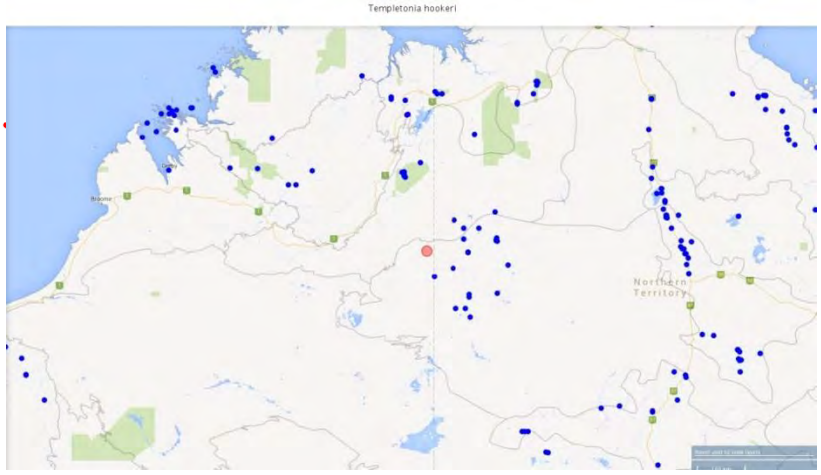
Swainsona formosa



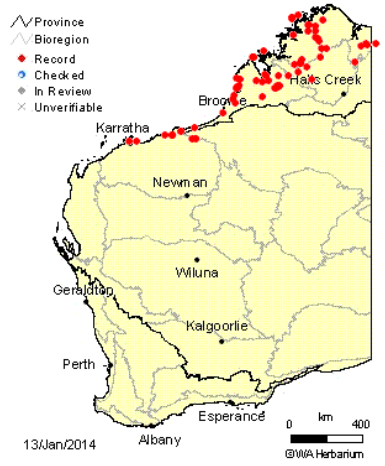


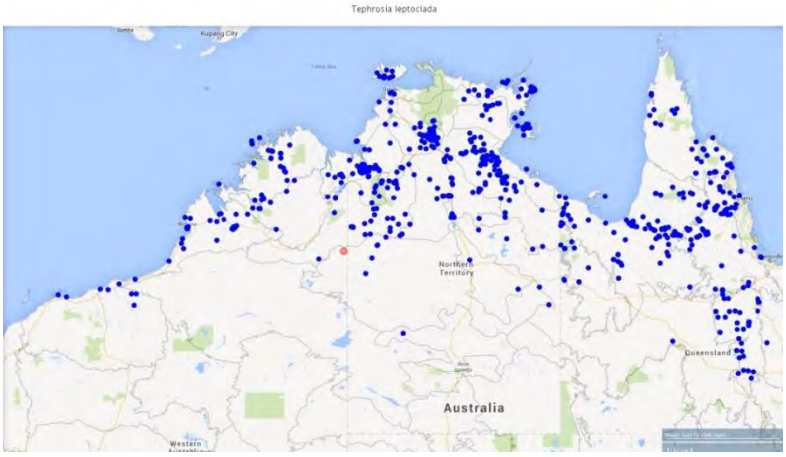
Templetonia hookeri



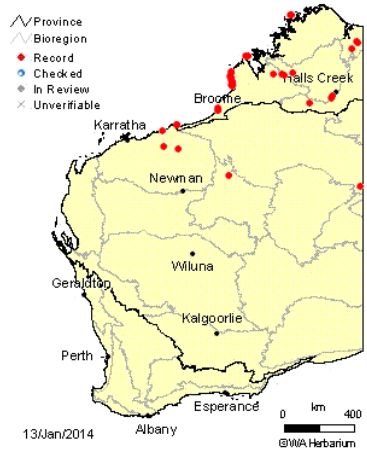


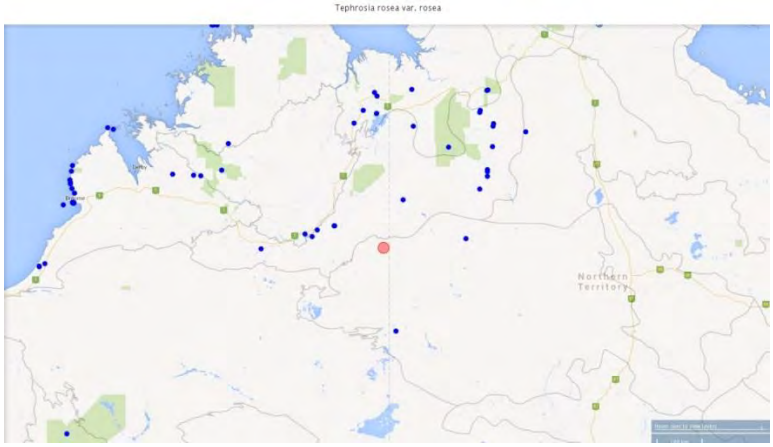
Tephrosia leptoclada



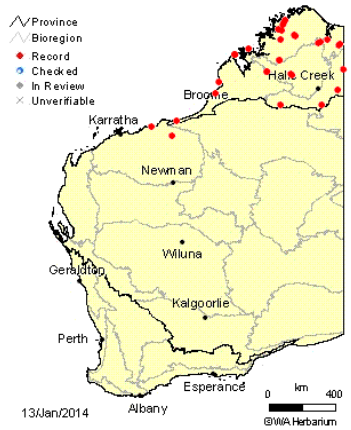


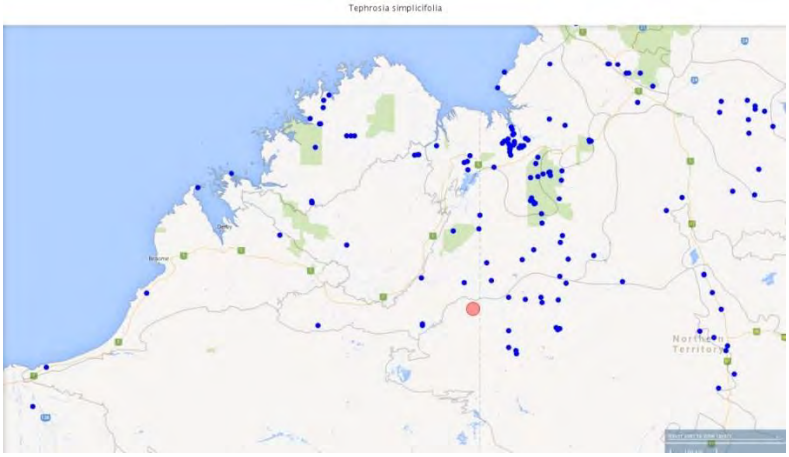
Tephrosia rosea var. *rosea*



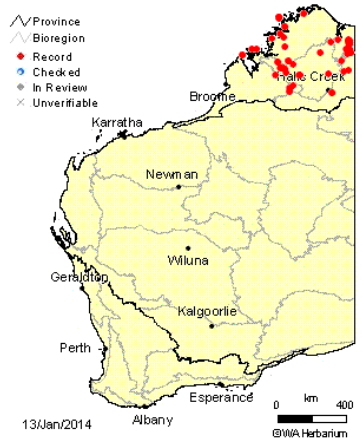


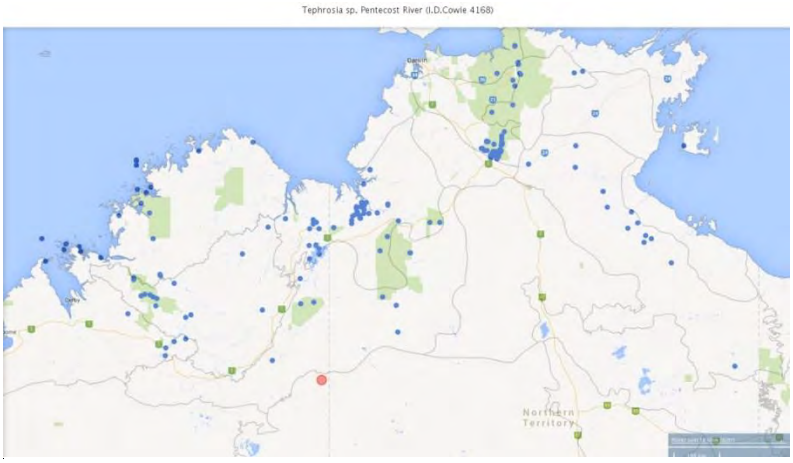
Tephrosia simplicifolia



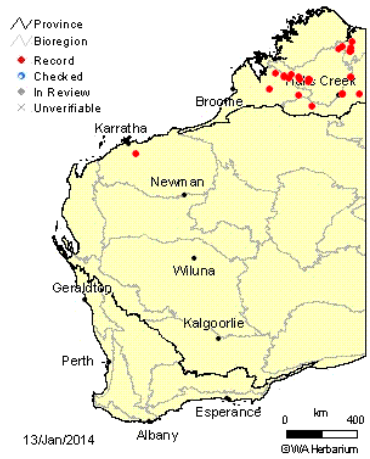


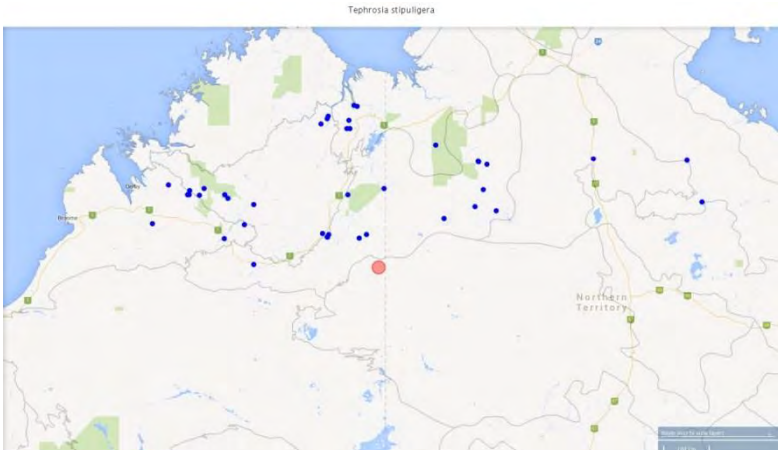
Tephrosia sp. Pentecost River (I.D. Cowie 4168)



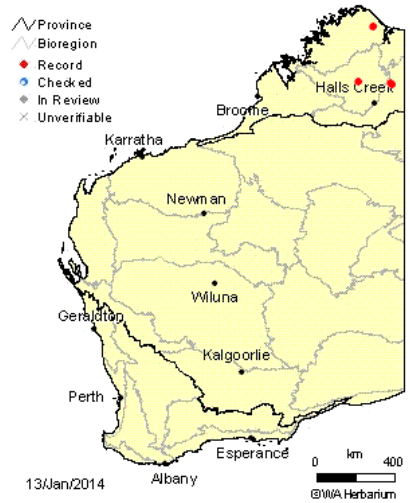


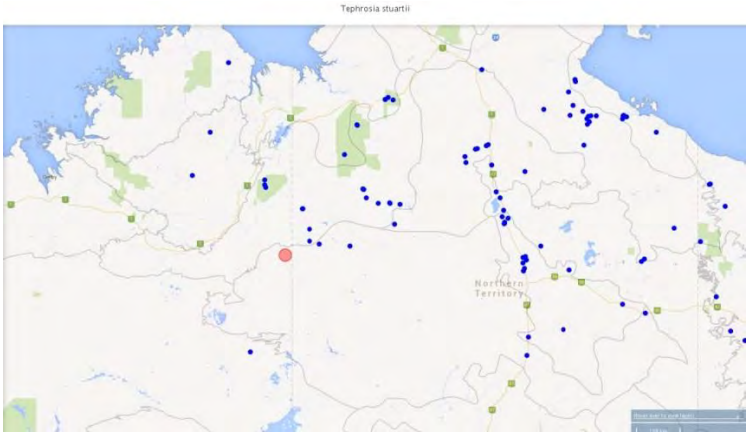
Tephrosia stipuligera



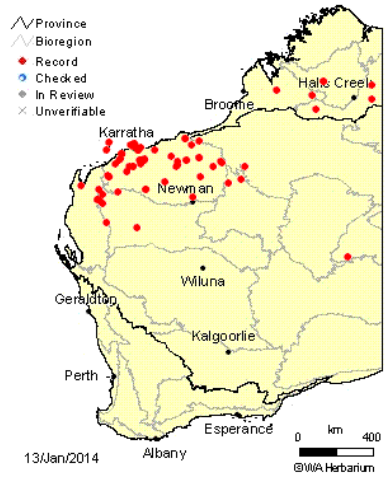


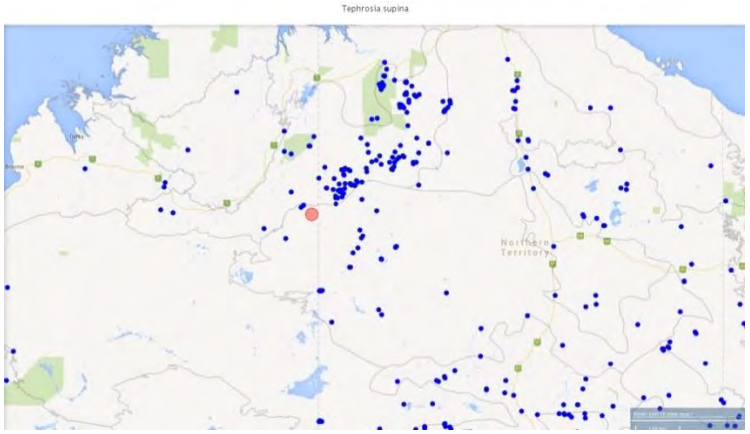
Tephrosia stuartii



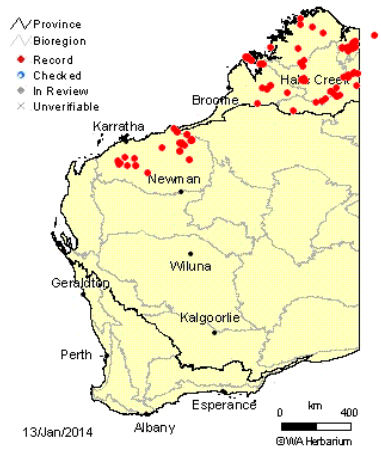


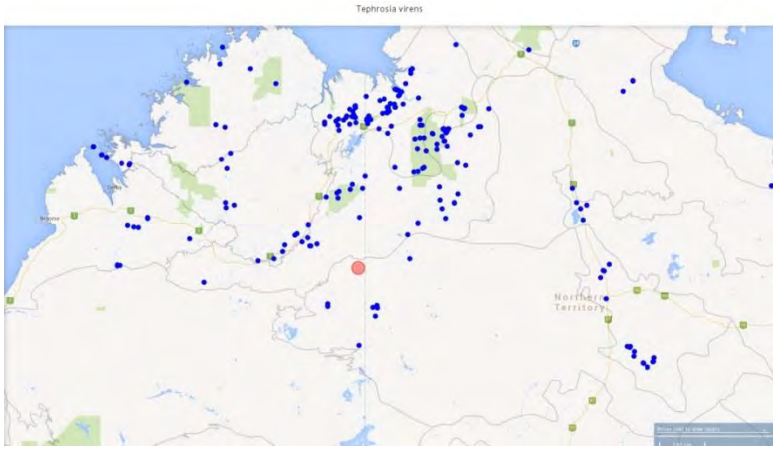
Tephrosia supina



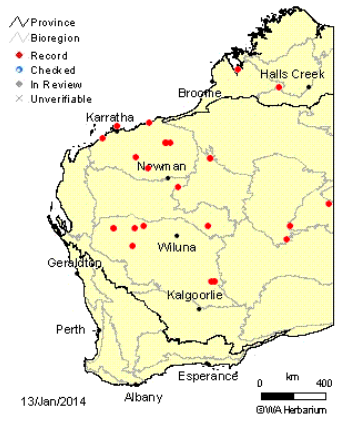


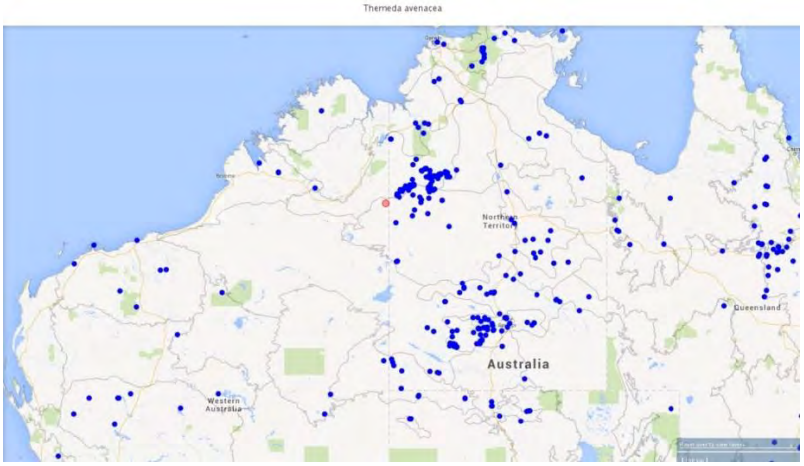
Tephrosia virens



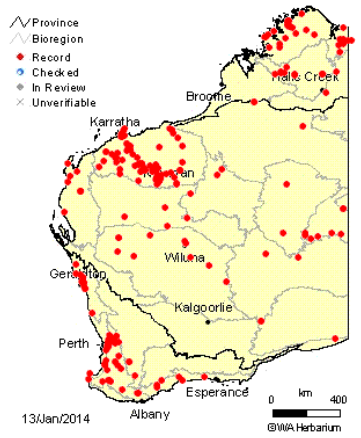


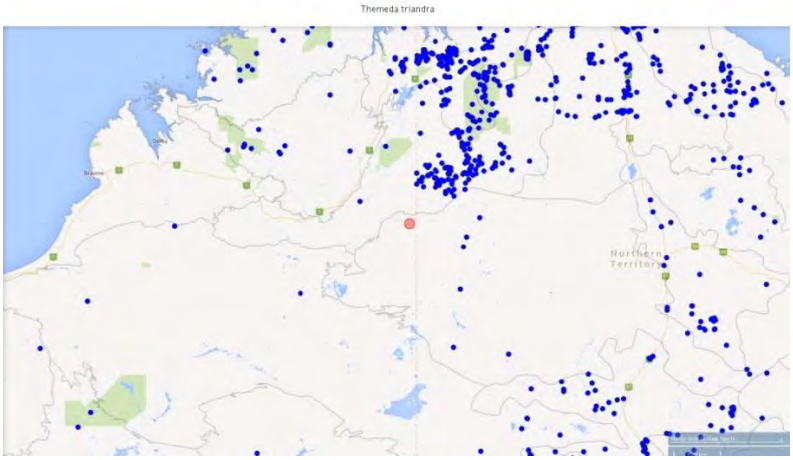
Themeda avenacea



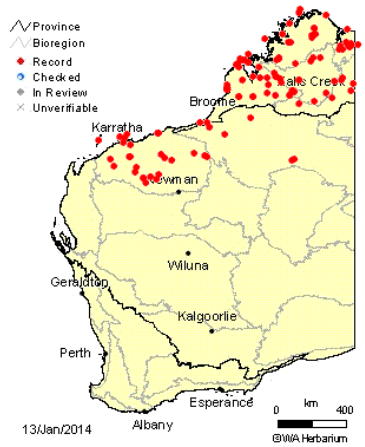


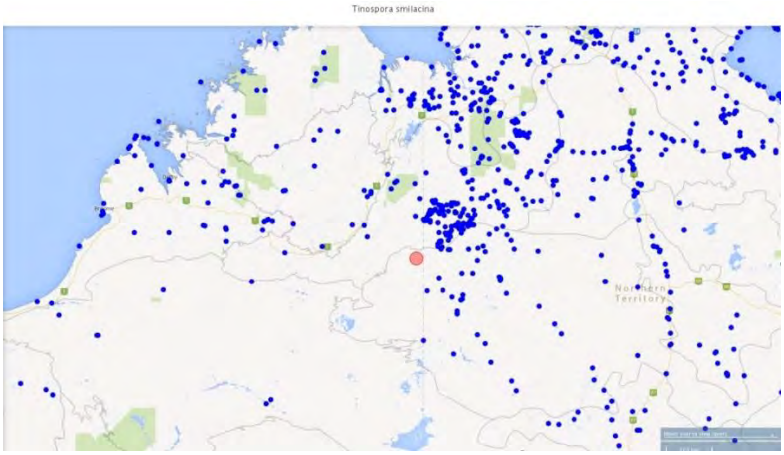
Themeda triandra



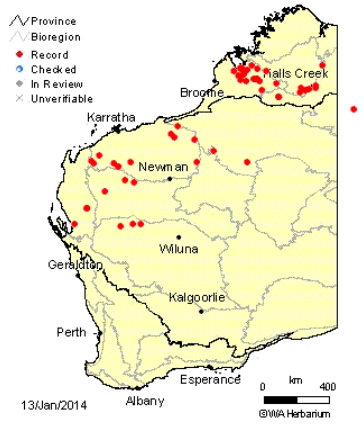


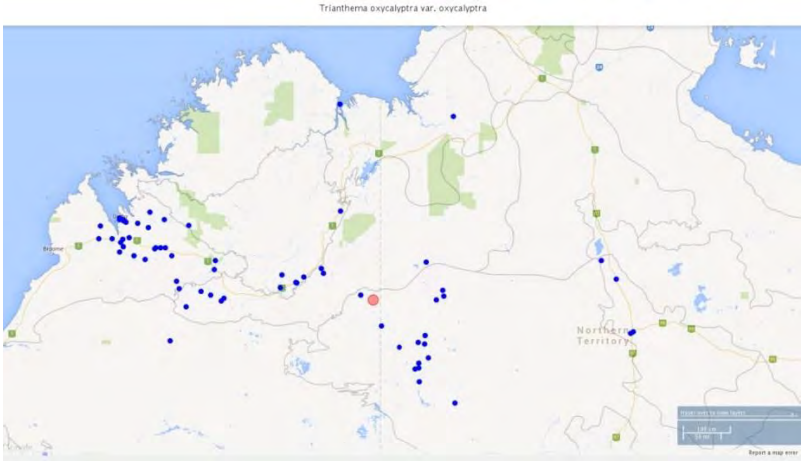
Tinospora smilacina



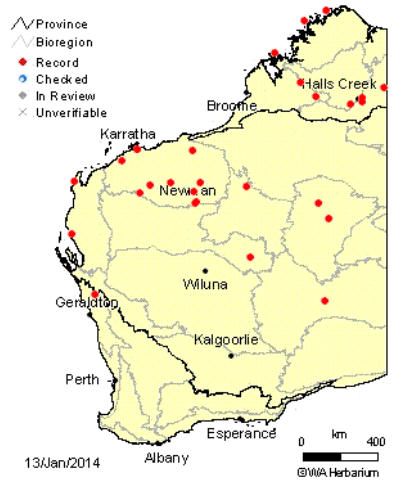


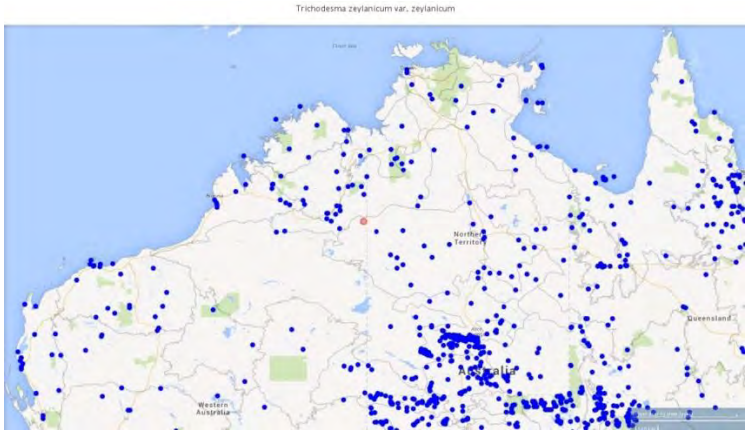
Trianthema oxycalyptra var. *oxycalyptra*



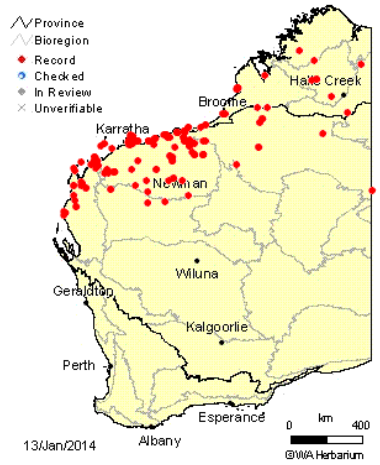


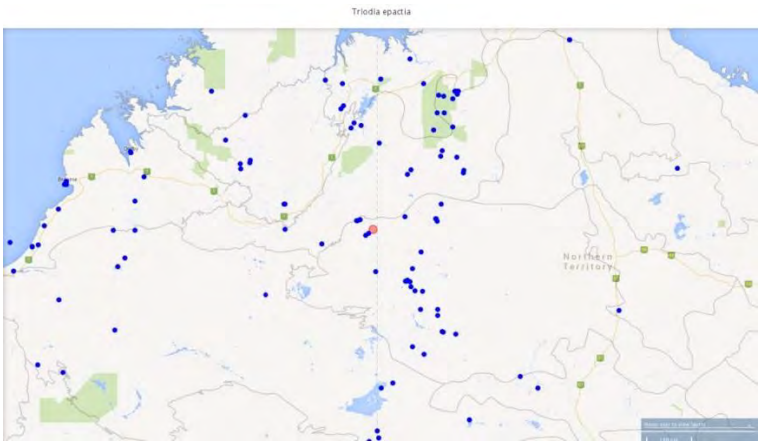
Trichodesma zeylanicum var. *zeylanicum*



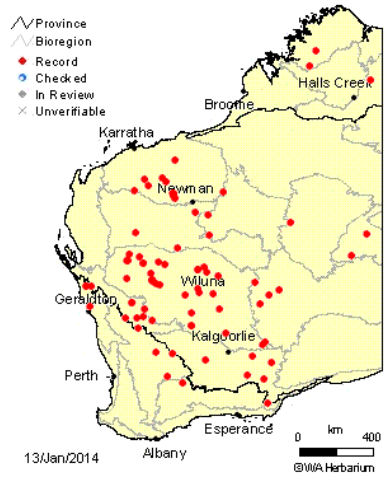


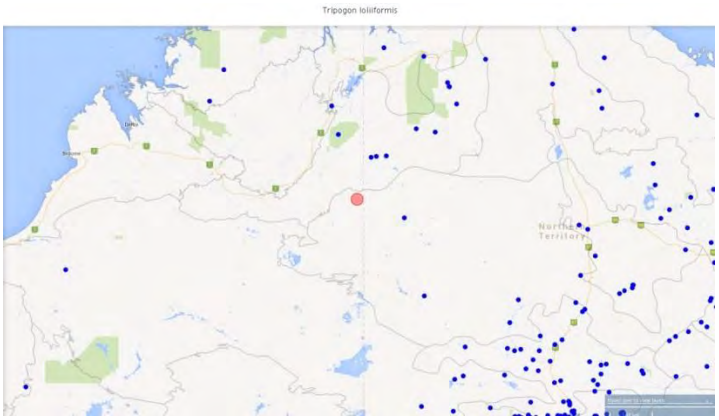
Triodia epactia



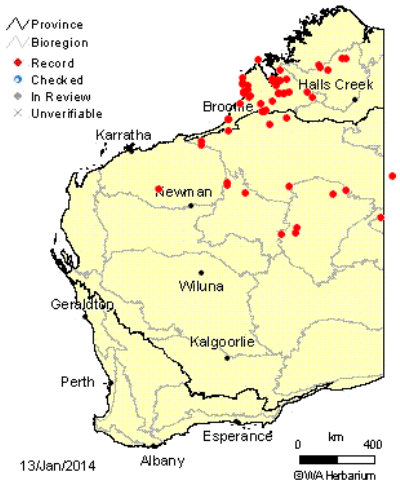


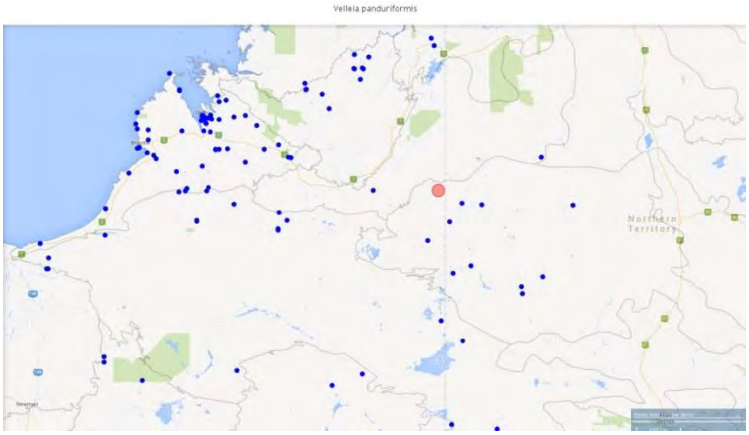
Tripogon loliiformis



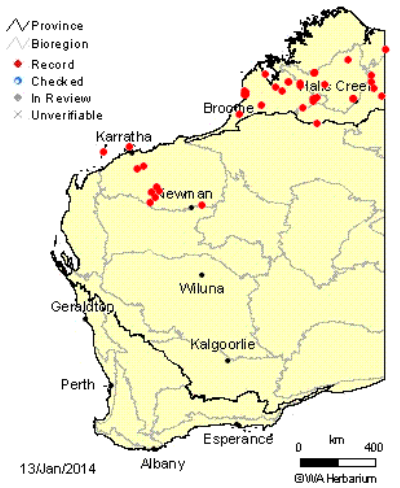


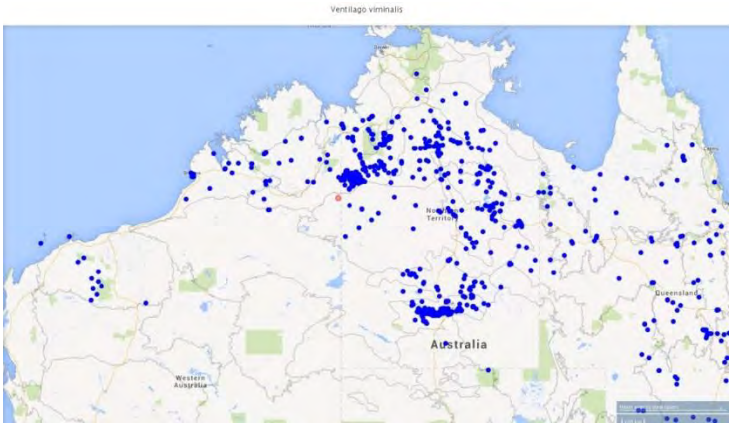
Velleia panduriformis



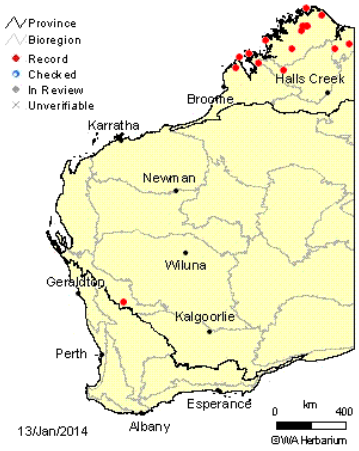


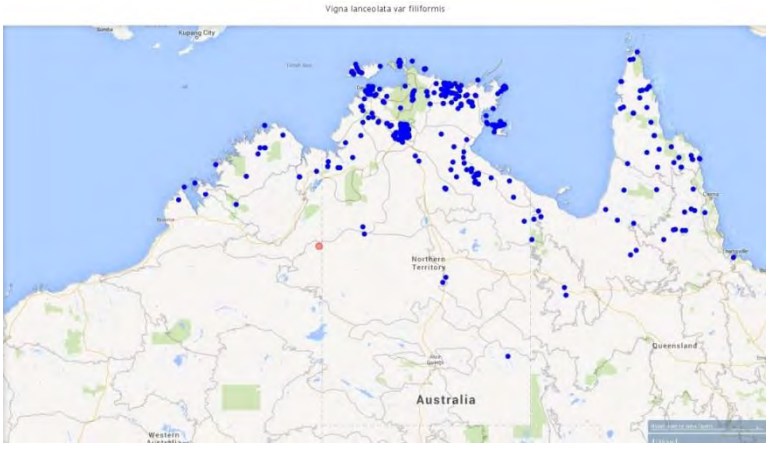
Ventilago viminalis



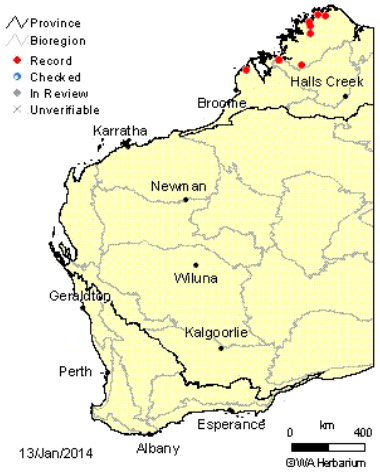


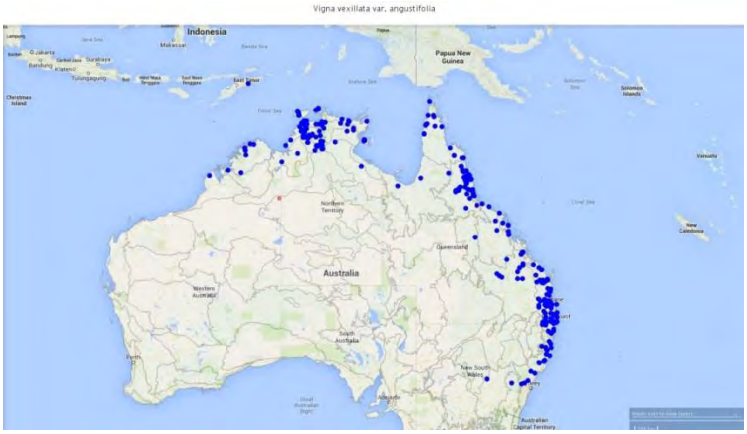
Vigna lanceolata var. *filiformis*



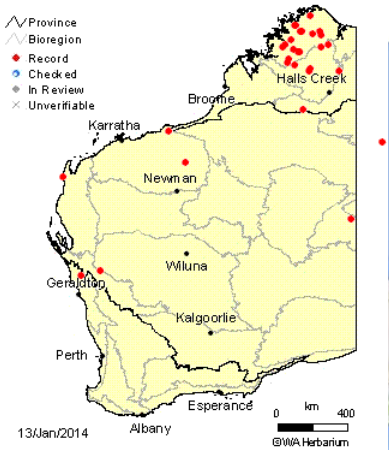


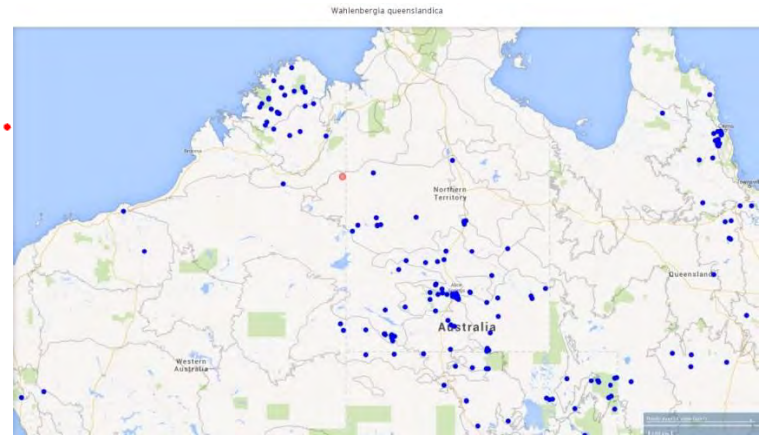
Vigna vexillata var. *angustifolia*



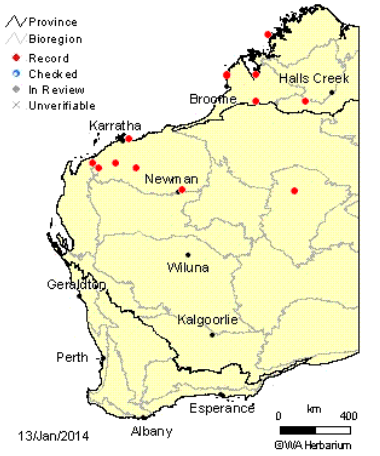


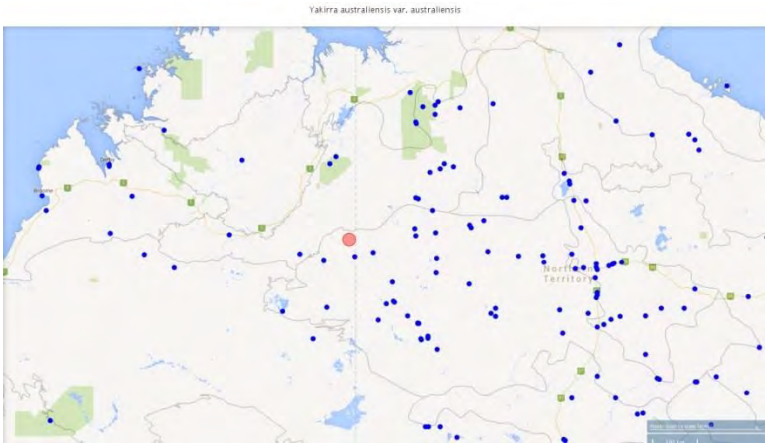
Wahlenbergia queenslandica



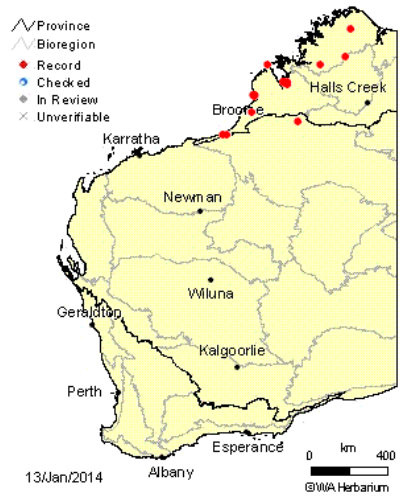


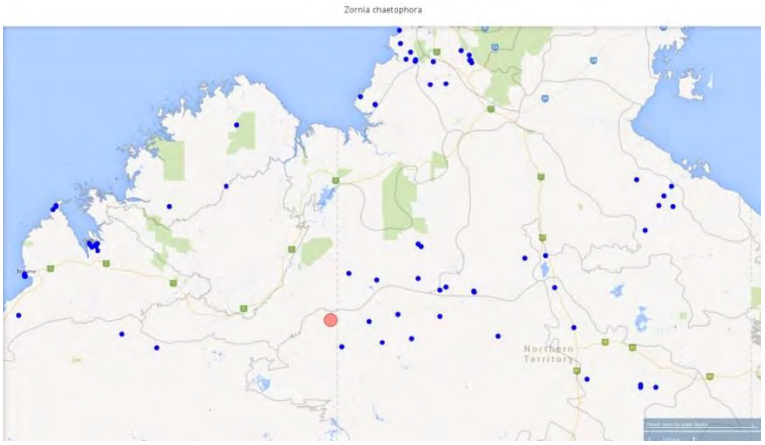
Yakirra australiensis var. *australiensis*



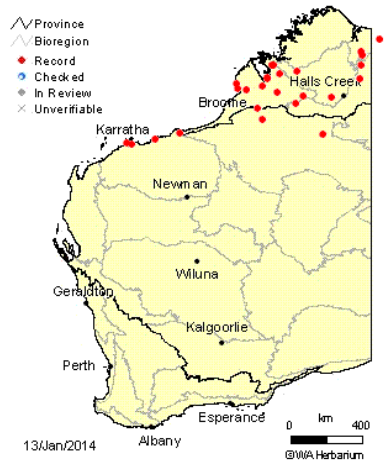


Zornia chaetophora





Zornia muelleriana subsp. *congesta*



APPENDIX H

Locations, Date of Survey and Vegetation Condition of Quadrats and Relevés Sampled in the Browns Range Study Area

Quadrats in the Browns Range Study Area				
Quadrat	AMG Zone 52 K		Vegetation Condition	
	Easting (NW corner)	Northing (NW corner)	2012	2013
QBrow 1	0491347	7913354	Very Good	Very Good
QBrow 5a	0492918	9714565	Excellent	Excellent
QBrow 6	0494362	7914531	Excellent	Partially cleared
QBrow 7	0494009	7914239	Excellent	Burnt ?Oct.12
QBrow 10	0493994	7913056	Excellent	Burnt ?Oct.12
QBrow 12	0494634	7912460	Excellent	Not assessed
QBrow 13	0494637	7912173	Excellent	Excellent
QBrow 14	0493873	7911949	Excellent	Not assessed
QBrow 15	0491600	7912487	Excellent	Not assessed
QBrow 16	0492140	7911864	Excellent	Not assessed
QBrow 21	0493396	7910695	Excellent	Excellent
QBrow 22	0494039	7910937	Excellent	Excellent
QBrow 24	0491339	7910221	Excellent	Not assessed
QBrow 28	0492948	7908685	Excellent	Recently burnt
QBrow 29	0493492	7908608	Excellent	Not assessed
QBrow 30	0494510	7908626	Excellent	Not assessed
QBrow 31	0491671	7908040	Excellent	Excellent
QBrow 32	0493486	7906935	Excellent	Not assessed
QBrow 33	0494294	7906027	Excellent	Excellent
QBrow 38	0493959	7904546	Excellent	Burnt ?Oct.12
QBrow 42	0491444	7904260	Excellent	Burnt ?Oct.12
QBrow 43	0491353	7903820	Excellent	Burnt ?Oct.12
QBrow 45	0492084	7903249	Excellent	Burnt ?Oct.12
QBrow 46a	0491913	7902725	Excellent	Excellent
QBrow 46b	495662	7903746	-	Very Good - Excellent
QBrow 49	0491656	7902178	Excellent	Excellent
QBrow 51	0493129	7901918	Excellent	Excellent
QBrow 51a	493761	7900350		Very Good
QBrow 52	0492861	7902519	Very Good	Not assessed
QBrow 53	0493649	7902545	Excellent	Not assessed

Quadrats in the Browns Range Study Area				
QBrow 55	0494409	7901737	Excellent	Burnt ?Oct.12
QBrow 56	0493806	7901717	Excellent	Burnt ?Oct.12
QBrow 57a	0494499	7907174	Excellent	Not assessed
QBrow 58	0494359	7914925	Excellent	Excellent
QBrow 59	0492103	7908957	Excellent	Burnt ?Oct.12
QBrow 64a	0492614	7905274	Excellent	Burnt ?Oct.12
QBrow 65	0492241	7907158	Excellent	Not assessed
QBrow 66	0492956	7909854	Excellent	Excellent
QBrow 67	0493042	7914629	Excellent	Excellent
QBrow 100	0491709	7907316	Excellent	Excellent
QBrow 101	491966	7908875	-	Excellent
QBrow 102	496441	7904200	-	Excellent
QBrow 103	496441	7904200	-	Excellent
QBrow 241	496725	7912181	-	Not recorded
QBrow 267	490785	7904638	-	Not recorded
QBrow 273	488842	7905906	-	Not recorded
QBrow 284	490144	7907246	-	Excellent
QBrow 294	486743	7905081		Excellent
QBrow 389	496707	7912628	-	Excellent
QBrow 398	496137	7916122	-	Excellent
QBrow 421	489446	7905821	-	Excellent
QBrow 427	492675	7914960	-	Very Good
QBrow 402	495571	7914266	-	Excellent
QBrow 406	495535	7911160	-	Excellent
QBrow 412	490152	7905342	-	Excellent
QBrow 417	489507	7905372	-	Excellent
QBrow 469	495703	7916538	-	Very Good
QBrow 475	485893	7907317		Very Good
QBrow 482	485510	7908456		Excellent
QBrow 483	485293	7908379		Very Good

Relevés in the Browns Range Study Area				
Site	**AMG Zone 52K**		**Recorded**	**Condition**
	Easting (start)	**Northing (start)**		
RBrow 11	0493365	7912844	2012	Excellent
RBrow 25	0492341	7910389	2012	Excellent
RBrow 25a	0491387	7906260	2012	Excellent
RBrow 26	0491413	7909635	2012	Excellent
RBrow 26a	0492851	7912994	2012	Excellent
RBrow 26b	0492725	7913000	2012	Excellent
RBrow 26c	0492447	7913056	2012	Excellent
RBrow 27	0493743	7909622	2012	Excellent
RBrow 38	0493677	7904312	2012	Excellent
RBrow 39	0493624	7904257	2012	Excellent
RBrow 63	0493114	7903135	2012	Excellent
RBrow 66	0492956	7909857	2012	Not recorded
RBrow 101	04917092	7902169	2012	Excellent
RBrow 104	0498762	7906260	2013	Excellent
RBrow 105	485696	7907825	2013	Excellent
RBrow 240	496646	7912605	2013	Not recorded
RBrow 248	495822	7915608	2013	Not recorded
RBrow 438	495703.	7916538	2013	Very Good
NORTHERN BOREFIELD				
Site	**AMG Zone 52K**		**Recorded**	**Condition**
	Easting (start)	**Northing (start)**		
RBrow 150	488940	7916158	2013	Burnt 2012
RBrow 151	488335	7916246	2013	Not recorded
RBrow 164	484936	7917172	2013	Excellent
RBrow 167	485025	7917444	2013	Excellent
RBrow 171	485080	7917724	2013	Excellent
SOUTHERN BOREFIELD				
Site	**AMG Zone 52K**		**Recorded**	**Condition**
	Easting (start)	**Northing (start)**		
RBrow 292	486699	7905026	2013	
QBrow 299	486520	7905094	2013	
RBrow 301	486099	7905112	2013	

SOUTHERN BOREFIELD				
RBrow 303	486180	7905209	2013	
RBrow 305	486521	7905594	2013	
RBrow 268	486430	7905601	2013	
RBrow 275	486141	7906142	2013	
RBrow 277	486087	7906320	2013	
RBrow 278	486176	7906452	2013	
RBrow 282	486491	7906550	2013	
RBrow 284	486569	7906495	2013	
RBrow 232	486882	7906368	2013	
RBrow 291	487090	7905906	2013	
HAUL ROAD				
Site	**AMG Zone 52K**		**Recorded**	**Condition**
	Easting (start)	**Northing (start)**		
RBrow 67	492110	7905535	2013	Good
RBrow 72	49200	7905556	2013	Good-Very Good
RBrow 74	491841	7905523	2013	Very Good - Excellent
RBrow 77	491867	7905368	2013	Not recorded
RBrow 79	491361	7903771	2013	Excellent
RBrow 81	491412	7903927	2013	Not recorded
RBrow 82	492799	7902532	2013	Excellent
RBrow 298	496636	7905958	2013	Recently burnt
RBrow 299	496905	7905983	2013	Not recorded
RBrow 303	493526	7913317	2013	Not recorded
RBrow 311-316	486599	7916385	2013	Excellent
RBrow 317	485371	7915723	2013	Excellent
RBrow 322	484936	7917172	2013	Good-Very Good
RBrow 306	481265	7906166	2013	Not recorded
RBrow 307	482393	7906059	2013	Not recorded
RBrow 309	482393	7906059	2013	Not recorded
RBrow 310	479350	7906356	2013	Not recorded
RBrow 311	478876	7906332	2013	Not recorded

HAUL ROAD				
Site	AMG Zone 52K		Recorded	Condition
	Easting (start)	Northing (start)		
RBrow 313	477739	7906304	2013	Not recorded
RBrow 314	477742	7906302	2013	Not recorded
RBrow 315	475991	7906160	2013	Not recorded
RBrow 316	472279	7906426	2013	Not recorded
RBrow 317	471953	7906485	2013	Not recorded
RBrow 320	466967	7907657	2013	Not recorded
RBrow 326	460623	7924605	2013	Burnt
RBrow 327	460968	7924244	2013	Not recorded
RBrow 329	461312	7923992	2013	Not recorded
RBrow 332	460239	7924352	2013	Not recorded
RBrow 333	461796	7923609	2013	Not recorded
RBrow 334	461785	7923461	2013	Not recorded
RBrow 336	461687	7923085	2013	Not recorded
RBrow 339	461596	7921338	2013	Not recorded
RBrow 340	461510	7920830	2013	Recently burnt
RBrow 341	461437	7920400	2013	Not recorded
RBrow 342	461464	7920199	2013	Not recorded
RBrow 347	495500	7910337	2013	Not recorded
RBrow 349	495686	7910343	2013	Excellent
RBrow 496	478608	7906077	2013	Not recorded
RBrow 500	460177	7924934	2013	Not recorded
RBrow 503	459639	7925265	2013	Not recorded
RBrow 504	460019	7924465	2013	Not recorded
RBrow 506	461624	7922651	2013	Not recorded
RBrow 507	461579	7922462	2013	Not recorded
RBrow 509	461546	7922360	2013	Not recorded
RBrow 510	461587	7921846	2013	Not recorded
RBrow 512	461513.0801	7919964.215	2013	Not recorded

APPENDIX I

Raw Data from Browns Range Surveys

BROW-VT-13001 Site: QBROW 1

Described: RD (14/05/2012), RB & JA (17/05/2013) **Location:** 52 K 491347 7913354
Type: Quadrat **Soil:** Orange red **Rock Type:** Nil **Vegetation Condition:** Good **Fire Age:** Last burnt more than 5 years ago, no sign of any other disturbance
Vegetation: *Dolichandrone heterophylla* and *Acacia* sp. Tall Open Shrubland over *Chrysopogon latifolius* and *Themeda avenacea* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Chrysopogon latifolius	60	2	*Goodenia triodiophila*	0.01	0.3
Themeda avenacea	5	1.2	*Gossypium australe*	0.01	1.4
Dolichandrone heterophylla	2	2	*Grevillea wickhamii*	0.01	1
Eulalia aurea	2	0.8	*Hakea macrocarpa*	0.01	2.5
Acacia sp.	1	4	*Halgania solanacea*	0.01	0.5
Acacia sp.	0.01	0.5	*Hibiscus leptocladus*	0.01	0.3
Aristida holathera	0.01	0.3	*Ipomoea costata*	0.01	0.8
Aristida latifolia	0.01	1	*Microstachys chamaelea*	0.01	
Boerhavia paludosa	0.01	0.6	*Mollugo molluginea*	0.01	0.2
Brachychiton multicaulis	0.01	1.5	*Nomismia rhomboidea*	0.01	0.3
Cassytha filiformis	0.01	0.4	*Panicum decompositum*	0.01	0.3
Clerodendrum floribundum var. *ovatum*	0.01	1.2	*Ptilotus fusiformis*	0.01	0.3
Crotalaria novae-hollandiae	0.01	0.4	*Senna curvistyla*	0.01	0.7
Cucumis argenteus	0.01	1.2	*Sida sp.*	0.01	0.5
Cymbopogon obtectus	0.01	0.5	*Spermacoce hillii*	0.01	0.2
Ehretia saligna	0.01	1.2	*Tephrosia* sp. sparse pinnae (C.R. Michel 2202)	0.01	0.4
Eragrostis eriopoda	0.01	0.4	*Tinospora smilacina*	0.01	1
Euphorbia sp.	0.01	0.2	*Trichodesma zeylanicum*	0.01	0.7
Euphorbia tannensis	0.01	0.6	*Triodia epactia (s. l.)*	0.01	0.4
Evolvulus alsinoides var. villosicalyx	0.01	0.3	*Zornia muelleriana*	0.01	0.2
Fimbristylis sp.	0.01	0.3			

BROW-VT-13001 Site: QBROW 5A
Described: JA (10/05/2012) and JA (15/05/2013) **Location:** 52 K 492966 7914571
Type: Quadrat **Season:** Excellent **Soil:** Orange brown with a lichen crust **Rock Type:** Nil
Vegetation Condition: Excellent **Fire Age:** burnt approximately 2 years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus chlorophylla* and *Corymbia opaca* Scattered Low Trees over *Acacia lysiphloia* and *Hakea macrocarpa* Tall Open Scrub over *Jacksonia aculeata* and *Halgania solanacea* Scattered Low Shrubs over *Aristida latifolia* and Eriachne *obtusa* Open Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia lysiphloia	40	2.5	*Brachychiton multicaulis*	0.01	1.6
Aristida latifolia	5	0.6	*Clerodendrum sp.*	0.01	0.6
Eriachne obtusa	5	0.4	*Corymbia opaca*	0.01	6-8
Halgania solanacea	5	0.4	*Eragrostis eriopoda*	0.01	0.4
Eucalyptus chlorophylla	2	6.5	*Eulalia aurea*	0.01	
Hakea macrocarpa	1	3.5	*Goodenia crenata*	0.01	
Acacia adoxa var. *adoxa*	0.01	0.5 - 0.8	*Jacksonia aculeate*	2	0.8
Acacia ancistrocarpa	0.01	3.1	*Paraneurachne muelleri*	0.01	
Acacia hilliana	0.01	0.7	*Sorghum plumosum*	0.01	1
Acacia sp.	0.01	3.5	*Tinospora smilacina*	0.01	
Bergia hensallii	0.01	0.02	*Triodia epactia*	0.01	

BROW-VT-13001 Site: QBROW 6

Described: RD (10/05/2012), AS & RB (05/2013) **Location:** NE end study area 52 K 494362 7914531 **Type:** Quadrat **Season:** Excellent (2012) and Very Good (2013) **Habitat:** Alluvial flat surrounded by rocky ridges **Soil:** Dark brown **Rock Type:** Sandstone **Vegetation Condition:** Excellent **Fire Age:** Last burnt approximately two years ago, quadrat has been partially cleared since 2012 survey.
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Chrysopogon fallax* (*Themeda avenacea*) Closed Tussock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Chrysopogon fallax	80	0.3 - 1.8	*Euphorbia sp.*	0.01	0.1
Themeda avenacea	5	1.5	*Ehretia saligna*	0.01	1
Crotalaria medicaginea	1	0.3	*Evolvulus alsinoides*	0.01	0.1
Crotalaria ramosissima	1	0.4	*Chaemaecrista absus*	0.01	0.3
Eucalyptus brevifolia	1		*Bulbostylis barbata*	0.01	0.2
Melaleuca nervosa	1	3	*Gomphrena sp.*	0.01	0.3
? Gomphrena sp.	0.01	0.2	*Goodenia triodiophylla*	0.01	0.3
Abutilon sp.	0.01	0.3	*Grevillea pyramidalis subsp. pyramidalis*	0.01	0.4
Acacia adoxa	0.01	0.4	*Hybanthus aurantiacus*	0.01	0.3
Acacia elachantha	0.01	0.3	*Indigofera hirsuta*	0.01	0.4
Aristida holathera	0.01	0.3	*Senna notabilis*	0.01	0.3
Bonamia ambigua			*Setaria surgens*	0.01	0.3
Buchnera ramosissima	0.01	0.3	*Tephrosia rosea*	0.01	0.4
Cleome viscosa	0.01	0.4	*Trichodesma zeylanicum*	0.01	0.4
Corymbia aspera	0.01	15	*Vigna lanceolata*	0.01	0.2
Cyperus blakeanus	0.01	0.4	*Yakirra australiensis*	0.01	0.2
Desmodium sp.	0.01	0.1	*Zornia muelleriana subsp. congesta*	0.01	0.2

BROW-VT-13001 Site: QBROW 7

Described: RD (9/05/2012) and AS (15/05/2013) **Location:** NE edge of study area 52 K 4994058 7914247
Type: Quadrat **Season:** Excellent (2012) and Very Good (2013) **Habitat:** Sloping plain surrounded by ridges
Soil: Orange brown **Rock Type:** Nil **Vegetation Condition:** Excellent **Fire Age:** 1 year **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Low Open Woodland over *Dolichandrone heterophylla* Scattered Shrubs over *Eulalia aurea, Aristida holathera* and *Eriachne obtusa* Open Tussock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Eulalia aurea	20		*Eragrostis eriopoda*	0.01	0.4
Aristida holathera	6		*Eucalyptus chlorophylla*	0.01	
Eriachne obtusa	5		*Evolvulus alsinoides* var. *villosiflorua*	0.01	
Eucalyptus brevifolia	4		*Goodenia armitiana*	0.01	
Dolichandrone heterophylla	2		*Goodenia crenata*	0.01	0.1
Acacia coriacea	1	0.8	*Gossypium australe*	0.01	
Acacia adoxa	0.01	0.3	*Hibiscus leptocladus*	0.01	
Acacia elachantha	0.01		*Hybanthus aurantiacus*	0.01	
Acacia hilliana	0.01		*Indigofera linifolia*	0.01	
Alternanthera nana	0.01		*Indigofera sp.*	0.01	0.2
Rutidosis helichrysoides subsp. *helichrysoides*	0.01	0.2	*Melaleuca glomerata*	0.01	
Bonamia pannosa			*Mollugo molluginea*	0.01	0.2
Brachychiton multicaulis	0.01		*Paraneurachne muelleri*	0.01	
Buchnera sp.	0.01	0.4	*Pterocaulon serrulatum*	0.01	
Chrysopogon fallax	0.01		*Rhynchosia minima*	0.01	Creeper
Crotalaria ramosissima	0.01		*Rutidosis* sp.	0.01	
Cyperus sp.	0.01		*Senna venusta*	0.01	
Digitaria brownii	0.01		*Sorghum plumosum*	0.01	1.2
Ehretia sp.	0.01		*Tephrosia brachycarpa*	0.01	

BROW-VT-13001 Site: QBROW 10

Described: JA (13/05/2012) and AS (May 2013) **Location:** 52 K 493994 7913056
Type: Quadrat **Season:** Excellent (2012) Very Good (2013) **Soil:** on red brown loamy flats **Rock Type:** Nil
Habitat: Flat **Vegetation Condition:** Excellent **Fire Age:** Approximately two years ago
Vegetation: *Corymbia opaca* Low Open Woodland over *Acacia* spp. Tall Open Shrubland of over a *Chrysopogon fallax, Eulalia aurea, Aristida hygrometrica* and *Setaria surgens* Tussock Grassland. **Note:** *Acacia* absent since hot fire.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia cuthbertsonii subsp. *cuthbertsonii*	0.01		*Goodenia triodiophila*	0.01	
Chamaecrista symonii	0.01		*Sorghum plumosum*	0.01	1.2
Chrysopogon fallax	0.01		*Tinospora smilacina*	0.01	
Corymbia opaca	0.01		*Zornia muelleriana* subsp. *congesta*	0.01	
Crotalaria novae-hollandiae subsp. *lasiophylla*	0.01		*Yakirra australiensis*	1	0.2
Dolichandrone heterophylla	0.01		*Marsdenia australis*	0.01	
Eriachne obtusa	0.01		*Setaria surgens*	0.01	0.3
Eulalia aurea	0.01		*Halgania solanacea* var. *solanacea*	0.01	0.3
Mollugo molluginea	0.01		*Commersonia sp.*	0.01	0.4
Rhynchosia minima	0.01		*Crotalaria novae-hollandiae subsp. lasiophylla*	0.01	0.3
Evolvulus alsinoides var. *villosicalyx*	0.01		*Desmodium sp.*	0.01	
Aristida hygrometrica	0.01		*Brachychiton multicaulis*	0.01	
Eragrostis eriopoda	0.01		*Mollugo molluginea*	0.01	0.2
			Triodia sp. (recently burnt and resprouting, species indeterminate)		

BROW-VT-13001 Site: QBROW 12

Described by: JA (13/05/2012) **Location:** 52 K 494634 7912460
Type: Quadrat **Season:** Excellent **Habitat:** Flood plain **Soil:** Yellow brown **Rock Type:** Nil
Vegetation Condition: Excellent **Fire Age:** Last burnt 50.01 years ago **Notes:** Bare ground 5%
Vegetation: *Eucalyptus brevifolia* Low Open Woodland over *Acacia hilliana* and *A. adoxa* var. *adoxa* Low Open Heath over *Triodia epactia* Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia hilliana	40	0.6 – 0.7	*Eriachne ciliata*	0.01	0.08
Acacia adoxa var. *adoxa*	30	0.5	*Goodenia stobbsiana*	0.01	0.5
Triodia epactia (s.l.)	25	0.5 – 0.6 (1.1)	*Gossypium australe*	0.01	0.4
Eucalyptus brevifolia	7	1.2 – 4.0	*Hibiscus leptocladus*	0.01	0.2
Acacia colei	0.01	3.5	*Indigofera haplophylla*	0.01	0.15
Acacia lysiphloia	0.01	2.5	*Mardannia graminea*	0.01	0.1 – 0.6
Acacia tumida	0.01	2.5	*Polycarpaea corymbosa*	0.01	0.1
Aristida contorta	0.01	0.2	*Polymeria* sp.	0.01	0.1
Aristida holathera	0.01	0.3	*Pterocaulon* sp.	0.01	0.6
Carissa lanceolata	0.01	1.1	*Tephrosia stuartii*	0.01	0.1
Chrysopogon fallax	0.01	0.4	*Triodia basedowii* (s.l.)	0.01	0.6
Cymbopogon sp. (just leaves)	0.01	0.6	*Evolvulus alsinoides* var. *villosicalyx*		

BROW-VT-13001 Site: QBROW 13

Described: JA & AJ (13/05/2012), JA (15/05/2013) **Location:** 52 K 494637 7912173
Type: Quadrat **Season:** 2012 Excellent, 2013 Very Good **Soil:** Orange-red **Rock Type:** Arkrose, pebbles and stones **Habitat:** near the top of a small hill **Vegetation Condition:** Excellent **Fire Age:** approximately more than 10 years ago
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Acacia retivenea* subsp. *retivenia, A. lysiphloia* and *A. colei* Scattered Tall Shrubs over *Acacia adoxa* Low Shrubland over *Triodia wiseana* and *T. schinzii* Closed Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia wiseana	60		*Eremophila latrobei* subsp. *filifolia*	0.01	1.5
Triodia schinzii	25		*Eriachne mucronata*	0.01	0.4
Acacia drepanocarpa subsp. *latifolia*	5	2.5-3.5	*Fimbristylis tetragona*	0.01	0.3
Eucalyptus brevifolia	2	3-5	*Goodenia armitiana*	0.01	0.5
Acacia lysiphloia check	1	2.5-3.5	*Goodenia stobbsiana*	0.01	
Acacia ? colei	0.01	2.2	*Hybanthus aurantiacus*	0.01	0.4
Acacia adoxa var. *adoxa*	0.01	0.6	*Phyllanthus madasperatensis*	0.01	0.15
Acacia retivenea subsp. *retivenea*	0.01	0.9-1.8	*Polygala insingii*	0.01	0.04-0.06
Acacia sp.	0.01	1.5	*Sida* aff. *fibulifera*	0.01	0.2
Acacia tenuissima	0.01	1.5			

BROW-VT-13001 Site: QBROW 14
Described: JA (13/05/2012) **Location:** 52 K 493873 7911949
Type: Quadrat **Season:** Excellent **Location:** Hill, very rocky **Habitat:** Rocky Hill **Soil:** Red brown **Rock Type:** Ironstone and quartz **Vegetation Condition:** Excellent **Fire Age:** Last burnt 50.01 years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Acacia hilliana* and *A. adoxa* var. *adoxa* Low Open Heath over *Triodia schinzii* Open Tussock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia hilliana	50	0.6	*Eriachne mucronata*	0.01	
Triodia schinzii	25	0.5 (1.1)	*Grevillea refracta*	0.01	3.0
Goodenia stobbsiana	10	0.5	*Grevillea wickhamii*	0.01	0.9
Acacia adoxa var. *adoxa*	5		*Hakea lorea* subsp. *lorea*	0.01	1.3
Eucalyptus brevifolia	1	2.5 – 3	*Halgania solanacea*	0.01	0.4

BROW-VT-13001 Site: QBROW 15

Described: RD (14/05/2012) **Location:** 52 K 491600 7912487
Type: Quadrat **Season:** Excellent **Habitat:** Plain **Soil:** Orange brown **Rock Type:** None **Vegetation Condition:** Excellent **Fire Age:** Last burnt less than one years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Acacia sericophylla* Scattered Tall Shrubs over *Themeda avenacea, Eriachne holathera* and *Chrysopogon fallax* Open Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Themeda avenacea	10	0.7	*Evolvulus alsiniodies*	0.01	
Eriachne holathera	4	0.4	*Goodenia crenata*	0.01	0.1
Chrysopogon fallax	2	0.2	*Gossypium australe*	0.01	1.2
Eucalyptus brevifolia	1	*15*	*Marsdenia angustata*	0.01	1.2
Abutilon otocarpum	0.01	0.3	*Mollugo molluginea*	0.01	
Acacia sericophylla	0.01	3	*Panicum decompositum*	0.01	0.3
Acacia stipuligera	0.01	1.2	*Pterocaulon* sp.	0.01	0.5
Acacia tenuissima	0.01	1.5	*Ptilotus polystachyus*	0.01	0.4
Alternanthera nana	0.01	0.3	*Sida* (possibly new, ?aff. sp. C. Kimberley Flora)	0.01	0.3
Aristida holathera	0.01	0.7	*Sida macrocarpa* 'filiform pedicels form'	0.01	0.3
Aristida latifolia	0.01	0.4	*Sida platycalyx*	0.01	0.4
Cymbopogon ambigua	0.01	0.7	*Solanum quadrilocatum*	0.01	0.3
Eulalia aurea	0.01	0.7	*Zornia muelleriana* subsp. *congesta*	0.01	0.2

BROW-VT-13001 Site: QBROW 16

Described: RD (14/05/2012) **Location:** 52 K 492140 7911864
Type: Quadrat **Season:** Excellent **Habitat:** Plain **Soil:** Orange brown **Rock Type:** None **Vegetation Condition:** Excellent **Fire Age:** Last burnt 100.01 years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Acacia hilliana* and *A. adoxa* var. *adoxa* Shrubland over *Triodia wiseana* Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia wiseana	40	0.7	*Chrysopogon fallax*	0.01	0.2
Acacia hilliana	10	0.6	*Eulalia aurea*	0.01	0.5
Eucalyptus brevifolia	2	10	*Goodenia armitiana*	0.01	0.3
Acacia adoxa var. *adoxa*	0.01	0.5	*Gossypium australe*	0.01	0.5
Acacia colei *var.* colei	0.01	10	*Santalum lanceolatum*	0.01	1.5
Aristida holather	0.01	0.7	*Zornia muelleriana* subsp. *congesta*	0.01	0.2

BROW-VT-13001 Site: QBROW 21

Described: RD & AS (11/05/2012), RB & VY (16/05/2013) **Location:** 52K
Type: Quadrat **Season:** Excellent (2012) and Very Good (2013) **Habitat:** broad rocky ridge
Location: Soil: Orange brown clay **Rock Type:** schist **Vegetation Condition:** Excellent **Fire Age:** burnt two years ago
Vegetation: *Corymbia pachycarpa* **(***Eucalyptus brevifolia)* Scattered Low Trees over *Acacia adoxa* var. *adoxa* Low Open Shrubland over *Triodia. basedowii* (*T. schinzii*) Hummock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia basedowii	40	0.3	*Goodenia triodiophila*	0.01	0.3
Acacia adoxa var. *adoxa*	10	0.5	*Grevillea wickhamii*	0.01	1.5
Corymbia pachycarpa	1	4	*Hakea cunninghamii*	0.01	0.6
Eriachne ciliata	1	0.2	*Hakea macrocarpa*	0.01	0.3
Sida macrocarpa 'filiform pedicels form'	1	0.3	*Heliotropium uniflorum*	0.01	0.2
Triodia schinzii	1	0.3	*Hybanthus aurantiacus*	0.01	0.3
Acacia acradenia	0.01	3.0	*Schizachryium fragile*	0.01	0.2
Acacia elachantha	0.01	0.3	*Jacksonia aculeate*	0.01	0.5
Acacia monticola	0.01	1	*Mirbelia viminalis*	0.01	1
Aristida holathera	0.01		*Mollugo molluginea*	0.01	0.1
Aristida latifolia	0.01		*Panicum decompositum*	0.01	0.5
Cassytha filiformis	0.01	Creeper	*Phyllanthus exilis*	0.01	0.2
Codonocarpus cotinifolius	0.01		*Pluchea tetranthera*	0.01	0.2
Eriachne aristidea	0.01		*Polygala isingii*	0.01	0.2
Eriachne ciliata	0.01	0.3	*Pterocaulon serrulatum*	0.01	0.4
Eriachne mucronata	0.01		*Sorghum ?plumosum*	0.01	0.6
Eriachne obtusa	0.01		*Spermacoce hillii*	0.01	
Eucalyptus brevifolia	0.01		*Tephrosia leptoclada*	0.01	0.3
Eucalyptus gamophylla	0.01		*Tephrosia sp.*	0.01	0.2
Evolvulus alsinoides var. *villosicalyx*	0.01	0.1	*Tinospora smilacina*	0.01	Climber
Fimbristylis caespitosa	0.01	0.2	*Triumfetta plumigera*	0.01	0.4
Glycine tomentella (s. l.)	0.01	0.3	*Velleia sp.*	0.01	0.5
Goodenia armitiana	0.01	0.3			

BROW-VT-13001 Site: QBROW 22
Described: 16/05/2013 **Location:** 52K
Type: Quadrat **Season:** Excellent **Uniformity: Location:** North of camp **Habitat:** Sand plain **Soil:** Orange brown **Rock Type:** None **Vegetation Condition:** Excellent **Fire Age: Notes:** No sign of any other disturbance
Vegetation: *Acacia acradenia* Open Heath over *Eriachne eriopoda, E. obtusa* and *Aristida holathera* Closed Tussock Grassland and *Triodia* aff. *schinzii* Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia acradenia	60	1.5	*Crotalaria sp.*	0.01	0.1
Eragrostis eriopoda	35	0.3	*Dodonaea hispidula*	0.01	1
Eriachne obtusa	35	0.5	*Eriachne* sp. indeterminate	0.01	
Aristida holathera	20	0.4	*Fimbristylis simulans*	0.01	0.3
Triodia aff. *schinzii*	20	1	*Gyrostemon tepperi*	0.01	1
Bonamia	0.01	0.4	*Halgania solanacea*	0.01	0.3
Chamaecrista symonii	8	0.3	*Halgania solanacea* var. *solanacea*	0.01	0.1
Acacia orthocarpa	2	0.6	*Schizachryium fragile*	0.01	0.2
Petalostigma nummularium	2	1.5	*Sauropus trachyspermus (s. l.)*	0.01	0.2
Corchorus vermicularis	1	0.3	*Polymeria ambigua*	0.01	0.3
Acacia adoxa	0.01	0.6	*Triodia* aff. *epactia*		
Acacia tumida var. *kulparn*	0.01	1	*Velleia panduriformis*	0.01	0.1
Chrysopogon fallax (fine leaf)	0.01	1.5	*Zornia muelleriana* subsp. *congesta*	0.01	0.2
Crotalaria novae-hollandiae	0.01	0.4	*Digitaria brownii*		

BROW-VT-13001 Site: QBROW 24

Described: RD **(**14/05/2012) **Location:** 52 K 494039 7910221
Type: Quadrat **Season:** Excellent **Habitat:** Hill/ Rocky Ridge **Soil:** Brown **Rock Type:** Arkose
Location: Hill 1 km west of camp **Vegetation Condition:** Excellent **Fire Age:** Last burnt 10 0.01 years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Acacia retivenea* subsp. *retivenea* and *Jacksonia aculeata* Open Shrubland over *Trioidia schinzii* Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia schinzii	50	0.3 (1.5)	*Cassytha* sp.	0.01	0.2
Acacia retivenea subsp. *retivenea*	5	1.5	*Eucalyptus aspera*	0.01	0.4
Jacksonia aculeata	4	1.2	*Eucalyptus brevifolia*	0.01	5
Acacia adoxa var. *adoxa*	0.01	0.4	*Grevillea wickhamii* subsp. *aprica*	0.01	1.5
Acacia matlandii	0.01	4	*Sebania muelleri*	0.01	0.2
Acacia sericophylla	0.01	8	*Sida fibulifera (s.l.)*	0.01	1.5
Aristida holathera	0.01	0.3	*Tephrosia leptoclada*	0.01	0.2

BROW-VT-13001 Site: QBROW 25

Described: JA (13/05/2012) **Location:** 52 K 492341 7910390
Type: Quadrat **Season:** Excellent **Habitat:** Hilltop **Soil:** Red Brown **Rock Type:** Quartz **Vegetation Condition:** Excellent **Fire Age:** Last burnt more than five years ago **Notes:** Evidence of drilling – some clearing
Vegetation: *Eucalyptus brevifolia* Low Open Woodland over *Acacia hilliana* and *A. adoxa* var. *adoxa* Shrubland over *Triodia angusta* and *T. schinzii* Closed Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia angusta	65	0.4 – 0.6	*Fimbristylis* sp.	0.01	0.15
Triodia schinzii	25	0.5 (1.1)	*Grevillea refracta*	0.01	1.2 – 3
Acacia hilliana	15	0.7	*Heliotropium sp.*	0.01	0.15
Goodenia stobbsiana	10	0.8	*Hybanthus aurantiacus*	0.01	0.4
Eucalyptus brevifolia	3	6 – 7	*Iseilema* sp.	0.01	0.15
Acacia adoxa var. *adoxa*	2	0.4	*Ptilotus calostachyus*	0.01	0.9
Acacia colei	0.01	1.2	*Scaevola*	0.01	0.3
Aristida latifolia	0.01	0.6	*Tinospora smilacina*	0.01	climber
Cassytha sp.	0.01	climber	*Triumfetta* sp.	0.01	0.15
Eremophila sp.	0.01	0.4	*Yakirra australiensis*	0.01	0.1
Eriachne pulchella	0.01	0.10 – 0.25			

BROW-VT-13001 Site: BROW 25a

Described: JA & AJ (14/05/2012), AS & JA (16/05/2013) **Location:** 52K
Type: Quadrat **Habitat:** Hills **Soil:** Brown **Rock Type:** Quartz arkrose **Vegetation Condition:** Excellent **Fire Age:** approx. 5 years prior (2012), October 2012 (2013)
Vegetation: *Eucalyptus brevifolia (E. odonotocarpa*) Low Open Woodland, over *Acacia monticola* and *Grevillea wickhamii* Tall Shrubland (over *Triodia schinzii* Hummock Grassland pre October 2012 fire)

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia hilliana	25-40	0.9-1.1	*Goodenia triodiophila*	0.01	0.5
Acacia adoxa var. *adoxa*	15	0.7	*Goodenia stobbsiana*	0.01	0.4
Acacia monticola	15	3	*Halgania solanacea*	0.01	0.4
Yakirra australiensis	10	0.1	*Heliotropium sp.*	0.01	0.4
Grevillea wickhamii subsp. *aprica*	8	3	*Hybanthus aurantiacus*	0.01	0.3
Eriachne ciliata	5	0.2	*Indigofera monophylla*	0.01	0.2
Eucalyptus brevifolia	5	3.5	*Sida sp.*	0.01	1
Eucalyptus odontocarpa	1	2-2.5	Triumfetta sp.	0.01	0.1
Aristida latifolia	0.01	1.2	*Paraneurachne muelleri*		
Bonamia pannosa	0.01	0.05	*Paspalidium rarum*	0.01	0.1
Fimbristylis simulans	0.01	0.2			

BROW-VT-13001 Site: RBROW 2

Described: JA & AS (15/05/2012) **Location:** 52 K 493743 7909622
Type: Relevé **Season:** Excellent **Habitat:** Floodplain **Soil:** Dark brown **Rock Type:** None **Vegetation Condition:** Excellent **Fire Age:** Last burnt 50.01 years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus pruinosa* and *Corymbia opaca* Low Woodland over *Acacia sericophylla* Open Tall Shrubland over *Aristida holathera* and *A. latifolia* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera	30	0.6	*Eremophila longifolia*	0.01	1
Aristida latifolia	30	1.2	*Eulalia aurea*	0.01	0.6
Acacia sericophylla	5	4	*Evolvulus alsinoides*	0.01	0.2
Eucalyptus pruinosa	5	2 – 7	*Gossypium australe*	0.01	0.6
Indigofera linifolia	1	0.4	*Indigofera ?boviperda*	0.01	0.3
Goodenia crenata	0.01	0.05	*Indigofera linnaei*	0.01	0.15
Chrysopogon fallax	0.01	0.5	*Paraneurachne muelleri*	0.01	0.3
Cleome viscosa	0.01	0.6	*Senna notabilis*	0.01	0.2
Enneapogon polyphyllus	0.01	0.4	*Solanum quadrilocatum*	0.01	0.8
Eragrostis eriopoda	0.01	0.5	*Tinospora smilacina*	0.01	climber

BROW-VT-13001 Site: QBROW 28

Described: RD (13/05/2012) **Location:** 52K
Type: Quadrat **Season:** Excellent **Location:** Southeast of camp on east side of main road 52 K 492948 7908685 **Habitat:** Plain **Soil:** Brown **Rock Type:** None **Vegetation Condition:** Excellent **Fire Age:** Last burnt 10.01 year ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia (E. pruinosa* subsp. *tenuata*) Low Woodland over *Acacia sericophylla* Scattered Tall Shrubs over *Aristida holathera* and *A. inaequiglumis* Closed Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera	40	0.4	*Eucalyptus pruinosa* subsp. *tenuata*	0.01	5
Aristida inaequiglumis	40	0.4	*Eucalyptus brevifolia*	10	15
Digitaria brownii	5	0.8	*Eulalia aurea*	5	0.5
Acacia sericophylla	2	5	*Evolvulus alsinoides*	0.01	0.2
Acacia stipuligera	0.01	0.4	*Goodenia armitiana*	0.01	0.4
Aristida latifolia	0.01	0.5 (1.7)	*Gossypium australe*	0.01	1.7
Chrysopogon fallax	0.01	0.3 (1.2)	*Halgania solanacea*	0.01	0.3
			Pterocaulon sphacelatum	0.01	0.5

BROW-VT-13001 Site: QBROW 29

Described: RD & AS (13/05/2012) **Location:** 52K 493492 7908608
Type: Quadrat **Season:** Excellent **Habitat:** Undulating plain **Soil:** Orange brown sandy clay **Vegetation Condition:** Excellent **Fire Age: Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus pruinosa* Scattered Low Trees over *Acacia sericophylla* Tall Open Shrubland over *Triodia epactia* (s. l.) Hummock Grassland.

Taxon	Cover (%)	Height (m)
Triodia epactia (s. l.)	50	0.4
Acacia sericophylla	5	8.0
Eucalyptus pruinosa subsp. *tenuata*	1	4.0
Aristida holathera	0.01	0.4
Eulalia aurea	0.01	0.4
Halgania solanacea	0.01	0.3
Panicum decompositum	0.01	0.4
Senna notabilis	0.01	0.3

BROW-VT-13001 Site: QBROW 30

Described: RD & AS (13/05/2012) **Location:** Near east border of study area via camp 52 K 494510 7908626 **Type:** Quadrat **Season:** Excellent **Habitat:** Plain **Soil:** Orange brown **Rock Type:** None **Vegetation Condition:** Excellent **Fire Age:** Last burnt 10.01 year ago **Notes:** No sign of any other disturbance **Vegetation:** *Corymbia opaca* and *Eucalyptus brevifolia* Low Open Woodland over *Acacia sericophylla* Scattered Tall Shrubs over *Aristida holathera* and *Paraneurachne muelleri* Open Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera	20	0.3	*Cymbopogon obtectus*	0.01	0.5
Paraneurachne muelleri	5	0.3	*Eragrostis eriopoda*	0.01	0.4
Corymbia opaca	3	6	*Goodenia armitiana*	0.01	0.4
Eucalyptus pruinosa subsp. *tenuata*	3	10	*Gossypium australe*	0.01	0.4
Acacia seriocophylla	2	2	*Hibiscus leptocladus*	0.01	0.3
Halgania solanacea	2	0.3	*Mollugo molluginea*	0.01	0.2
Acacia lysiphloia	1	0.3	*Polymeria lanata* (s. l.)	0.01	0.1
Eucalyptus brevifolia	1	12	*Senna notabilis*	0.01	0.3
Triodia schinzii	1	0.3	*Tinospora smilacina*	0.01	0.1
Acacia adoxa var. *adoxa*	0.01	0.4	*Zornia muelleriana* subsp. *congesta*	0.01	0.2
Acacia stipuligera	0.01	0.5			
Aristida contorta	0.01	0.2			
Aristida latifolia	0.01	1.2			
Chrysopogon fallax	0.01	0.3			

BROW-VT-13001 Site: QBROW 31

Described: RD & AS (12/5/2012), AS (19/05/2013) **Location:** 52K
Type: Quadrat **Season:** Excellent (2012), Very Good (2013) Type**: Vegetation Condition:** Excellent
Habitat: Plain **Soil:** Orange brown sandy clay **Rock Type:** None **Vegetation Condition:** Excellent
Fire Age: Burnt approximately one year prior to 2012 survey. **Notes:** No sign of any other disturbance **Location: East side of road south of camp**
Vegetation: *Eucalyptus chlorophylla, Corymbia opaca* and *E. pruinosa* subsp. *tenuata* Scattered Low Tress over *Acacia maconochieana* and *Hakea macrocarpa* over *Ehretia saligna* Low Open Shrubland over Grassland of *Aristida holathera* (*A. latifolia*) Closed Tussock Grassland.

Taxon	Cover (%)	Height	Taxon	Cover (%)	Height
Acacia elachantha	OPP		*Grevillea wickhamii*	0.01	0.2
Amaranthus sp.	Opp		*Hakea macrocarpa*	1	0.4
Eucalyptus chlorophylla	Opp		*Halgania solanacea*	0.01	0.4
Aristida holathera	65	0.4	*Hibiscus leptocladus*	0.01	0.3
Eragrostis eriopoda	35	0.4	*Tephrosia brachycarpa*	0.01	0.2
Aristida latifolia	10	0.4	*Keraudrenia nephrosperma*	0.01	1.5
Acacia maconochieana	8	4	*Leptosema sp.*	0.01	0.2
Ehretia saligna	5	1	*Mollugo molluginea*	0.01	0.1
Corymbia opaca	1	5	*Paraneurachne muelleri*	0.01	0.3
Eucalyptus pruinosa subsp. *tenuata*	1	12	*Polymeria ambigua*	0.01	
Triodia epactia	1	0.3	*Rhynchosia minima*	0.01	
Acacia ancistrocarpa	0.01	1.4	*Schizachyrium fragile*	0.01	0.2
Boerhavia burbidgeana	0.01	cr	*Senna notabilis*	0.01	0.3
Chrysopogon fallax	0.01	0.8	*Senna sp.*	0.01	1
Cymbopogon obtectus	0.01	0.7	*Sida sp.*	0.01	0.3
Enneapogon polyphyllus	0.01	0.2	*Solanum quadriloculatum*	0.01	
Eulalia aurea	0.01	0.3	*Tephrosia leptoclada*	0.01	0.2
Tribulopsis augustifolia	0.01	0.1	*Yakirra australiensis*	0.01	0.1
Goodenia armitiana	0.01	0.4	*Zornia muelleriana subsp. congesta*	0.01	0.1
Gossypium australe	0.01	1	*Alternanthera nana*	0.01	
			Mollugo molluginea	0.01	

BROW-VT-13001 Site: QBROW 32
Described: RD & AS (12/05/2012) **Location:** Rocky base of low range 52 K 493486 7906935
Type: Quadrat **Season:** Excellent **Habitat:** Base of range **Soil:** Grey brown **Rock Type:** Quartz **Vegetation Condition:** Excellent **Fire Age:** Last burnt more than 10 years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Scaevola browniana* Low Open Shrubland over *Triodia schinzii* and *T. wiseana* Very Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Goodenia stobbsiana	5	0.4	*Halgania solanacea*	0.01	0.3
Scaevola browniana	5	0.4	*Hibiscus leptocladus*	0.01	
Triodia schinzii	5	0.2	*Hybanthus aurantiacus*	0.01	0.3
Triodia wiseana	5	0.3	*Jacksonia aculeata*	0.01	0.3
Fimbristylis sp.	2	0.2	*Polycarpaea corymbosa*	0.01	0.3
Acacia adoxa var. *adoxa*	0.01	0.3	*Polymeria lanata* (s.l.)	0.01	0.1
Acacia hilliana	0.01	0.3	*Senna notabilis*	0.01	0.3
Aristida holathera	0.01	0.3	*Tephrosia leptoclada*	0.01	0.3
Corchorus sidoides subsp. *sidoides*	0.01	0.3	*Tephrosia stuartii*	0.01	0.2
Eriachne obtusa	0.01	0.4			
Eucalyptus brevifolia	0.01	1.8			

BROW-VT-13001 Site: QBROW 33

Described: JA (15/05/2012), JA (16/05/2013) **Location:** 52K 494294 7906027
Type: Quadrat **Season:** Excellent (2012), Very Good (2013) **Habitat:** Flat plain with lichen crust
Vegetation Condition: Excellent (2012 & 2013) **Fire Age:** Last burnt more than 10 years ago (2012), Burnt October 2012 (2013).
Vegetation: *Eucalyptus brevifolia* and *E. pruinosa* subsp. *pruinosa* Scattered Low Trees over *Acacia lysiphloia* Tall Open Scrub over *Aristida holathera, Eragrostis eriopoda, Chrysopogon fallax* and *Aristida latifolia* Closed Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera	80	0.2	*Eulalia aurea*	0.01	0.7
Acacia lysiphloia	(60)	3.0 – 4.0	*Evolvulus alsinoides* var. *villosicalyx*	0.01	0.4
Eragrostis eriopoda	15	0.5	*Goodenia*	0.01	0.3
Chrysopogon fallax	5	1.2	*Gossypium australe*	0.01	0.6
Halgania solanacea	5	0.5 - 0.6	*Hakea macrocarpa*	0.01	1.3 - 3.5
Eucalyptus brevifolia	3	5.0	*Hibbertia lepidocalyx*	0.01	0.9
Aristida latifolia	1	1.2	*Hibiscus leptoclada*	0.01	0.9
Cymbopogon obtectus	1	0.5 (1.2)	*Keraudrenia nephrosperma*	0.01	0.7
Eucalyptus pruinosa subsp. *pruinosa*	1	6	*Marsdenia*	0.01	Creeper
Acacia ancistrocarpa	0.01	1.2	*Paraneurachne muelleri*	0.01	0.5
Acacia coriacea subsp. *sericophylla*	0.01	3.5	*Scaevola parviflora*	0.01	0.2
Bonamia ambigua	0.01	0.2	*Sida echinocarpa*	0.01	0.4
Brachychiton multicaulis	0.01	1.0	*Sorghum plumosum*	0.01	1.2
Capparis lasiantha	0.01	creeper	*Tephrosia* sp. Pentecost River (I.D. Cowie 4168)	0.01	0.2
Cassytha sp.	0.01	climber	*Triodia bitextura (s. l.)*	0.01	0.5
Corymbia opaca	0.01	4	*Eriachne ciliata*		
Cucumis maderaspatanus	0.01	creep	*Eucalyptus pruinosa* subsp. *pruinosa*		
Dolichandrone heterophylla	0.01	3	*Senna notabilis*		
Ehretia saligna	0.01	3	*Ventilago viminalis*		
Eremophila	0.01	3.5			
Eriachne ciliata	0.01	0.1			

BROW-VT-13001 Site: QBROW 38

Described: JA (15/05/2012), JA (15/05/2013) **Location:** 52K 493959 7904546
Type: Quadrat **Season:** Excellent (2012), Very Good (2013) **Habitat:** Plain **Rock Type:** None noted. **Vegetation Condition:** Excellent (2012), Very Good (2013) **Fire Age:** Last burnt more than 10 years ago (2012), Burnt October 2012 (2013).

Vegetation: *Eucalyptus chlorophylla* Scattered Low Trees over *Acacia drepanocarpa* subsp. *latifolia* Tall Open Scrub over *Aristida holathera* and *Eriachne obtusa* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia drepanocapra subsp. *latifolia*	60	2.2-3.0	*Goodenia triodiophila*	0.01	0.3
Aristida holathera	30	0.5	*Gossypium australe*	0.01	0.7 - 2.3
Eriachne obtusa	5	0.7 (1.3)	*Hybanthus aurantiacus*	0.01	0.4
Eucalyptus chlorophylla	1	4	*Indigofera linifolia*	0.01	0.3
Cymbopogon obtectus	0.01	0.6	*Indigofera sp.*	0.01	0.1
Cyperus blakeanus	0.01	0.1	*Polymeria ambigua*	0.01	0.1
Dentella asperata	0.01	0.03	*Tinospora smilacina*	0.01	0.4
Dolichandrone heterophylla	0.01	2.3	*Yakirra australiensis*	0.01	0.1
Eriachne ciliata	0.01	0.1	*Zornia muelleriana* subsp. *congesta*	0.01	0.2
Eucalyptus brevifolia	0.01	3	*Tephrosia sp. Pentecost River*		
Eulalia aurea	0.01	0.6			
Evolvulus alsinoides	0.01	0.15			

BROW-VT-13001 Site: QBROW 39

Described: JA (13/05/2012) **Location:** 52 K 493624 7904257
Type: Releve **Season:** Excellent **Habitat:** Plain **Soil:** Light brown sandy loam **Rock Type:** thin arkrose veneer with lichen crust **Vegetation Condition:** Excellent **Fire Age:** Last burnt 100.01 years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus chlorophylla* Scattered Low Trees over *Triodia epactia* Hummock Grassland.

Name	Cover (%)	Height (m)
Triodia epactia	60	0.4
Acacia ancistrocarpa	0.01	2.0
Aristida holathera	0.01	0.4
Capparis lasiantha	0.01	climber
Capparis umbonata	0.01	4.5
Carissa lanceolata	0.01	2.2
Chrysopogon fallax	0.01	0.3
Dolichandrone heterophylla	0.01	2.5-3.5
Eucalyptus chlorophylla	0.01	8.0
Hibiscus sturtii	0.01	0.5
Stylobasium spathulatum	0.01	1.2

BROW-VT-13001 Site: QBROW 42

Described: JA (11/05/2012), JA (17/05/2013) **Location:** 52K 491444 7904260
Type: Quadrat **Season:** Excellent (2012), Very Good (2013) **Habitat:** Plain **Soil:** Orange-brown **Rock Type:** Ironstone **Vegetation Condition:** Excellent **Fire Age:** Last burnt more than 10 years ago (2012), Burnt Oct 2012 (2013)
Vegetation: *Eucalyptus pruinosa* Scattered Low Trees over *Acacia sericophylla* Tall Shrubland over *Paraneurachne muelleri, Aristida holathera, A. latifolia* and *Eriachne obtusa* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Paraneurachne muelleri	25	0.5	*Halgania solanacea*	0.01	0.3
Aristida holathera	20	0.6	*Indigofera ?georgei* (sterile material)	0.01	0.4
Acacia sericophylla	15	4.5	*Indigofera monophylla*	0.01	0.6-1.0
Aristida latifolia	5	1.2	*Mollugo molluginea*	0.01	0.1
Eriachne obtusa	5		*Panicum decompositum*	0.01	0.5
Eucalyptus pruinosa	3	7	*Pluchea tetranthera*	0.01	0.7
Acacia ancistrocarpa	0.01	1.1	*Polycarpaea corymbosa*	0.01	0.1
Acrachne racemosa	0.01	0.6	*Polymeria ambigua*	0.01	0.08
Boerhavia sp.	0.01	0.1	*Portulaca pilosa*	0.01	0.1
Capparis sp.	0.01	0.8	*Pterocaulon serrulatum*	0.01	0.7
Cucumis maderaspatanus	0.01	climb	*Sauropus trachyspermus (s. l.)*	0.01	0.08
Cymbopogon ambiguus	0.01	0.5	*Schizachryium fragile*	0.01	0.3
Ehretia saligna	0.01	0.6	*Senna notabilis*	0.01	0.4
Enneapogon polyphyllus	0.01	0.3	*Sida* sp. (inadequate material following fire)	0.01	0.25
Eragrostis eriopoda	0.01	0.5	*Tephrosia brachycarpa*	0.01	
Eucalyptus pruinosa	0.01		*Tinospora smilacina*	0.01	creeper
Eucalyptus sp. (inadequate material following fire)	0.01		*Triodia epactia*	30	0.6
Eulalia aurea	0.01		*Triodia schinzii*	1	0.7
Evolvulus alsinoides var. *villosicalyx*	0.01	0.15	*Ventilago sp.*	0.01	3.5
Goodenia crenata	0.01	0.4	*Yakirra australiensis*	0.01	0.1
Gossypium australe	0.01	0.7			
Hakea sp.	0.01	2-3.5			

BROW-VT-13001 Site: QBROW 43

Described: RD (15/05/2012), JA (17/05/2013) **Location:** 52K 491353 7903820
Type: Quadrat **Season:** Excellent (2012), Very Good (2013) **Habitat:** Plain subject to water logging
Soil: Light brown **Rock Type:** None **Vegetation Condition:** Excellent **Fire Age:** Last burnt more than 10 years ago (2012), burnt Oct 2012? (2013)
Vegetation: *Eucalyptus pruinosa* subsp. *tenuata* Scattered Low Trees over *Acacia sericophylla* Scattered Tall Shrubs over *Eulalia aurea* Open Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Eulalia aurea	30	0.4	*Indigofera colutea*	0.01	0.2
Acacia sericophylla	2	4	*Indigofera linifolia*	0.01	0.25
Eucalyptus pruinosa subsp. *tenuata*	2	5.0 – 12.0	*Mollugo molluginea*	0.01	0.2
Atalaya salicifolia	0.01	0.8	*Phyllanthus maderaspatensis*	0.01	0.1
Chrysopogon fallax	0.01	0.2	*Portulaca pilosa*	0.01	0.1
Convolvulus sp.	0.01	0.05	*Pterocaulon serrulatum* subsp. *velutinum*	0.01	0.6
Ehretia saligna	0.01	0.6	*Sida platycalyx*	0.01	0.15
Enneapogon polyphyllus	0.01	0.2	*Tinospora smilacina*	0.01	climb
Eragrostis eriopoda	0.01	0.3	*Tinospora smilacina*	0.01	0.4
Evolvulus alsinoides	0.01	0.08	*Zornia muelleriana* subsp. *congesta*	0.01	0.4
Fimbristylis caespitosa	0.01	0.2			
Goodenia crenata	0.01	0.1			
Gossypium australe	0.01	0.6			

BROW-VT-13001 Site: QBROW 45

Described by: JA (11/5/2012) JA & AS (16/05/2013) **Location:** 52K 492084 7903249
Date: 16/05/2013 **Type:** Quadrat **Season:** Excellent (2012), Very Good (2013) **Habitat:** Elevated plain **Soil:** Reddish **Rock Type:** None **Vegetation Condition:** Excellent (2012 and 2013) **Fire Age:** No fire evident (2012), burnt ?Oct 2012
Vegetation: *Acacia sericophylla* Tall Shrubland over *Halgania solanaceae* Low Open Heath over *Aristida holathera, A. latifolia, Paraneurachne muelleri* and *Cymbopogon obtectus* Tussock Grassland and *Triodia schinzii* Scattered Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Halgania solanacea	45	0.4	*Fimbristylis*	0.01	0.3
Aristida holathera var. *holathera*	30	0.5	*Goodenia armitiana*	0.01	0.2
Acacia sericophylla	20	4.5	*Goodenia triodiophila*	0.01	0.2-0.4
Aristida latifolia	5	1.2	*Gossypium australe*	0.01	1
Acacia ancistrocarpa	3	0.5 - 2.0	*Hibiscus leptocladus*	0.01	0.8
Paraneurachne muelleri	3	0.4	*Indigofera boviperda*	0.01	0.1
Cymbopogon obtectus	2	1.1	*Indigofera haplophylla*	0.01	0.15
Triodia schinzii	2	0.6	*Indigofera linifolia*	0.01	0.15
Chrysopogon fallax	0.01	0.4	*Marsdenia australis*	0.01	climb
Corymbia opaca	0.01	3.8	*Mollugo molluginea*	0.01	0.1
Crotalaria medicaginea	0.01	0.7-1.0	*Rhynchosia minima*	0.01	Climber
Cucumis argenteus	0.01	Climber	*Schizachrium fragile*	0.01	0.1
Digitaria brownie	0.01	0.3	*Senna notabilis*	0.01	0.6
Eragrostis eriopoda	0.01	0.4	*Tephrosia brachycarpa*	0.01	0.2
Eriachne ciliata	0.01	0.1	*Tephrosia leptoclada*	0.01	0.15
Eriachne sp.	0.01	0.8	*Tephrosia sp.*	0.01	0.2
Euphorbia schultzii var. *comans*	0.01	0.15	*Tinospora smilacina*	0.01	
			Yakirra australiensis	0.01	0.1

BROW-VT-13001 Site: QBROW 46a

Described: RD (16/05/2012), VY & RB (5/2013) **Location:** 52K
Type: Quadrat **Season:** Excellent (2012) and Very Good (2013) **Habitat:** Plain subject to waterlogging
Soil: Dark brown **Rock Type:** None **Vegetation Condition:** Excellent (2012 and 2013)
Fire Age: Last burnt more than 11 years ago (2013)
Vegetation: *Corymbia flavescens* and *Eucalyptus pruinosa* subsp. *tenuata* Scattered Trees over *Carissa lanceolata* Shrubland over *Eulalia aurea*, Themeda avenacea and *Chrysopogon fallax* Closed Tussock Grassland and *Triodia epactia* Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Eulalia aurea	50	0.4	*Atalaya sp.*	0.01	1
Triodia epactia	30		*Boerhavia burbidgeana*	0.01	creeper
Themeda avenacea	15	1	*Enneapogon polyphyllus*	0.01	
Carissa lanceolata	10	1.5	*Eremophila longifolia*	0.01	1
Chrysopogon fallax	10	1	*Eriachne obtusa*	0.01	
Corymbia flavescens	5	10	*Evolvulus sp.*	0.01	
Goodenia crenata	2	0.1	*Indigofera colutea*	0.01	0.1
Acacia sericophylla	1	3	*Indigofera linifolia*	0.01	
Chamaecrista symonii	1	0.3	*Panicum decompositum*	0.01	
Dentella asperata	1	0.2	*Pluchea tetranthera*	0.01	
Eucalyptus pruinosa subsp. *tenuata*	1	13	*Pterocaulon serrulatum*	0.01	0.6
Gossypium australe	1	0.8	*Pterocaulon sphacelatum*	0.01	0.2
Amaranthus sp.	0.01	0.2	*Sida* sp.dark green fruits	0.01	0.6
Aristida holathera var. holathera	0.01		*Stemodia* sp. Tanami (P.K. Latz 8218)	0.01	0.3
Aristida latifolia	0.01		*Trichodesma zeylanicum*	0.01	
			Zornia muelleriana subsp. *congesta*	0.01	0.2

BROW-VT-13001 Site: QBROW 46b

Described: VY & RB (17/05/2013) **Location:** Southern extension 52K 495662 7903746
Type: Quadrat **Season:** Very Good **Habitat:** Alluvial plain waterlogged/seasonal **Soil:** Orange sand
Vegetation Condition: Very Good **Fire Age:** Less than 2 years ago
Vegetation: *Eucalyptus brevifolia* and *E. pruinosa* Scattered Low Trees over *Acacia sericophylla* Tall Shrubland over *Triodia epactia* Hummock Grassland and *Eulalia aurea* and *Aristida holathera* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia epactia	60	0.3	*Goodenia armitiana*	0.01	0.2
Eulalia aurea	25	0.6	*Hakea lorea*	0.01	1-Feb
Acacia sericophylla	15	1.0 - 4.0	*Indigofera linifolia*	0.01	0.2
Aristida holathera	10	0.3	*Mollugo molluginis*	0.01	0.1
Eucalyptus brevifolia	2	8	*Nomismia rhomboidea*	0.01	creeper
Eucalyptus pruinosa	2	5	*Panicum decompositum*	0.01	0.6
Bergia sp.	0.01	0.1	*Pluchea tetranthera*	0.01	0.1
Goodenia crenata	1	0.1	*Polymeria* sp.	0.01	
Gossypium australe	1	1	*Senna notabilis*	0.01	0.3
Zornia muelleriana	1	0.2	*Sida sp.*	0.01	0.5
Acacia elachantha	0.01	2	*Solanum dioicum*	0.01	0.2
Aristida latifolia	0.01	0.3	*Acacia hemignosta*	opp	
Capparis loranthifolia	0.01	0.2	*Amyema* sp.	opp	
Carissa lanceolata	0.01	0.8	*Hakea macrocarpa*	opp	
Cassytha filiformis	0.01	cr	*Lysiana subfalcata*	opp	
Eragrostis eriopoda	0.01	0.2	*Scaevola* sp.	opp	
Eriachne obtusa	0.01	0.2	*Stemodia* sp. Tanami (P.K. Latz 8218)	opp	
Evolvulus alsinoides	0.01	0.1	*Yakirra australiensis*	opp	

BROW-VT-13001 Site: QBROW 49
Described: JA (14/05/2012), VY (16/05/2013) **Location:** 52K
Type: Quadrat **Season:** Excellent (2012), Very Good (2013) **Habitat:** Plain **Soil:** Orange surface **Rock Type:** Quartz **Vegetation Condition:** Excellent (2012) bulldozing – track through centre of site and animal burrows.
Fire Age: Last burnt more than five years ago.
Vegetation: *Eucalyptus cupularis, Corymbia flavescens* and *C. opaca* Low Woodland over *Capparis loranthifolia* Open Shrubland over *Triodia epactia* Hummock Grassland and *Aristida latifolia, Eulalia aurea* and *Eriachne obtusa* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia epactia	40	0.5	*Hibiscus aff. leptocladus*	0.01	
Aristida latifolia	25	1.3	*Hybanthus aurantiacus*	0.01	0.4
Capparis loranthifolia	8	2.2	*Indigofera linifolia*	0.01	0.2
Eucalyptus cupularis	6	8	*Iseilema sp.*	0.01	0.1
Eulalia aurea	5	0.6	*Mollugo molluginea*	0.01	0.1
Eriachne obtusa	2	0.4	*Nomismia rhomboidea*	0.01	Creep
Corymbia flavescens	1	8	*Paraneurachne muelleri*	0.01	0.5
Corymbia opaca	1	12	*Phyllanthus sp.*	0.01	
Aristida holathera	0.01	0.3	*Santalum lanceolatum*	0.01	to 1
Boerhavia paludosa	0.01	0.03	*Senna notabilis*	0.01	0.25
Carissa lanceolata	0.01		*Senna venusta*	0.01	1.4
Chrysopogon fallax	0.01	1.3	*Sida rohlenae*	1%	0.5
Corchorus vermicularis	0.01	0.5 - 1.0	*Spermacoce hillii*	0.01	
Crotalaria brevis	0.01	0.2	*Themeda triandra*	0.01	
Crotalaria novae-hollandiae	0.01	0.6	*Tinospora smilacina*	0.01	Climb
Cymbopogon ambigua	0.01	1.1	*Trichodesma zeylanicum*	0.01	0.8
Dolichandrone heterophylla	0.01	0.6	*Ventilago viminalis*	0.01	
Ehretia saligna	0.01		*Waltheria indica*	0.01	0.4
Eragrostis eriopoda	0.01	0.4	*Whiteochloa airoides*	0.01	
Euphorbia tannensis	0.01		*Yakirra australiensis*	0.01	0.1
Goodenia armitiana	0.01		*Zornia muelleriana* subsp. *congesta*	0.01	0.25
Gossypium australe	0.01	0.5	*Evolvulus alsinoides*		
Hakea macrocarpa	0.01		*Ventilago sp.*		
Halgania solanacea	0.01				

Photo of QBROW 49 2013

BROW-VT-13001 Site: QBROW 51
Described: JA (11/05/2012), VY & RB (17/05/2013) **Location:** 52K
Type: Quadrat **Season:** Excellent (2012 and 2013) **Habitat:** Plain **Soil:** Red brown **Rock Type:** None
Vegetation Condition: Excellent **Fire Age:** Burnt approximately 2 years ago
Vegetation: *Corymbia flavescens* (*C. opaca*) Scattered Low Trees over *Acacia hammondii* and *Hakea macrocarpa* Tall Shrubland over *Crotalaria novae-hollandiae, Dolichandrone heterophylla*, *Androcalva loxophylla*, *Chamaecrista symonii, Scaevola parviflora* and *Halgania solanacea* Low Shrubland over *Sorghum plumosum* and *Eriachne obtusa* Closed Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Sorghum plumosum	60	1.5 - 2	*Euphorbia cinerea*	0.01	0.15
Eriachne obtusa	35	0.6	*Fimbristylis ammobia*	0.01	0.2
Androcalva loxophylla	25	0.6	*Glycine tomentella*	0.01	0.2
Chamaecrista symonii	15	0.3	*Gossypium australe*	0.01	1.5
Acacia drepanocarpa subsp. *latifolia*	10	2	*Leptosema anomalum*	0.01	0.2
Hakea macrocarpa	10	4	*Nomismia rhomboidea*	0.01	creep
Crotalaria novae-hollandiae	5	1.4	*Polymeria ambigua*	0.01	cr
Scaevola parviflora	5	0.3	*Pterocaulon serrulatum*	0.01	0.2
Dolichandrone heterophylla	2	0.6	*Santalum lanceolatum*	0.01	1.3
Halgania solanacea	1	0.2	*Spermacoce hillii*	0.01	0.2
Aristida holathera	0.01	0.3	*Tephrosia leptoclada*	0.01	0.2
Aristida latifolia	0.01	0.2	*Tinospora smilacina*	0.01	cr
Boerhavia burbidgeana	0.01	0.2	*Trichodesma zeylanicum*	0.01	0.7
Bonamia linearis	0.01	creeper	*Triodia epactia*	0.01	0.2
Bulbostylis barbata	0.01	0.1	*Velleia panduriformis*	0.01	0.7
Carissa lanceolata	0.01	1	*Zornia muelleriana* subsp. *congesta*	0.01	0.2
Eragrostis eriopoda	0.01	0.3	*Tribulopis angustifolia*		
			Corymbia opaca	opp	

BROW-VT-13001 Site: BROW 51a (VY225)

Described: VY & RB (17/05/2013) **Location:** 52K
Type: Quadrat **Habitat:** Plain **Soil:** Orange, sand **Rock Type:** No outcropping. **Fire Age:** less than 2 years ago, evidence of fire: dead branches, epicormic shoots and bare ground. Some grazing observed. **Vegetation Condition:** Excellent
Vegetation: *Corymbia opaca*, *C. flavescens* and *Eucalyptus pruinosa* Low Open Woodland over *Acacia drepanocarpa* subsp. *latifolia, Dolichandrone heterophylla, Hakea macrocarpa* and *Grevillea pyramidalis* Tall Shrubland over *Chaemacrista symonii, Crotalaria novae-hollandiae* over *Eriachne obtusa* Closed Tussock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Eriachne obtusa	70	0.6	*Cymbopogon ambiguus*	0.01	0.8
Chamaecrista symonii	5	0.2	*Eragrostis eriopoda*	0.01	0.2
Acacia drepanocarpa subsp. *latifolia*	25	1.5	*Evolvulus alsinoides*	0.01	0.2
Androcalva loxophylla	10	0.3	*Goodenia armitiana*	0.01	0.2
Dolichandrone heterophylla	10	1.0 – 3.0	*Gossypium australe*	0.01	1
Aristida holathera	1	0.2	*Halgania solanacea*	0.01	0.2
Corymbia flavescens	1		*Hybanthus aurantiacus*	0.01	0.2
Corymbia opaca	1		*Phyllanthus sp.*	0.01	0.2
Crotalaria novae-hollandiae	1	0.2	*Polymeria ambiguua*	0.01	cr
Eucalyptus flavescens	1		*Portulaca australis*	0.01	cr
Glycine tomentella	1	creeper	*Ptilotus arthrolasius*	0.01	0.2
Grevillea pyramidalis	1	1.0-3.0	*Setaria sp.*	0.01	0.2
Grevillea wickhamii	1	1	*Spermacoce hillii*	0.01	0.2
Hakea macrocarpa	1	3	*Tinospora smilacina*	0.01	cr
Triodia epactia	1	0.3	*Trichodesma zeylanicum*	0.01	0.8
Acacia tumida var. *kulparn*	0.01	0.8	*Zornia muelleriana*	0.01	0.2
Aristida latifolia	0.01	0.3	*Bonamia linearis*		cr
Boerhavia paludosa	0.01	0.2	*Scaevola parviflora*		0.2
Corynotheca micrantha	0.01	0.3	*Brachychiton multicaulis*	opp	

ROW-VT-13001 Site: QBROW 52

Described: JA (11/05/2012) **Location:** 52 K 492861 7902519
Type: Quadrat **Season:** Excellent 2012
Habitat: Flat **Soil:** Orange brown **Rock Type:** Ironstone **Vegetation Condition:** Excellent **Fire Age:** Last burnt more than five years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus cupularis (E. pruinosa, E. brevifolia*) Low Open Woodland over *Acacia ?tumida* and *A. ancistrocarpa* Tall Open Scrub over *Triodia epactia* Closed Hummock Grassland.

Name	Cover (%)	Height (m)	Name	Cover (%)	Height (m)
Acacia ?tumida	35	to 3.5	*Eremophila ?longifolia*	0.01	2.3
Eucalyptus cupularis	5	6	*Eucalyptus pruinosa* subsp. *tenuata*	0.01	4
?Rhynchosia minima	0.01	Creep	*Evolvulus alsinoides* var. *villosicalyx*	0.01	0.08
Acacia ancistrocarpa	0.01	2.2	*Gossypium australe*	0.01	0.8
Atalaya salicifolia	0.01	2.0	*Indigofera boviperda*	0.01	0.08
Capparis umbonata	0.01	2.0	**Malvastrum americanum*	0.01	0.5
Chrysopogon fallax	0.01	0.6	*Tinospora smilacina*	0.01	Climber
Crotalaria medicaginea	0.01	0.6	*Triodia epactia* (s.l.)		1.3
Cymbopogon obtectus	0.01	2.0			

BROW-VT-13001 Site: QBROW 53

Described: RD (15/05/2012) **Location:** 52 K 493649 7902545
Type: Quadrat **Season:** Excellent **Habitat:** Rocky plateau **Soil:** Grey brown **Rock Type:** Arkose **Vegetation Condition:** Excellent **Fire Age:** Last burnt 100.01 years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Acacia hilliana* and *A. adoxa* var. *adoxa* Low Shrubland over *Triodia pungens* (s. l.) Very Open Hummock Grassland.

Name	Cover (%)	Height (m)	Name	Cover (%)	Height (m)
Acacia hilliana	15	0.7	*Goodenia triodiophila*	0.01	0.2
Acacia adoxa var. *adoxa*	15	0.7	*Hakea chlorophylla*	0.01	2.2
Triodia pungens (s.l.)	10	0.5	*Indigofera monophylla*	0.01	0.3
Eriachne ciliata	0.01	0.2	*Mollugo molluginea*	0.01	0.1
Aristida holathera	0.01	0.4	*Paraneurachne muelleri*	0.01	0.5
Eriachne mucronata	0.01	0.3	*Senna costata*	0.01	1.2
Eucalyptus brevifolia	0.01	5	*Sida macrocarpa* 'filiform pedicels form'	0.01	0.3
Evolvulus alsinoides var. *villosicalyx*	0.01	0.2	*Sida sidoides* subsp. *sidoides*	0.01	0.7

BROW-VT-13001 Site: QBROW 55

Described by: RD (11/05/2012) and JA & AS (16/05/2013) **Location:** 52K 494452 7901762
Type: Quadrat **Season:** 2012 Excellent 2013 Very Good **Habitat:** Sandplain, elevated **Soil:** Orange-brown sand with no rocks seen. **Vegetation Condition:** Excellent **Fire Age:** Estimated burnt approximately two years ago and possibly again more recently. No sign of any other disturbance.
Vegetation: *Androvalva loxophylla, Newcastelia cladotricha, Chamaecrista symonii* and *Corchorus sidoides* subsp. *sidoides* Low Open Shrubland over *Eriachne obtusa* and *Sorghum plumosum* Tussock Grassland and *Triodia schinzii* Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia schinzii	25	0.4	*Crotalaria novae-hollandiae* subsp. *lasiophyllum*	0.01	0.5
Eriachne obtusa	15	0.4 - 0.6	*Eragrostis eriopoda*	0.01	0.4
Sorghum plumosum	15	1.2	*Evolvulus alsinoides*	0.01	0.1
Androvalva loxophylla	2	0.4	*Fimbristylis dichotoma* (desert form)	0.01	0.15
Newcastelia cladotricha	2	0.6	*Glycine tomentella* (s. l.)	0.01	0.1
Chamaecrista symonii	1	0.3	*Hakea macrocarpa*	0.01	0.8
Corchorus sidoides subsp. *sidoides*	1	0.3	*Hybanthus aurantiacus*	0.01	0.4
Acacia drepanocarpa subsp. *latifolia*	0.01	1	*Indigofera monophylla*	0.01	
Acacia stipuligera	0.01	0.4	*Polymeria ambigua*	0.01	0.08
Aristida contorta	0.01	0.4	*Ptilotus arthrolasius*	0.01	0.3
Aristida holathera var. *holathera*	0.01	0.2	*Spermacoce sp.*	0.01	0.3
Aristida latifolia	0.01	0.4	*Tephrosia leptoclada*	0.01	0.1
Bonamia linearis	0.01	0.01	*Trichodesma zeylanicum*	0.01	0.6
Corynotheca micrantha var. *gracilis*	0.01	0.4-0.7	*Velleia panduriformis*	0.01	0.4
Crotalaria cunninghamii	0.01	1	*Vigna sp.*	0.01	creep
			Zornia muelleriana	0.01	0.3

BROW-VT-13001 Site: QBROW 56
Described: RD (11/05/2013), JA & AS (16/05/2013) **Location:** 52K 493806 7901717
Type: Quadrat **Season:** Excellent (2012) and Very Good (2013) **Habitat:** Crest of ridge **Soil:** Orange brown
Rock Type: Granite and quartz bands **Vegetation Condition:** Excellent **Fire Age:** Last burnt over a year ago (2012) and subject to a hot burnt 2012 (2013)
Vegetation: *Eucalyptus brevifolia* and *Corymbia aspera* Scattered Low Trees over *Sesbania muelleri* Scattered Shrubs over *Triodia pungens* and *T. schinzii* Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia pungens (s. l.)	20	0.5	*Eriachne pulchella*	0.01	0.1
Triodia schinzii	15	0.6	*Gomphrena lanata*	0.01	0.04
Fimbristylis sp.	5	0.3	*Grevillea wickhamii*	0.01	1.7
Eucalyptus brevifolia	1	3	*Mollugo mollugineus*	0.01	0.1
Sesbania muelleri	1	1.3	*Oldenlandia spermacocoides*	0.01	0.02
Triodia basedowii (s. l.)	1	0.4	*Polycarpaea corymbosa*	0.01	0.1
Acacia acradenia	0.01	1.8	*Polygala insingii*	0.01	0.01
Aristida holathera var. *holathera*	0.01	0.4	*Ptilotus polystachyus*	0.01	0.4
Aristida latifolia	0.01	0.8	*Scaevola browniana* subsp. *browniana*	0.01	0.3
Capparis lasiantha	0.01	0.4	*Senna venusta*	0.01	1.0
Cassytha sp.	0.01	Climber	*Setaria surgens*	0.01	0.6
Cleome viscosa	0.01	0.4 - 3	*Sida sp.*	0.01	0.7 - 1.2
Corymbia aspera	0.01	4	*Triumfetta sp.*	0.01	0.3
Crotalaria sp.	0.01	0.1	*Triumfetta sp.*	0.01	0.4
Cymbopogon obtectus	0.01	0.5	*Acacia stipuligera*		1.8
Cyperus sp.	0.01	0.4	*Indigofera monophylla*		
Eriachne mucronata	0.01	0.4	*Urochloa holosericea* subsp. *velutina*		0.2

QBROW 56 (2012)

BROW-VS-12001: BROW-VT-13001 Site: Brow 57a

Described: JA & AJ (13/05/2012) **Location:** 52 K 494495 7907174
Type: Quadrat **Season:** Excellent **Habitat:** Plain **Soil:** Reddish brown **Rock Type:** Ironstone
Vegetation Condition: Excellent **Fire Age:** Last burnt 10.01 year ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* (*Corymbia opaca*) Low Open Woodland over *Acacia sericophylla* Scatttered Shrubs over *Halgania solanacea* and *Acacia adoxa* var. *adoxa* Low Shrubland over *Aristida holathera* and *A. contorta* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera	60	0.5	*Cucumis maderaspatanus*	0.01	Creeper
Acacia hemignosta	25	2 – 4.5	*Cymbopogon obtectus*	0.01	0.5
Aristida contorta	15	0.2	*Dampiera candicans*	0.01	0.4 – 0.7
Eucalyptus brevifolia	10	10	*Grevillea wickhamii*	0.01	0.7 – 2.2
Halgania solanacea	10	0.4	*Hybanthus aurantiacus*	0.01	0.2
Acacia adoxa var. *adoxa*	1	0.6	*Jacksonia aculeata*	0.01	0.6
Acacia sericophylla	1	1.3	*Mollugo molluginea*	0.01	0.14
Corymbia opaca	1	7	*Paraneurachne muelleri*	0.01	0.5
Eragrostis eriopoda	1	0.5	*Polycarpaea corymbosa*	0.01	0.15
Eriachne obtusa	1	0.6	*Senna notabilis*	0.01	0.4
Schizachryium fragile	1	0.15	*Solanum diversiflorum*	0.01	0.5
Acacia hilliana	0.01	0.6	*Tinospora smilacina*	0.01	Climber
Brachychilon multicaulis	0.01	0.2	*Triodia epactia*	0.01	0.6 (1.7)
Buchnera ramosissima	0.01	0.4	*Waltheria indica*	0.01	0.3
Cassytha sp.	0.01	0.4	*Yakirra australiensis*	0.01	0.15
Chrysopogon fallax	0.01	1.2	*Zornia muelleriana* subsp. *congesta*	0.01	0.15

BROW-VT-13001 Site: QBROW 58

Described: JA (10/05/2012), AS & VY (15/05/2013) **Location:** 52K 492103 7908957
Type: Quadrat **Season:** Excellent (2012) and Very Good (2013) **Habitat:** Hill/Escarpment **Soil:** Reddish brown
Rock Type: Quartz **Vegetation Condition:** Excellent **Fire Age:** Last burnt approximately 4 years ago.
Vegetation: *Eucalyptus brevifolia* Low Open Woodland over *Acacia gonoclada* Tall Open Shrubland over *Acacia adoxa* var. *adoxa* and *A. orthocarpa* Scattered Low Shrubs over *Triodia wiseana* and *T. schinzii* Closed Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia wiseana	60	0.3 - 0.4 (1)	*Goodenia triodiophila*	0.01	0.2
Triodia schinzii	12	0.6 (1.4)	*Hakea chordophylla*	0.01	
Eucalyptus brevifolia	8	2.5-3.2	*Hibiscus leptocladus*	0.01	0.4
Acacia gonoclada	5	to 2.8	*Hybanthus aurantiacus*	0.01	0.25
Acacia adoxa var. *adoxa*	2	0.5	*Schizachrium fragile*	0.01	0.2
Acacia orthocarpa	0.01	0.9	*Oldenlandia spermacocoides*	0.01	0.25
Acacia acradenia	0.01	1.3	*Polycarpaea corymbosa*	0.01	0.15
Aristida holathera var. *holathera*	0.01	0.3	*Polygala isingii*	0.01	0.02
Buchnera	0.01	0.3	*Senna notabilis*	0.01	0.3
Cassytha sp.	0.01	creeper	*Senna oligoclada*	0.01	
Eremophila latrobei subsp. *filiformis*	0.01		*Sida* aff. *fibulifera*	0.01	0.2
Eriachne mucronata	0.01	0.5	*Yakirra australiensis*	0.01	0.15
Evolvulus alsinoides var. *decumbens*	0.01		*Triumfetta sp.*	opp	
Fimbristylis tetragona	0.01	0.3			

AS Photo 323

BROW-VT-13001 Site: QBROW 59

Described: RD (13/05/2012), JA & AS (17/05/2013) **Location:** 52K 492103 7908957
Type: Quadrat **Season:** Excellent (2012) and Very Good (2013) **Location:** Immediately south of camp **Habitat:** elevated plain **Soil:** red Pindan sand veneer over a dark brown loamy sand. **Rock Type:** Quartz **Fire Age:** burnt approximately 2 years ago and then again ?October 2012. The fire appears to have been a relatively cool burn. No sign of any other disturbance. The grass cover is less than recorded in the 2012 survey.
Vegetation: *Corymbia opaca* and *C. flavescens* Low Open Woodland over *Hakea macrocarpa* (*A. sericophylla)* Tall Open Shrubland over *Triodia epactia* Hummock Grassland and *Aristida holathera* Open Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia epactia	45		*Eriachne obtusa*	0.01	
Aristida holathera	30		*Eulalia aurea*	0.01	
Corymbia opaca	10	6	*Evolvulus alsinoides*	0.01	
Hakea macrocarpa	5	3	*Fimbristylis dichotoma*	0.01	
Acacia sericophylla	1	2.2	*Gossypium australe*	0.01	
Alternanthera nana	0.01	0.15	*Halgania solanacea*	0.01	
Aristida contorta	0.01	0.1	*Indigofera linifolia*	0.01	0.1
Aristida latifolia	0.01		*Paraneurachne muelleri*	0.01	0.4
Bauhinia cunninghamii	0.01	1	*Paraneurachne muelleri*	0.01	
Boerhavia sp.	0.01	0.1	*Rhynchosia minima*	0.01	0.08
Brachychiton multicaulis	1 plant	1.1	*Santalum lanceolatum*	0.01	1 - 1.2
Corymbia flavescens	0.01	6	*Sida sp.*	0.01	
Crotalaria novae-hollandiae	0.01		*Spermacoce hillii*	0.01	
Cucumis argenteus	0.01		*Tephrosia leptoclada*	0.01	
Digitaria sp.	0.01	0.4	*Tinospora smilacina*	0.01	creeper
Dolichandrone heterophylla	0.01	0.3	*Triodia schinzii*	0.01	0.7
Duperreya commixta	0.01	climber	*Yakirra australiensis*	0.01	0.01
Ehretia saligna	0.01	2	*Zornia sp.*	0.01	0.1

BROW-VT-13001 Site: QBROW 60

Described: JA (15/05/2012) **Location:** 52 K 494458 7903556
Type: Quadrat **Season:** Excellent **Habitat:** Elevated Plain **Soil:** Light brown **Rock Type:** Arkose **Vegetation Condition:** Excellent **Fire Age:** Patches burnt 1+ year ago remaining 5+ years **Notes:** No sign of any other disturbance
Vegetation: *Acacia sericophylla* Tall Open Shrubland and Open Shrubland over *Triodia epactia* Hummock Grassland and *Aristida holathera* (*A. latifolia*) Open Tussock Grassland.

Name	Cover (%)	Height (m)	Name	Cover (%)	Height (m)
Triodia epactia	45	0.35 – 0.6	*Euphorbia* sp.	+	0.15
Aristida holathera	30	0.6	*Evolvulus alsinoides*	+	0.10
Acacia sericophylla	10	1 -3.5	*Halgania solanacea*	+	0.2
Aristida latifolia	2	0.5 (1.2)	*Hibiscus sturtii*	+	0.2
Trichodesma zeylanicum	1	0.6 – 1.2	*Hybanthus aurantiacus*	+	0.5
Bauhinia cunninghamii	+	0.4 – 1.1	*Indigofera linifolia*	+	0.2 -0.3
Bergia sp.	+	0.005	*Marsdenia ?australis*	+	Climb
Carissa lanceolata	+	0.8	*Pterocaulon* sp.	+	0.4
Cassytha sp.	+	Creeper/climber	*Senna notabilis*	+	0.5
Cucumis maderaspatanus	+	Climb	*Setaria surgens*	+	
Cymbopogon obtectus	+	0.9	*Tephrosia leptoclada*	+	0.4
Digitaria ?brownii	+	0.5	*Tinospora smilicina*	+	Climb
Eragrostis eriopoda	+	0.5	*Yakirra australiensis*	+	0.08
Eriachne obtusa	+	0.8	*Zornia muelleriana* subsp. *congesta*	+	0.15
Eulalia aurea	+	0.5			

BROW-VT-13001 Site: RBROW 63

Described: RD (15/05/2012) **Location:** 52 K 493114 7903135
Type: Releve along ephemeral creek **Season:** Excellent **Habitat:** Ephemeral creek line **Soil:** Light brown **Rock Type:** Ironstone and Arkose **Vegetation Condition:** Excellent **Fire Age:** Last burnt 10+ years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Eulalia aurea* Tussock Grassland and and *Triodia schinzii* Hummock Grassland.

Name	Cover (%)	Height (m)	Name	Cover (%)	Height (m)
Eulalia aurea	55	0.7	*Eucalyptus brevifolia*	0.01	6
Triodia schinzii	35	1.0	*Fimbristylis microcarya*	0.01	0.2
Acacia adoxa var. *adoxa*	0.01	0.7	*Fimbristylis nuda*	0.01	0.1
Acacia colei var. *colei*	0.01	0.5	*Gossypium australe*	0.01	
Acacia lysiphloia	0.01	2.5	*Hybanthus aurantiacus*	0.01	0.3
Blumea saxatilis	0.01	0.3	*Schizachryium fragile*	0.01	0.4
Carissa lanceolata	0.01	2.0	*Senna notabilis*	0.01	0.4
Centipeda minima subsp. *minima*	0.01	0.2	*Setaria surgens*	0.01	0.5
Chrysopogon fallax	0.01	0.3	*Sida fibulifera (s.l.)*	0.01	0.5
Cymbopogon ambigua	0.01	1.0	*Triumfetta micracantha*	0.01	0.3
Cyperus pulchellus	0.01	0.3	*Waltheria indica*	0.01	0.4
Drosera sp.	0.01	0.1	*Zornia muelleriana*	0.01	0.3
Eragrostis cumingii	0.01	0.1 – 0.3	*Indigofera monophylla*		
Eragrostis exigua	0.01	0.1	*Pterocaulon* sp.		
Eragrostis speciosa	0.01	0.6	*Schizachyrium pseudeulalia*		
Eriachne obtusa	0.01	0.3			

Photo of RBROW 63 in 2012

BROW-VT-13001 Site: BROW 64a

Described: JA (14/05/2012), JA & AS (17/05/2013) **Location:** 52K 492614 7905274
Type: Quadrat **Season:** Excellent (2012) Very Good (2013) **Habitat:** Plain (elevated) **Soil:** Orange red sandy loam **Rock Type:** Ironstone and arkose **Vegetation Condition:** Excellent **Fire Age**: last burnt over 10 years ago. Old fire scars up to 3 m up trunks. Patchy lichen crust.
Vegetation: *Acacia sericophylla* and *Gossypium australe*Tall Open Shrubland over *Aristida holathera*, *Eriachne obtusa* and *Eulalia aurea* Tussock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera	20	0.4	*Gomphrena lanata*	0.01	0.15
Acacia sericophylla	10	4.0 – 6.0	*Goodenia armitiana*	0.01	0.15
Eriachne obtusa	10	0.4	*Halgania solanacea*	0.01	0.4
Eulalia aurea	5	0.6	*Indigofera linifolia*	0.01	0.2
Gossypium australe	5	1 - 3.5	*Indigofera monophylla*	0.01	0.4
Aristida latifolia	1	0.6 (1.0)	*Marsdenia australis*	0.01	Creep
Eremophila latrobei subsp. *filiformis*	1	1.8	*Mollugo molluginea*	0.01	0.15
Abutilon otocarpum	0.01	0.15	*Paraneurachne muelleri*	0.01	0.5
Acacia ancistrocarpa	0.01	1.2	*Pluchea tetranthera*	0.01	0.2
Acacia lysiphloia	0.01	2.2	*Portulaca pilosa*	0.01	0.1
Alternanthera nana	0.01	0.4	*Sida sp.*	0.01	
Alternanthera nana	0.01		*Solanum diversiflorum*	0.01	0.4
Atalaya salicifolia	0.01	2	*Solanum quadrilocatum*	0.01	0.3
Boerhavia burbidgeana	0.01	0.08	*Stylobasium spathulatum*	0.01	1.1
Chrysopogon fallax	0.01	0.4	*Tephrosia leptoclada*	0.01	0.4
Dolichandrone heterophylla	0.01	0.6 - 3	*Tephrosia sp.*	0.01	0.4
Eragrostis eriopoda	0.01	0.3	*Triodia bitextura*	0.01	0.05
Eucalyptus sp.Corymbia opaca	0.01	2.5	*Ventilago viminalis*	0.01	3.5
Evolvulus alsinoides	0.01	0.3	*Zornia muelleriana* subsp. *congesta*	0.01	0.4

BROW-VT-13001 Site: QBROW 65

Described: RD (12/05/2012) **Location:** Centre of study area 52K 492241 7907158
Type: Quadrat **Season:** Excellent **Habitat:** Undulating Plain **Soil:** Orange brown **Rock Type:** Quartz
Vegetation Condition: Excellent **Fire Age:** Last burnt 10+ years ago **Notes:** No sign of any other disturbance
Vegetation: *Eucalyptus brevifolia* Open Low Woodland over *Acacia lysiphloia* and *A. hilliana* Closed Heath over *Aristida holathera* and *A. latifolia* Tussock Grassland.

Name	Cover (%)	Height (m)	Collection Number		
Acacia lysiphloia	50	2.2	*Eulalia aurea*	0.01	0.3
Aristida holathera	40	0.3	*Fimbristylis* sp.	0.01	
Eragrostis eriopoda	30	0.4	*Gossypium australe*	0.01	1.0
Acacia hilliana	25	1.2	*Grevillea wickhamii*	0.01	0.4
Aristida latifolia	10	0.3 (1.2)	*Halgania solanacea*	0.01	0.3
Eucalyptus brevifolia	5	8	*Hibiscus leptocladus*	0.01	1.0
Goodenia armitiana	3	0.1	*Panicum decompositum*	0.01	0.5
Triodia epactia	1	0.5	*Paraneurachne muelleri*	0.01	0.4
Acacia adoxa var. *adoxa*	0.01	0.4	*Pterocaulon serrulatum*	0.01	0.1
Cucumis argenteus	0.01	0.5	*Schizachryium fragile*	0.01	0.2
Cymbopogon sp.	0.01	1.2	*Senna notabilis*	0.01	0.2
Digitaria brownii	0.01	0.5	*Tephrosia stuartii*	0.01	0.2

BROW-VT-13001 Site: QBROW 66

Described: RD (16/05/2012), VY & RB (16/05/2013) **Location:** 52K 492956 7909854
Type: Quadrat **Season:** Excellent (2012) and Very Good (2013) **Location:** south of old camp **Habitat:** Plain
Soil: Orange **Rock Type:** None **Fire Age:** burnt more than 2 years ago. No sign of any other disturbance.
Vegetation: *Santalum lanceolatum* Shrubland over *Corchorus sidoides* subsp. *vermicularis* Low Open Heath over *Eriachne obtusa* Tussock Grassland and *Triodia schinzii* Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Eriachne obtusa	65	0.7	*Gyrostemon tepperi*	0.01	0.8
Corchorus sidoides subsp. *vermicularis*	35	0.6	*Hakea macrocarpa*	0.01	1
Triodia schinzii	35	0.4	*Hibiscus leptocladua*	0.01	0.4
Acacia tumida var. kulparn	20	0.5	*Hibiscus sturtii*	0.01	
Santalum lanceolatum	20	1.5	*Hybanthus aurantiacus*	0.01	0.6
Sida sp.	10	0.6	*Marsdenia australis*	0.01	1
Aristida latifolia	1	1	*Mollugo molluginea*	0.01	0.2
Dolichandrone heterophylla	1	2	*Portulaca filifolia*	0.01	0.2
Acacia acradenia	0.01	1	*Ptilotus arthrolasius*	0.01	0.2
Bonamia linearis	0.01	creeper	*Sida platycalyx*	0.01	0.3
Brachychiton multicaulis	0.01		*Spermacoce hillii*	0.01	0.1
Chaemacrista absus			*Tephrosia stuartii*	0.01	
Chamaecrista symonii	0.01	0.3	*Tinospora smilacina*	0.01	cr
Clerodendrum floribundum	0.01	2	*Triodia* aff. *epactia*	0.01	1
Corynotheca micrantha	0.01	0.6	*Triodia angusta*	0.01	0.4
Crotalaria novae-hollandiae	0.01	0.2	*Velleia panduriformis*	0.01	0.8
Crotalaria ramosissima	0.01	0.2	*Abutilon otocarpum*	opp	
Dicrastylis sp.	0.01	0.4	*Brunonia suffruticosa*	opp	
Dodonaea hispidula	0.01	1	*Cajanus marmoratus*	opp	
Enneapogon robustissimus	0.01	0.6	*Corymbia flavescens*	opp	
Euphorbia schultzii var. *comans*	0.01		*Cucumis argenteus*	opp	
Evolvulus alsinoides var. *villosicalyx*	0.01	0.2	*Dampiera candicans*	opp	
Fimbristylis sp.	0.01	0.2	*Ehretia saligna*	opp	
Glycine tomentella	0.01	0.3	*Eucalyptus gamophylla*	opp	
Goodenia armitiana	0.01	0.4	*Heliotropium diversifolium*	opp	
Gossypium australe	0.01	1	*Indigofera colutea*	opp	
Grevillea refracta	0.01	2	*Jacksonia aculeata*	opp	
Grevillea wickhamii	0.01	1	*Sauropus trachyspermus* (s. l.)	opp	

BROW-VT-13001 Site: RBROW 67

Described: JA & AS (10/05/2012), JA **(**15/05/2013) **Location:** 52K 493042 7914629
Type: Releve **Season:** Excellent (2012) and Very Good (2013) **Habitat:** Plain (elevated) **Soil:** Orange brown
Rock Type: Arkrose with quartz - some surface outcropping with quartz surface rock piles. **Fire age**: Last burnt estimate 3 years ago. Lichen crust.
Vegetation: *Eucalyptus brevifolia* Low Open Woodland ovewr *Acacia adoxa* var. *adoxa* Low Open Shrubland to Low Shrubland over *Triodia wiseana (T. schinzii)* Hummock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia wiseana	40	0.4	*Fimbristylis sp.*	0.01	0.4
Eucalyptus brevifolia	5	7	*Gossypium australe*	0.01	2
Acacia adoxa var. *adoxa*	5-15	0.5	*Halgania solanacea*	0.01	0.25
Triodia schinzii	2	0.5	*Heliotropium sp.*	0.01	0.1
Acacia hilliana	0.01	0.6	*Hybanthus aurantiacus*	0.01	0.6
Alternanthera nodiflora	0.01	0.3	*Indigofera linifolia*	0.01	0.1
Aristida holathera	0.01		*Mirbelia viminalis*	0.01	0.6
Buchnera	0.01	0.3	*Mollugo molluginea*	0.01	
Capparis lanceolata	0.01	1.4	*Scaevola parvifolia*	0.01	0.2
Corchorus sidoides subsp. *vermicularis*	0.01	0.3	*Schizachyrium fragile*	0.01	
Cymbopogon ambiguus	0.01		*Senna notabilisi*	0.01	0.3
Eragrostis eriopoda	0.01		*Solanum diversifolium*	0.01	0.35
Eremophila latrobei subsp. *filiformis*	0.01	2	*Tephrosia lasiochlaena*	0.01	0.6
Eriachne obtusa	0.01	0.4	*Triodia epactia*	0.01	0.5

BROW-VT-13001 Site: BROW 100

Described: RD (12/05/2012), VY & JA (20/05/2013) **Location:** 52K 491438 7907316
Type: Quadrat **Season:** Excellent (2012) and Very Good (2013). **Location:** Centre of original study area, south of old camp **Habitat:** Slight depression **Soil:** light brown **Rock Type:** Nil **Fire Age:** burnt over 2 years ago **Vegetation:** *Corymbia flavescens* and *C. opaca* Scattered Low Trees over *Acacia sericophylla* Tall Shrubland over *Themeda avenacea, Eulalia aurea, Aristida holathera* and *Themeda triandra* Closed Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Themeda avenacea	35	0.5 (1.2)	*Evolvulus alsinoides*	0.01	0.3
Eulalia aurea	25	0.6 (1.0)	*Fimbristylis sp.*	0.01	0.2
Acacia sericophylla	20	5	*Goodenia armitiana*	0.01	0.3
Aristida holathera	10	0.4	*Goodenia crenata*	0.01	0.1
Themeda triandra	10	0.6 (1.2)	*Goodenia* ?sp. nov	0.01	0.15
Aristida latifolia	5	0.5 (1.2)	*Gossypium australe*	0.01	2
Chrysopogon fallax	2	0.5	*Indigofera colutea*	0.01	0.2
Carissa lanceolata	1	0.8	*Indigofera linifolia*	0.01	0.4
Corymbia flavescens	1	5	*Indigofera linnaei*	0.01	0.1
Corymbia opaca	1	5	*Marsdenia australis*	0.01	0.4
Amaranthus undulatus	0.01	0.2	*Panicum decompositum*	0.01	0.5
Boerhavia sp.	0.01	0.1	*Pterocaulon serrulatum*	0.01	1
Cleome sp.	0.01	1.2	*Scaevola laciniata*	0.01	
Corymbia flavescens	0.01	5	*Senna artemisiodes* subsp. *helmsii*	0.01	0.5
Enneapogon polyphyllus	0.01	0.4	*Sida sp.*	0.01	0.4
Eriachne obtusa	0.01	0.4	*Solanum sp.*	0.01	0.2
			Tephrosia supina	0.01	0.3

BROW-VT-13001 Site: BROW 102

NW corner 52K 494017 7901753 Described: JA & AS (16/05/2013) **Location:** 52K
Type: Quadrat **Season:** Very Good **Location:** 52K 491966.08 m E 7908875.90 m S (WPT JA 359) **Habitat:** Sandplain, elevated **Soil:** Red Pindan sandy loam **Rock Type:** None noted. **Vegetation Condition:** Excellent – no signs of disturbance other than kangaroo scats. **Fire Age:** Burn estimated at 3 years ago with *Owenia* trunks blackened.
Vegetation: *Owenia reticulata* Scattered Low Trees over *Newcastelia cladotricha* Low Open Shrubland over *Triodia epactia* (s. l.) Hummock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia epactia (s.l)	35	0.5	*Eragrostis eriopoda*	0.01	0.25
Aristida holathera	20	0.6	*Eriachne obtusa*	0.01	0.15
Newcastelia cladotricha	10	0.6-0.8	*Fimbristylis dichotoma*	0.01	0.08
Triodia schinzii	10	0.5 (0.9)	*Grevillea wickhamii*	0.01	1.3
Owenia reticulata	2	5.6	*Gyrostemon tepperi*	0.01	0.6
Acacia sericophylla	0.01	4.5	*Hibiscus leptocladus*	0.01	0.6
Acacia stipuligera	0.01	0.5	*Hybanthus aurantiacus*	0.01	0.3 - 0.5
Chamaecrista absus	0.01	0.4	*Ptilotus arthrolasius*	0.01	0.2
Clerodendrum floribundum var. *coriaceum*	0.01	0.2 - 1.2	*Setaria surgens*	0.01	0.01
Corchorus sidoides subsp. *vermicularis*	0.01	0.6	*Spermacoce hillii*	0.01	0.15
Corynotheca micrantha	0.01		*Tinospora smilacina*	0.01	Climb
Crotalaria cunninghamii	0.01	1.6	*Trichodesma zeylanicum*	0.01	0.6
Crotalaria novae-hollandiae	0.01	1.8	*Velleia panduriformis*	0.01	0.5
Cucumis maderaspatanus	0.01	climber	*Zornia muelleriana*	0.01	0.15

BROW-VT-13001 Site: QBROW 103

Described: RB & JA (18/05/2013) **Location:** 52K
Type: Quadrat **Season:** Very Good **Location:** East side of 2013 study area **Habitat:** flat plain **Soil:** Red brown fine sand **Rock Type:** None noted **Vegetation Condition:** Excellent **Fire Age:** Partially bunrt on edge 2 years prior to survey **Notes:** Evidence of fire: fire scar, dead branches and bare ground.
Vegetation: *Eucalyptus pruinosa* and *E. brevifolia* (*E. limitaris*) Low Woodland over *Acacia lysiphloia* (*A. sericophylla*) Tall Open Scrub over *Acacia ancistrophylla* and *Carissa lanceolata* Open Shrubland over *Triodia epactia* Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia lysiphloia	40	4	*Buchnera ramosissima*	0.01	0.4
Triodia epactia	30	1.3	*Cymbopogon ambiguus*	0.01	0.6
Eucalyptus pruinosa	10	6	*Eriachne ciliata*	0.01	0.2
Acacia ancistrophylla	5	1.5	*Gossypium australe*	0.01	2.3
Eucalyptus brevifolia	5	5	*Grevillea wickhamii*	0.01	0.2
Acacia sericophylla	2	3.5	*Halgania solanacea*	0.01	0.4
Aristida holathera var. *holathera*	2	0.6	*Heliotropium sp.*	0.01	0.2
Aristida latifolia	2	0.8	*Hibiscus* aff. *leptocladus*	0.01	0.7
Carissa lanceolata	2	1.2	*Indigofera boviperda*	0.01	0.3
Chrysopogon fallax	2	0.4	*Indigofera monophylla*	0.01	0.8
Eragrostis eriopoda	2	0.5	*Marsdenia australis*	0.01	2
Paraneurachne muelleri	2	0.5	*Pterocaulon serrulatum*	0.01	0.6
Senna notabilis	2	0.6	*Senna artemisioides* subsp. *helmsii*	0.01	0.8
Eucalyptus limitaris	1	5	*Sida sp.*	0.01	0.7
Acacia sp.	0.01	1.6	*Stylobasium australe*	0.01	1.2
Amyema sanguinea	0.01	0.4	*Tephrosia* aff. sp. Bungaroo Creek (M.E. Trudgen 11601)	0.01	0.3
Atalaya hemiglauca	0.01	1	*Zornia muelleriana* subsp. *congesta*	0.01	0.4

BROW-VT-13001 Site: RBROW 104

Described: 18/05/2013 **Location:** 52K
Type: Releve **Season:** Very Good **Habitat:** Slightly elevated **Soil:** Red brown sandy loam **Rock Type:** None seen. **Vegetation Condition:** Excellent **Fire Age:** Estimated at greater than 10 years since last burnt. No evidence of fire.
Vegetation: *Eucalyptus brevifolia* Low Open Woodland over *Acacia lysiphloia* Tall Open Shrubland to Tall Open Scrub over *Triodia epactia* Hummock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia lysiphloia	5-60	2.5	*Eragrostis eriopoda*	0.01	0.4
Triodia epactia (s. l.)	40	0.6 (1.5)	*Eriachne mucronata*	0.01	0.2
Eucalyptus brevifolia	5	10-Dec	*Eragrostis eriopoda*	0.01	0.4
Triodia aff. *epactia*	2	0.6	*Eriachne mucronata*	0.01	0.2
Acacia sp.	0.01	2.5			
Acacia sericophylla	0.01	5			
Acacia tenuissima	0.01	2.5			
Aristida latifolia	0.01	0.4			

BROW-VT-13001 Site: RBROW 105 2013

Described: RB & JA (18/05/2013) **Location: JAW WP 140 centre**
Type: Releve **Season:** Very Good **Habitat:** depression area with clay crab holes – undulating *Eucalyptus victrix* **Soil:** Dark brown **Rock Type:** None **Vegetation Condition:** Excellent **Fire Age:** Burnt approximately 2 years ago?
Vegetation: *Eucalyptus victrix* Open Woodland over *Bothriochloa* sp. and *Themeda avenacea* Closed Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Bothriochloa sp.	70	0.7	*Enneapogon polyphyllus*	0.01	0.1
Themeda avenacea	30	1.2	*Eremophila bignoniiflora*	0.01	1.2
Eucalyptus victrix	8	6.0-15.0	*Eulalia aurea*	0.01	0.5
Acacia tenuissima	0.01	3	*Evolvulus alsinoides*	0.01	0.15
Aristida latifolia	0.01	0.6	*Pluchea sp.*	0.01	0.3
Atalaya hemiglauca	0.01	0.9	*Pterocaulon serrulatum*	0.01	0.7
Carissa lanceolata	0.01	1.2 - 4	*Sida fibulifera*	0.01	0.08
Ehretia saligna	0.01	2.5	*Ventilago viminalis*	0.01	2.5

Photo of QBrow 105

BROW-VT-13001 Site: BROW 389
Described: AS DATE? **Location:** 52K
Type: Quadrat **Season:** Very Good **Habitat:** Sloping plain **Soil:** Red brown **Rock Type:** Quartz and ?ironstone
Fire age: estimated burnt more than 2 years ago

Vegetation: *Eucalyptus odontocarpa* Low Mallee Woodland over *Acacia monticola* and *A. colei* Tall Shrubland over *Acacia adoxa* Low Open Heath over *Triodia epactia* Closed Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia epactia	70	200	*Eucalyptus brevifolia*	0.01	600
Acacia adoxa	40	50-60	*Eulalia aurea*	0.01	30
Eucalyptus odontocarpa	15	300-400	*Evolvulus alsinoides* var. *villosicalyx*	0.01	25
Acacia monticola	8	300	*Fimbristylis dichotoma*	0.01	20
Acacia colei	4	300	*Gossypium australe*	0.01	80
Santalum lanceolatum	2	160	*Grevillea refracta*	0.01	100
Eriachne obtusa	1	40	*Hakea macrocarpa*	0.01	180
Grevillea wickhamii	1	200	*Halgania solanacea*	0.01	25
Acacia hilliana	0.01		*Hybanthus aurantiacus*	0.01	40
Acacia sericophylla.	0.01	120	*Jacksonia aculeata.*	0.01	160
Acacia drepanocarpa subsp. *latifolia*	0.01	220	*Paraneurachne muelleri*	0.01	30
Aristida holathera	0.01	40	*Sauropus trachyspermus* (s. l.)	0.01	0.2
Aristida latifolia	0.01	55	*Scaevola laciniata*	0.01	40
Brachychiton multicaulis	0.01	160	*Tephrosia brachycarpa*	0.01	45
Cassytha sp.	0.01	creeper	*Tephrosia stipuligera*	0.01	20
Corchorus sidoides subsp. *vermicularis*	0.01	50	*Tinospora smilacina*	0.01	creeper
Corymbia aspera	0.01	350	*Triodia schinzii*	0.01	120
Cymbopogon obtectus	0.01	50	*Ventilago viminalis*	0.01	300
Digitaria brownii	0.01	40	*Zornia muelleriana*	0.01	20
Eragrostis eriopoda	0.01	45	*Eucalyptus pruinosa*	opp	
			Ptilotus calostachyus	opp	40

BROW-VT-13001 Site: BROW 398
Described: AS (18/05/2013) **Location:** 52K
Type: Quadrat **Season:** Very Good **Habitat:** Plain **Soil:** Red loam **Rock Type:** Quartz (scattered) **Fire Age:** Estimated less than one year ago based on fies scars, dead branches and bare ground.

Vegetation: *Eucalyptus brevifolia* Low Open Woodland over a (formerly before fire) *Acacia* sp. Tall Shrubland of (can't ID, burnt) over *Aristida latifolia, Eriachne obtusa, Cymbopogon obtectus* and *Chrysopogon fallax* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Eriachne obtusa	15	0.5	*Jacksonia aculeata*	0.01	30
Eucalyptus brevifolia	10	6	*Mollugo molluginea*	0.01	0.15
Aristida contorta	5	0.2	*Paraneurachne muelleri*	0.01	0.4
Aristida holathera var. *holathera*	5	0.4	*Paspalidium rarum*	0.01	0.2
Chrysopogon fallax	5		*Phyllanthus sp.*	0.01	0.2
Aristida latifolia	3	0.4	*Scaevola parvifolia*	0.01	20
Crotalaria sp.	2	0.15	*Senna notabilis*	0.01	0.2
Yakirra australiensis	2	0.15	*Sida sp.*	0.01	60
Eragrostis eriopoda	1	0.4	*Tephrosia sp.*	0.01	0.2
Halgania solanacea	1	0.4	*Tinospora smilacina*	0.01	cr
Acacia colei	0.01	0.2	*Triodia sp.*	0.01	0.2
Acacia drepanocarpa ssp latifolia	0.01	3	*Unknown sp.*	0.01	30
Acacia lissophloia	0.01	40	*Zornia chaetophora*	0.01	25
Bonamia pannosa	0.01	0.15	*Zornia muelleriana*	0.01	
Brachychiton multicaulis	0.01	200	*Corymbia opaca*	opp	
Cymbopogon obtectus	0.01	0.55	*Crotalaria novae-hollandiae subsp. lasiophylla*	opp	
Eulalia aurea	0.01	0.5	*Dolichandrone heterophylla*	opp	
Evolvulus alsinoides var. *villosicalyx*	0.01	0.15	*Hakea macrocarpa*	opp	
Hibiscus sp.	0.01	0.2	*Ipomoea costata*	opp	
Indigofera linifolia	0.01	0.3	*Rhynchosia minima*	opp	
Indigofera haplophylla	0.01	0.2	*Spermacoce hillii*	opp	
Schizachyrium fragile	0.01	10	*Tephrosia leptoclada*	opp	

BROW-VT-13001 Site: QBROW 402
Described: AS (18/06/2013) **Location:** 52K
Type: Quadrat **Season:** Very Good **Habitat:** plain **Soil:** Brown-red, loam **Rock Type:** Quartz **Fire Age:** Estimated burn less than two years
Vegetation: *Eucalyptus brevifolia* Low Open Woodland over *Acacia hilliana* and *A.adoxa* Low Shrubland over *Triodia wiseana* and *T. epactia* Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia wiseana	50	1.2	*Goodenia sp.*	0.01	0.45
Eucalyptus brevifolia	15	4.0 – 8.0	*Gossypium australe*	0.01	0.45
Acacia hilliana	10	80	*Hakea macrocarpa*	0.01	1
Triodia epactia	3	2	*Halgania solanacea*	0.01	0.4
Acacia adoxa	2	0.8	*Heliotropium sp.*	0.01	0.25
Aristida holathera	2	0.45	*Hibiscus sp.*	0.01	50
Aristida latifolia	1	0.5	*Tephrosia brachycarpa*	0.01	0.4
Acacia ancistrocarpa	0.01	160	*Hybanthus aurantiacus*	0.01	0.4
Acacia sericophylla	1	100	*Petalostigma sp.*	0.01	2.2
Acacia	0.01	100	*Pterocaulon serrulatum*	0.01	1
Acacia tenuissima	0.01	170	*Senna curvistyla*	0.01	0.4
Acacia tumida var. *kulparn*	0.01	0.8	*Solanum diversiflorum*	0.01	0.4
Brachychiton multicaulis	0.01	200	*Tinospora smilacina*	0.01	cr
Corchorus sidoides subsp. *vermicularis*	0.01	0.4	*Ventilago sp.*	0.01	1.5
Corymbia opaca	0.01	3	*Dolichandrone heterophylla*	0.01	1.5
Cymbopogon obtectus	0.01	0.6	*Jacksonia sp.*	0.01	
Eriachne obtusa	0.01	0.4	*Acacia colei var. colei*	opp	5
Eulalia aurea	0.01	0.55	*Acacia drepanocarpa ssp latifolia*	opp	
Evolvulus alsinoides var. *villosicalyx*	0.01	0.2	*Eucalyptus odontocarpa*	opp	
			Triodia epactia	opp	0.8

BROW-VT-13001 Site: QBROW 406
Described: AS & VY (May 2013) **Type:** Quadrat **Habitat:** Plain **Soil:** Red brown, clay loam
Rock Type: None **Vegetation Condition: Excellent**
Vegetation: *Corymbia flavescens* and *C. opaca* Low Open Woodland over *Hakea macrocarpa and H. arborescens* Tall Open Shrubland over *Acacia tumida* Scattered Shrubs over *Santalum lanceolatum* Low Open Shrubland over *Aristida holathera, Eragrostis eriopoda* and *Eulalia aurea* Tussock Grassland and *Triodia epactia* Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera	50	0.5	*Dolichandrone heterophylla*	0.01	2.5
Hakea macrocarpa	15	3	*Eucalyptus pruinosa* subsp. *pruinosa*	0.01	
Triodia epactia	15	1.2	*Evolvulus alsinoides* var. *villosicalyx*	0.01	0.2
Eragrostis eriopoda	5	0.4	*Goodenia sp.*	0.01	0.45
Eulalia aurea	5	0.6	Grevillea wickhamii	0.01	
Hakea arborescens	5	2	*Hakea lorea*	0.01	2
Santalum lanceolatum	5	1.3	*Halgania solanacea*	0.01	0.45
Acacia tumida var. *kulparn*	2		*Hibiscus sturtii*	0.01	
Triodia schinzii	2	1	*Ipomoea costata*	0.01	0.6
Acacia sericophylla	1	100	*Mukia maderaspatana*	0.01	cr
Corymbia flavescens	1	800	*Nomismia rhomboidea*	0.01	cr
Corymbia opaca	1		*Paraneurachne muelleri*	0.01	0.4
Eriachne obtusa	1	0.45	*Bonamia linearis*	0.01	0.2
Trichodesma zeylanicum	1	0.3	*Scaevola parviflora*	0.01	45
Acacia stipuligera	0.01		*Senna notabilis*	0.01	0.35
Aristida latifolia	0.01	0.4	*Tephrosia leptoclada*	0.01	0.4
Brachychiton multicaulis	0.01	150	*Tinospora smilacina*	0.01	
Carissa lanceolata	0.01	0.5	*Zornia muelleriana*	0.01	
Cassytha filiformis	0.01	cr	*Acacia elachantha*	opp	
Chrysopogon fallax	0.01				
Corchorus sidoides subsp. *vermicularis*	0.01	0.4			
Corymbia opaca	0.01	8			

BROW-VT-13001 Site: QBROW 412
Described: AS (19/05/2013) **Type:** Quadrat **Habitat:** undulating, elevated plain **Soil:** Loamy black soil
Vegetation Condition: Excellent **Fire Age:** estimated to have been burnt less than two years ago.
Vegetation: *Corymbia flavescens* (*C. opaca*) and *Eucalyptus pruinosa* Scattered Low Trees over *Hakea chordophylla* and *H. macrocarpa* Tall Shrubland over *Aristida holathera* var. *holathera* and *Eriachne obtusa* Closed Tussock Grassland. In depressions *Corymbia flavescens* over *Sorghum plumosum* and *Themeda* avenacea dominate.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera var. *holathera*	40	0.45	*Pterocaulon serrulatum*	0.01	0.2
Eriachne obtusa	30	0.45	*Senna sp.*	0.01	1.3
Acacia hemignosta	20	1.5	*Sida sp.*	0.01	0.4
Hakea chordophylla	15	5	*Sorghum plumosum*	0.01	1.6
Hakea macrocarpa	10	6	*Spermacoce hillii*	0.01	0.25
Chrysopogon fallax	5	1.2	*Tephrosia supina*	0.01	0.4
Trichodesma zeylanicum	1	0.5	*Zornia muelleriana*	0.01	0.3
Aristida latifolia	0.01	1	*Acacia tumida var. kulparn*	opp	
Rutidosis helichrysoides subsp. *helichrysoides*	0.01	0.25	*Androcalva loxophyla*	opp	
Digitaria brownii	0.01	0.35	*Carissa lanceolata*	opp	
Ehretia salign	0.01	0.6	*Chamaecrista symonii*	opp	
Euphorbia australis var. *hispidula*	0.01	0.2	*Corchorus sidoides subsp. vermicularis*	opp	
Evolvulus alsinoides var. *villosicalyx*	0.01		*Corymbia opaca*	opp	
Fimbristylis dichotoma	0.01	0.2	*Dolichandrone heterophylla*	opp	
Goodenia sp.	0.01	0.35	*Eucalyptus pruinosa*	opp	
Goodenia sp.	0.01	0.25	*Eucalyptus sp.*	opp	
Gossypium australe	0.01	2	*Gyrostemon tepperi*	opp	
Nomismia rhomboidea	0.01	creeper	*Newcastelia spodiotricha*	opp	
Phyllanthus sp.	0.01	0.2	*Ptilotus arthrolasius*	opp	
Polymeria ambigua	0.01	0.2	*Themeda avenacea*		
Portulaca pilosa	0.01	0.2	*Tinospora smilacina*	opp	

BROW-VT-13001 Site: QBROW 417
Described: AS (19/05/2013) **Type:** Quadrat **Season:** Very Good **Habitat:** hill **Soil:** Orange, loamy clay **Rock Type:** Arkrose **Vegetation Condition:** Excellent **Fire Age:** Estimated to have been burnt less than two years ago based on fire scar and dead branches.
Vegetation: *Grevillea refracta* and *G. wickhamii* Tall Shrubland over *Acacia adoxa, A. hilliana, Jacksonia aculeata* and *Scaevola browniana* subsp. *browniana* Low Open Heath over *Triodia* Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia sp.	50	1.2	*Aristida holathera* var. *holathera*	0.01	0.2
Acacia adoxa	20	0.5 - 1	*Eriachne ciliata*	0.01	0.2
Acacia hilliana	10	1	*Halgania solanacea*	0.01	0.3
Grevillea refracta	10	2 - 3	*Heliotropium glabellum*	0.01	0.4
Grevillea wickhamii	10	2 - 3	*Hibiscus sturtii*	0.01	0.4
Jacksonia aculeata	5	0.6	*Hybanthus aurantiacus*	0.01	0.2
Scaevola browniana subsp. *browniana*	5	0.45 - 0.9	*Tephrosia virens*	0.01	0.25
Corymbia aspera	1	3.5	*Yakirra australiensis*	0.01	0.15
Acacia monticola	0.01	1	*Eucalyptus cupularis*	opp	
Acacia stipuligera	0.01	0.4	*Senna curvistyla*	opp	

BROW-VT-13001 Site: QBROW 421

Described: AS & VY (19/05/2013) **Location:** 52K
Type: Quadrat **Habitat:** Broad drainage flats **Soil:** Red brown, loamy sand **Vegetation Condition:** Excellent **Fire age:** No evidence of fire.
Vegetation: *Corymbia flavescens* and *Eucalyptus victrix* Low Open Woodland over *Dolichandrone heterophylla* Scattered Tall Shrubs over *Acacia acradenia* Low Open Shrubland (patchy) over *Sorghum plumosum*, *Aristida holathera* and *Eriachne obtusa* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Sorghum plumosum	40	1.2	*Goodenia crenata*	0.01	
Aristida holathera var. *holathera*	20	0.5	*Hybanthus aurantiacus*	0.01	0.3
Corymbia flavescens	10	10	*Indigofera linifolia*	0.01	0.2
Eucalyptus victrix	10	12	*Nomismia rhomboidea*	0.01	creeper
Acacia acradenia	6	1	*Phyllanthus sp.*	0.01	0.25
Cyperus blakeanus	4	0.8	*Portulaca pilosa*	0.01	0.2
Eriachne obtusa	4	0.45	*Pterocaulon serrulatum*	0.01	0.35
Fimbristylis eremophila	3	0.5	*Senna curvistyla*	0.01	1
Aristida latifolia	2	0.6	*Tephrosia sp.*	0.01	0.2
Dolichandrone heterophylla	2	1.2 - 3	*Themeda avenacea*	0.01	1
Acacia sp.	0.01	1	*Tinospora smilacina*	0.01	cr
Asteraceae sp.	0.01	0.2	*Trichodesma zeylanicum*	0.01	0.5
Capparis sp.	0.01	1	*Triodia sp.*	0.01	0.4
Digitaria brownii	0.01	0.5	*Zornia muelleriana*	0.01	0.3
Enneapogon robustissimus	0.01		*Chamaecrista symonii*		
Evolvulus alsinoides	0.01	0.2	*Trianthema pilosa*		
Gomphrena flaccida	0.01	0.35			

BROW-VT-13001 Site: QBROW 427
Described: AS & RB (20/05/2013) **Type:** Quadrat **Season:** Very Good **Habitat:** plain **Soil:** Red, sandy with a little loam **Rock Type:** None **Vegetation Condition:** Very Good **Fire Age:** Partially burnt one year ago and up to five years prior based on dead branches and bare ground
Vegetation: *Eucalyptus chlorophylla* (*E. brevifolia*) Low Open Woodland over *Acacia lysiphloia, A. sericophylla* (*Melaleuca glomerata*) Tall Shrubland to Tall Open Scrub over *Triodia epactia* Open Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Acacia lysiphloia	20	2.5	*Eucalyptus brevifolia*	0.01	3.5
Triodia epactia	30	1.6	*Evolvulus alsinoides* var. *villosicalyx*	0.01	0.3
Aristida holathera	5	0.5	*Hibiscus leptocladus*	0.01	1
Eucalyptus chlorophylla	5	4	*Indigofera linifolia*	0.01	0.2
Acacia sericophylla	2	1.8	*Panicum decompositum*	0.01	0.6
Eragrostis eriopoda	2	0.6	*Pluchea tetranthera*	0.01	0.5
Eriachne obtusa	2	0.4	*Senna venusta*	0.01	0.6
Melaleuca glomerata	2	2	*Sida sp.*	0.01	0.3
Acacia sp.	0.01	1.5	*Spermacoce hillii*	0.01	0.2
Crotalaria novae-hollandiae	0.01	0.5	*Tephrosia simplicifolia*	0.01	0.3
Cymbopogon obtectus	0.01	0.7	*Themeda avenacea*	0.01	0.9
Cyperus blakeanus	0.01	0.5	*Tinospora smilacina*	0.01	4
Dolichandrone heterophylla	0.01	1.5	*Triodia schinzii*	0.01	1.2
Ehretia saligna	0.01	1.2	*Zornia muelleriana*	0.01	0.3
Eriachne mucronata	0.01	0.4	*Triodia epactia /latzii*		

BROW-VT-13001 Site: RBROW 438
Described: AS & RB (20/05/2013) **Type:** Releve **Season:** Fair **Habitat:** Alluvial plain **Soil:** Red and brown, mixed sandy loam **Rock Type:** None **Vegetation Condition:** Good **Fire Age:** hot fire estimated two years prior to survey based on bare ground and fire scar
Vegetation: *Corymbia opaca* Scattered Low Trees over *Hakea macrocarpa, Dolichandrone heterophylla* and *Capparis umbonata* Scattered Tall Shrubs over *Chrysopogon fallax, Eriachne obtusa, Aristida holathera* var. *holathera* and *Sorghum plumosum* Tussock Grassland (patchy).

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Chrysopogon fallax	40		*Evolvulus alsinoides* var. *villosicalyx*		
Eriachne obtusa	15		*Gossypium australe*		
Aristida holathera var. *holathera*	5		*Hakea macrocarpa*		
Aristida latifolia	5		*Indigofera linifolia*		
Sorghum plumosum	2		*Leptosema anomalum*		
Acacia ancistrocarpa			*Mollugo molluginea*		
Acacia hemignosta			*Nomismia rhomboidea*		
Acacia maconochieana			*Panicum antidotale*		
Boerhavia paludosa			*Pterocaulon serrulatum*		
Capparis umbonata			*Scaevola laciniata*		
Carissa lanceolata			*Scaevola parviflora*		
Corymbia opaca			*Sida platycalyx*		
Crotalaria novae-hollandiae			*Sida sp.*		
Cymbopogon obtectus			*Tephrosia* aff. sp. Bungaroo Creek (M.E. Trudgen 11601)		
Cyperus blakeanus			*Tephrosia* sp. sparse pinnae (C.R. Michel 2202)		
Dolichandrone heterophylla			*Tinospora smilacina*		
Ehretia saligna			*Trichodesma zeylanicum*		
Enneapogon polyphyllus			*Triodia epactia*		
Enneapogon sp.			*Tripogon loliiformis*		
Eragrostis eriopoda			*Zornia chaetophora*		
Eulalia aurea			*Zornia muelleriana*		

BROW-VT-13001 Site: RBROW 240

Described: VY (18/05/2013) **Type:** Releve **Season:** Good
Habitat: Very small isolated outcrop **Rock Type:** Sandstone
Vegetation: *Eucalyptus brevifolia* with *Acacia monticola* and *Grevillea wickhamii* and *Ventilago* over *Cymbopogon ambigus* and *Enneapogon polyphyllus* with Cyperus VY1-01.

Taxon	Taxon
Acacia adoxa	*Eucalyptus brevifolia*
Acacia monticola	*Gossypium australe*
Cheilanthes austrotenuifolia	*Grevillea wickhamii*
Cleome viscosa	*Marsdenia australis*
Cymbopogon ambiguus	*Senna venusta*
Cyperus sp.	*Tephrosia sp.*
Enneapogon polyphyllus	*Tinospora smilacina*

BROW-VT-13001 Site: QBROW 241
Described: VY (18/05/2013) **Type:** Quadrat **Season:** Good **Location:** Eastern extension of survey area
Habitat: rolling hills with minor drainage line **Soil:** Orange, clay loam
Rock Type: Quartz/sandstone, no outcropping **Fire Age:** <2 years (dead branches, epicormic shoots)
Vegetation: *Eucalyptus brevifolia (E. pruinosa* subsp. *pruinosa*) Scattered Low Trees with *Grevillea wickhamii, Melaleuca lasiandra, Acacia monticola* over *Jacksonia* Low Open Shrubland over *Triodia wiseana* and *T. schinzii* Closed Hummock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Triodia wiseana	70	0.3	*Halgania solanacea*	0.01	0.2
Triodia schinzii	15	0.8	*Heliotropium sp.*	0.01	0.3
Jacksonia sp.	5	1	*Hibiscus sturtii*	0.01	0.3
Eucalyptus brevifolia	2	6	*Hybanthus aurantiacus*	0.01	0.2
Acacia orthocarpa	1	0.8	*Triumfetta sp.*	0.01	0.2
Melaleuca lasiandra	1	2	*Acacia adoxa*	0.01	0.3
Hibiscus sp.	0.01		*Acacia monticola*	0.01	1.5
Acacia colei	0.01	1.5	*Tephrosia sp.*	0.01	
Aristida holathera	0.01	0.3	*Eucalyptus pruinosa* subsp. *pruinosa*	opp	2.5
Digitaria brownii	0.01	0.2	*Hakea lorea*	opp	2.5
Grevillea wickhamii	0.01	1.5	*Senna venusta*	opp	1

BROW-VT-13001 Site: RBROW 248
Described: VY (18/05/2013) **Type:** Releve **Location:** northern extension of survey area

Vegetation: *Eucalyptus brevifolia* over *Acacia sericophylla* Open Shrubland over *Triodia epactia* Hummock Grassland and *Aristida holathera* Open Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Halgania solanacea	1%	0.3	*Goodenia armitiana*		
Acacia adoxa			*Gossypium australe*		
Acacia colei			*Gossypium australe*		
Acacia ancistrocarpa			*Heteropogon sp.*		
Acacia sericophylla			*Hibiscus sp.*		
Aristida holathera		0.3	*Hibiscus sturtii*		
Aristida holathera			*Malvastrum sp.*		
Aristida latifolia			*Scaevola parviflora*		
Bergia sp.			*Senna notabilis*		
Corymbia opaca			*Sida sp.*		
Cymbopogon ambiguus			*Solanum diversiflorum*		
Dolichandrone heterophylla			*Sorghum sp.*		
Eragrostis eriopoda			*Triodia epactia*		
Eucalyptus brevifolia			*Zornia muelleriana* subsp. *congesta*		
Evolvulus alsinoides					

BROW-VT-13001 Site: QBROW 267
Described: VY (19/05/2013) **Type:** Quadrat (267, 268, 269, 266) **Season:** Good
Location: south-west main survey area **Habitat:** Alluvial plain **Soil:** Red sand
Rock Type: None noted

Vegetation: *Corymbia opaca and Eucalyptus pruinosa* (*Corymbia flavescens*) Scattered Low Trees over *Acacia* 31-1 Tall Shrubland over *Ehretia saligna* and *Dolichandrone heterophylla* (patchy) Open Shubland over *Triodia epactia* Open Hummock Grassland and *Aristida holathera, A. latifolia* and *Eulalia aurea* Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Corymbia flavescens	opp		*Eragrostis eriopoda*	0.01	0.3
Aristida holathera	60	0.4	*Evolvulus alsinoides*	0.01	0.1
Acacia sp.	20	2	*Goodenia armitiana*	0.01	0.2
Eulalia aurea	20	0.4	*Heliotropium sp.*	0.01	0.2
Aristida latifolia	10	0.8	*Indigofera colutea*	0.01	0.2
Corymbia opaca	5	8	*Paraneurachne muelleri*	0.01	0.3
Eriachne obtusa	5	0.3	*Portulaca sp.*	0.01	0.3
Eucalyptus pruinosa	2	2	*Scaevola parviflora*	0.01	0.2
Gossypium australe	2	0.8	*Sida sp.*	0.01	0.3
Carissa lanceolata	1	2	*Solanum sp.*	0.01	0.3
Eremophila sp.	1	0.4	*Tephrosia leptoclada*	0.01	0.2
Amaranthus sp.	0.01	0.2	*Yakirra australiensis*	0.01	0.2
Boerhavia sp.	0.01	0.2	*Zornia muelleriana*	0.01	0.2
Enneapogon sp.	0.01	0.2	*Dolichandrone heterophylla*		
Enneapogon sp.	0.01	0.2	*Ehretia saligna*		
			Triodia epactia		

BROW-VT-13001 Site: QBROW 273

Described: VY (19/05/2013) **Location:** Elevated depression along main road next to a flow line at the base of rocky hills 52K
Type: Quadrat **Habitat:** Depression **Soil:** Light orange brown sand

Vegetation: *Melaleuca nervosa* Low Woodland over *Acacia tumida* and *Grevillea refracta* Scattered Tall Shrubs over *Aristida holathera* and *Eriachne obtuse* Closed Tussock Grassland

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Aristida holathera	50	0.4	*Grevillea refracta*	0.01	2
Melaleuca nervosa	35	4	*Grevillea wickhamii*	0.01	1
Eriachne obtusa	25	0.4	*Hybanthus aurantiacus*	0.01	0.3
Triodia schinzii	2	0.9	*Newcastelia cladotricha*	0.01	0.4
Crotalaria sp.	1	0.2	*Nomismia rhomboidea*	0.01	creeper
Velleia panduriformis	1	0.8	*Polycarpaea sp.*	0.01	0.1
Acacia tumida var. *kulparn*	0.01	1	*Pterocaulon serrulatum*	0.01	0.2
Brunonia suffruticosa	0.01	0.2	*Ptilotus arthrolasius*	0.01	0.2
Calotis breviseta	0.01	0.2	*Sauropus trachyspermus* (s .l.)	0.01	0.2
Carissa lanceolata	0.01	0.6	*Sauropus trachyspermus* (s. l.)	0.01	0.1
Chamaecrista sp.	0.01	0.2	*Scaevola parviflora*	0.01	0.2
Chrysopogon fallax	0.01	1	*Spermacoce hillii*	0.01	0.2
Corynotheca micrantha	0.01	0.6	*Tephrosia sp.*	0.01	0.1
Cyperus blakeanus	0.01	0.3	*Trianthema pilosa*	0.01	cr
Dolichandrone heterophylla	0.01	0.8	*Zornia muelleriana*	0.01	0.2
Eucalyptus brevifolia	0.01	4	*Schizachyrium fragile*	opp	
Euphorbia cinerea	0.01	0.1	*Trichodesma zeylanicum* var. *zeylanicum*		
Evolvulus alsinoides	0.01	0.1	*Trianthema pilosa*	0.01	cr
Fimbristylis dichotoma	0.01	0.2	*Schizachyrium fragile*	opp	
Glycine tomentella	0.01	creeper			
Goodenia triodiophila	0.01	0.3			

BROW-VT-13001 Site: QBROW 284

Described: VY (20/05/2013) **Location:** 52K
Type: Quadrat **Location:** Sloping plain adjacent to drainage **Soil:** Red sand **Vegetation Condition:** Excellent but drying off **Fire Age:** <2 years
Vegetation: *Acacia sericophylla* and *Dolichandrone heterophylla* Open Tall Shrubland to Scattered Tall Shrubs over *Chaemacrista symonii* and *Androcalva loxophylla* Low Shrubland over *Eriachne obtuse* and *Aristida holathera* Closed Tussock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Eriachne obtusa	45	0.4	*Hybanthus aurantiacus*	0.01	
Aristida holathera	30	0.4	*Mollugo molluginea*	0.01	
Aristida latifolia	5	0.4	*Polymeria ambigua*	0.01	
Chamaecrista symonii	5	0.2	*Portulaca filifolia*	0.01	
Eragrostis eriopoda	2	0.2	*Ptilotus sp.*	0.01	
Dolichandrone heterophylla	1	0.8	*Scaevola parviflora*	0.01	
Acacia sericophylla			*Trichodesma zeylanicum*	0.01	
Androcalva loxophylla	1	0.4	*Triodia schinzii*	0.01	
Acacia tumida var. *kulparn*	0.01		*Velleia panduriformis*	0.01	
Calotis breviseta	0.01	0.2	*Zornia muelleriana*	0.01	
Chrysopogon fallax	0.01	1	*Crotalaria novae-hollandiae* subsp. *lasiophylla*		
Corynotheca micrantha	0.01	0.3	*Hakea macrocarpa*		
Crotalaria sp.	0.01	0.3	*Enneapogon robustissimus*		
Evolvulus alsinoides	0.01	0.1	*Ipomoea costata*		
Goodenia sp.	0.01	0.2	*Sorghum plumosum*		
Gossypium australe	0.01	0.8	*? Gomphrena sp.*	opp	
		0.3	*Ipomoea sp.*	opp	

BROW-VT-13001 Site: RBROW 466 Vegetation Type 7 (see also QBROW6 2012) Russ & Alex

Described: 20/05/2013
Type: Releve **Habitat: Alluvial plain Soil:** Reddish brown sand **Rock Type:** Arkrose around a valley

Vegetation: *Eucalyptus brevifolia* Scattered Low Trees over *Capparis umbonata* and *Acacia maconochiana* Open Shrubland over *Themeda australis* Closed Hummock Grassland.

Taxon	Cover (%)	Height (m)	Taxon	Cover (%)	Height (m)
Themeda australis	60		*Indigofera boviperda*		
Acacia maconochieana			*Indigofera colutea*		
Aristida holathera			*Indigofera hirsuta*		
Aristida hygrometrica			*Indigofera linifolia*		
Bergia hensalli			*Melaleuca nervosa*		
Capparis umbonata			*Mollugo molluginea*		
Carissa lanceolata			*Murdannia graminea*		
Chrysopogon fallax			*Oldenlandia mitrasacmoides*		
Corymbia opaca			*Paspalidium rarum*		
Corymbia opaca			*Pluchea tetranthera*		
Crotalaria brevis			*Polygala* aff. *isingii*		
Crotalaria medicaginea			*Polymeria ambigua*		
Cymbopogon bombycinus			*Pterocaulon serrulatum*		
Eragrostis cumingii			*Spermacoce hillii*		
Eriachne ciliata			*Stackhousia sp.*		
Eriachne obtusa			*Stemodia sp.*		
Eriachne sp.			*Tephrosia* aff. sp. Bungaroo Creek (M.E. Trudgen 11601)		
Eucalyptus brevifolia			*Tephrosia valleculata*		
Eulalia aurea			*Tinospora smilacina*		
Evolvulus alsinoides			*Triodia wiseana*		
Goodenia armitiana			*Triumfetta sp.*		
Gossypium australe			*Waltheria indica*		
Heliotropium sp.			*Zornia muelleriana*		

APPENDIX J
Descriptions of Vegetation Associations

Vegetation Association 1: *Eucalyptus brevifolia* rocky hills

This vegetation association was recorded in ten quadrats on broad rocky schist ridges, arkose hills and at the base of hills. It comprises: *Eucalyptus brevifolia* Scattered Low Trees to Low Open Woodland occasionally with *Corymbia pachycarpa, C. aspera* or *Eucalyptus odontocarpa* over Scattered Shrubs to a Low Open Shrubland comprising combinations of *Acacia colei, A. gonoclada, A. hilliana*, *A. lysiphloia*, *A. monticola, A. retivenea* subsp. *retivenea* and *Grevillea wickhamii* over either *Scaevola browniana, Acacia adoxa* var. *adoxa* or *A. orthocarpa* Scattered Low Shrubs to Low Open Shrubland over combinations of *Triodia schinzii, T. wiseana, T. pungens* and *T. basedowii* Hummock Grassland and variable densities. Recorded at: QBrow 14, QBrow 16, QBrow 21, QBrow 25, QBrow 25a, QBrow 32, QBrow 53, QBrow 56, QBrow 58, QBrow 67, QBrow 241.

Plate 1: Vegetation Association 1 - *Eucalyptus brevifolia* rocky hills

Vegetation Association 2: *Eucalyptus cupularis* on rocky hills

Scattered to Open Low Trees of *Eucalyptus cupularis* and *Corymbia pachycarpa* (+/- *E. odontocarpa*, *E. brevifolia*) over Scattered Low Trees of *Acacia monticola* (+/- *Grevillea wickhamii*, *G. refracta, A. colei* and *Melaleuca nervosa*) over a Low Shrubland of *A. hilliana* and *A. adoxa* (+/- *Corchorus sidoides*) over a Tussock Grassland of *Eriachne obtusa* (+/- *Eulalia aurea* and *Eriachne aristidea*) OR a Hummock Grassland of *Triodia epactia* with scattered tussocks. Recorded at RBrow 322, RBrow 74, RBrow 77, RBrow 339, RBrow 67, RBrow 81, RBrow 334 and RBrow 342.

Plate 2: Vegetation Association 2 - *Eucalyptus cupularis* on rocky hills

Vegetation Association 3: Drainage Basins amongst rocky hills

This association was recorded in two very small areas on alluvial flats surrounded by rocky ridges with dark brown sandy loam and sandstone. The vegetation comprises: *Chrysopogon fallax (Themeda avenacea*) Closed Tussock Grassland. Scattered Low *Eucalyptus brevifolia* was also recorded in Site RBrow466. Recorded at: QBrow6 and QBrow466 (**Figure 22**).

Plate 3: Vegetation Association 3 - Drainage Basins amongst rocky hills (2012 photo)

Vegetation Association 4: Perched Damplands

Several small perched damplands on a gently undulating rise were recorded within the proposed Haul Road alignment north of Ringer Soak. The vegetation comprised: *Themeda avenacea, Aristida holathera* and *Acrachne racemosa (Eriachne obtusa)* Closed Tussock Grassland. Recorded at site: JA82 (**Figure 24**).

Plate 4: Vegetation Association 4 - Perched Damplands

Vegetation Association 5: Treeless Plain

This vegetation association was recorded on the northern boundary of the northern borefield on an upland plateau. The vegetation comprised *Acacia drepanocarpa* and *Grevillea refracta* Tall Open Scrub over *Acacia adoxa* Scattered Low Shrubs over *Triodia bitextura* Open Hummock Grassland. Recorded at: JA171. (**Figure 20**).

Plate 5: Vegetation association 5 - Treeless Plain

Vegetation Association 6: *Eucalyptus brevifolia* plains

This vegetation association was recorded in 10 quadrats on plains and slightly elevated plains. The vegetation comprises: *Eucalyptus brevifolia* Scattered Low Trees to Low Open Woodland over a variable mid-storey (when present) of either *Acacia sericophylla* or *A. lysiphloia* Scattered Tall Shrubs to Tall Open Shrubland over *Acacia adoxa* var. *adoxa* and *A. hilliana* Low Shrubland to Shrubland over either *Triodia epactia* (*T. wiseana*) Hummock Grassland or a combination of *Aristida holathera, A. latifolia, Eriachne obtusa, Chrysopogon fallax, Cymbopogon obtectus, Paraneurachne muelleri* and *Themeda avenacea* Tussock Grassland. Recorded at: QBrow 7, QBrow 10, QBrow 12, QBrow 24, QBrow 30, QBrow 15, QBrow 104, QBrow 248, QBrow 398 and QBrow 402.

Plate 6: Vegetation Association 6 - *Eucalyptus brevifolia* plains

Vegetation Association 7: *Owenia reticulata* on elevated plains.

This association was recorded on an elevated sandplain on the south east side of the Study Area. The vegetation comprises: *Owenia reticulata* Scattered Low Trees over *Androvalva loxophylla, Newcastelia cladotricha, Chamaecrista symonii* and *Corchorus sidoides* subsp. *sidoides* Low Open Shrubland over *Eriachne obtusa* and *Sorghum plumosum* Tussock Grassland and *Triodia epactia* Open Hummock Grassland. Recorded at: QBrow55 and QBrow102.

Plate 7: Vegetation Association 7 - *Owenia reticulata* on elevated plains

Vegetation Association 8: *Eucalyptus brevifolia* and *E. pruinosa* flats

This vegetation association was recorded on plains and is described as *Eucalyptus brevifolia* and *E. pruinosa* Scattered Low Trees over either *Acacia lysiphloia* or *A. sericophylla* Tall Shrubland to Open Scrub over *Aristida holathera, Eragrostis eriopoda, Chrysopogon fallax* and *Aristida latifolia* Closed Tussock Grassland. Recorded at QBrow 267. Most of the locations surveyed in 2013 had been burnt in October 2012.

Plate 8: Vegetation Association 8 - *Eucalyptus brevifolia* and *E. pruinosa* flats

Vegetation Association 9: *Corymbia opaca* on flats

This vegetation was recorded on extensive areas of sandy flat in the southern borefield and haul road. The vegetation comprises: *Corymbia opaca* Scattered Low Trees over *Grevillea refracta* and *Grevillea wickhamii* Tall Shrubland over *Acacia drepanocarpa* Open Shrubland over *Triodia bitextura* Open Hummock Grassland and *Aristida holathera* and *Eragrostis eriopoda* Scattered Tussock Grassland. Recorded at QBrow 475.

Plate 9: Vegetation Association 9 - *Corymbia opaca* on flats

Vegetation Association 10: Eucalyptus chlorophylla undulating plains with Acacia lysiphloia Scrub

This association was recorded on slightly undulating plains with orange-brown sand-sandy loam. The vegetation association comprises: *Eucalyptus chlorophylla* Scattered Low Trees over *Acacia lysiphloia* Tall Open Scrub over *Aristida holathera* and *Eriachne obtusa* Open Tussock Grassland and *Triodia epactia* Very Open Hummock Grassland. Recorded at: QBrow 5a, QBrow 31, QBrow 38, QBrow 39 and QBrow 427.

Plate 10: Vegetation Association 10 - *Eucalyptus chlorophylla* undulating plains with *Acacia lysiphloia* scrub

Vegetation Association 11: *Sorghum* plain

This vegetation association was recorded on a broad plain in the northern borefield and was described as: *Acacia depranocarpa* subsp. *latifolia* (*Dolichandrone heterophylla*) Shrubland over *Sorghum plumosum* Tussock Grassland and *Cyperus* sp. Scattered Sedges. *Eucalyptus chlorophylla* were scattered outside. This vegetation was recorded only at RBrow162 (**Figure 20**).

Plate 11: Vegetation Association 11 - *Sorghum* plain

Vegetation Association 12: *Eucalyptus flavescens* broad drainage

This vegetation association was recorded in seven quadrats within areas of broad, undefined drainage on plains. This vegetation appears to be subject to seasonal inundation and supports large populations of the Priority 3 Flora species *Goodenia crenata*. The vegetation comprises: *Corymbia flavescens* (*C. opaca* or *Eucalyptus pruinosa*) Scattered Low Trees to Low Open Woodland over combinations of *Hakea macrocarpa, H. arborescens, Acacia sericophylla* or *Dolichandrone heterophylla* Tall Open to Tall Shrubland over *Aristida holathera, Eragrostis eriopoda, Eulalia aurea, Chrysopogon fallax, Cymbopogon obtectus, Themeda avenacea* and *T. triandra* Tussock Grassland to Closed Tussock Grassland. In the lower lying areas *Eucalyptus victrix* forms a significant proportion of the overstorey and *Chrysopogon fallax* or *Sorghum plumosum* may dominate the Tussock Grassland. Recorded at: QBrow 46a, QBrow 51, QBrow 59, QBrow 100, QBrow 406, QBrow 412 and QBrow 421.

Plate 12: Vegetation Association 12 - *Eucalyptus flavescens* broad drainage

Vegetation Association 13: *Eucalyptus victrix* low lying depression

This vegetation association was recorded in one very small area on the east side of the Study Area and comprises *Eucalyptus victrix* Open Woodland over *Bothriochloa bladhii* and *Themeda avenacea* Closed Tussock Grassland in a lower lying depression. Recorded only at: QBrow 105 (**Figure 23**).

Plate 13: Vegetation Association 13 - *Eucalyptus victrix* low-lying depression

Vegetation Association 14: *Melaleuca nervosa* flats

This vegetation association was recorded on a seasonally wet flat below sandstone ridges. The vegetation is described as: *Melaleuca nervosa* Scattered Tall Shrubs over *Chrysopogon fallax* Open Tussock Grassland and *Cyperus blakeanus* Open Sedgeland. This vegetation grades into a *Eucalyptus chlorophylla* and *Corymbia flavescens* Open Low Woodland away from the ridge. Recorded at QBrow 483. Approximately 120 ha of this vegetation was identified outside the Study Area adjacent to the access road and proposed haul road, using aerial imagery.

Plate 14: Vegetation Association 14 - *Melaleuca nervosa* flats

Vegetation Association 15: *Eucalyptus victrix* drainage lines

This vegetation association was recorded in the northern borefield, southern main Study Area and in several locations on the haul road. The vegetation varied across the Study Area and could possibly be mapped at a finer scale, however is broadly described as *Eucalyptus victrix* over *Eulalia aurea* Tussock Grassland to Closed Tussock Grassland. Recorded at: WPJA156, 160 and 174 (Northern Borefield).

Plate 15: Vegetation Association 15 – *Eucalyptus victrix* drainage lines

Vegetation Association 16: *Triodia* Hummock Grassland

This vegetation association was recorded on the eastern side of the haul road, on the foothills of moderate sized rocky hills. The vegetation is described as *Triodia basedowii* Hummock Grassland and was recorded at site JA 375 (**Figure 24**).

Plate 16: Vegetation Association 16 - *Triodia* Hummock Grassland

Vegetation Association 17: *Acacia synchronicia* over Tussock Grassland

This vegetation association was recorded on a plain at the base of large hills in the northern haul road. The vegetation was described as *Acacia synchronicia* Tall Open Shrubland over *Atalaya hemiglauca* and *Carissa lanceolata* Scattered Shrubs over *Eriachne obtusa, Chrysopogon fallax* and *Eulalia aurea* Open Tussock Grassland to Closed Tussock Grassland. This vegetation is seasonally inundated and supported a population of the Priority 3 Flora species *Goodenia crenata*. Recorded at site JA 381 (**Figure 24**).

Plate 17: Vegetation Association 17 – *Acacia synchronicia* over Tussock Grassland

Vegetation Association 18: Minor Flowlines

This vegetation association was mapped to indicate areas where surface flows were concentrated as indicated by denser shrub and tussock grassland cover. The associations in which they were mapped were primarily within rocky hills extending down into the plains. Six minor flowlines were mapped throughout the Study Area.

Plate 18: Vegetation Association 18 – Minor Flowlines (photo at site WPAS477)

Vegetation Association 19: *Corymbia opaca* over *Acacia monticola*

This vegetation association was recorded on low rises in the northern section of the haul road. It was described as *Corymbia opaca* Scattered Low Trees over *Acacia monticola, Grevillea wickhamii* and *G. refracta* Tall Open Scrub over *Acacia hilliana, A. adoxa, Halgania solanaceae, Tephrosia* uniovulata Low Open Shrubland over *Triodia* Hummock Grassland (**Figure 24**). Recorded at: site VY 341.

Plate 19: Vegetation Association 19 – *Corymbia opaca* over *Acacia monticola* (photo at Site WPVY341)

Vegetation Association 20: *Corymbia opaca* over *Chrysopogon fallax*

This vegetation association was mapped in one location, on a red-brown hardpan fine clay loam plain at the base of large rocky hills in the northern haul road (**Figure 24**). The vegetation is described as *Corymbia opaca* Scattered Low Trees over *Acacia ancistrocarpa* Tall Open Shrubland over *Gossypium australe* Open Shrubland over *Chrysopogon fallax, Cymbopogon ambiguous* and *Aristida latifolia* Tussock Grassland. This vegetation association is seasonally inundated and at the time of the survey supported several hundred Priority 3 Flora species *Goodenia crenata*. Recorded at: site JA 311. Approximately 120 ha of this Vegetation Association is extant outside the Study Area based on interpretation of aerial imagery following the survey.

Plate 20: Vegetation Association 20 – *Corymbia opaca* over *Chrysopogon fallax* recorded at Site JA311 (looking north)

APPENDIX K

Summary of Flora and Vegetation Values of the Browns Range Study Area

SUMMARY OF THE FLORA VALUES OF THE BROWNS RANGE SURVEY AREA

FLORISTIC DIVERSITY

High – 393 taxa recorded with 376 taxa listed for the Tanami bioregion on FloraBase. One family not previously recorded in the Tanami bioregion and ALA databases. 170 species not listed on FloraBase database.

PRIORITY FLORA

- *Eleocharis ochrostachys* (Priority 3) (one population/six individuals);
- *Goodenia crenat a* (Priority 3) (51 populations/6,247 individuals);
- *Heliotropium uniflorum* (Priority 1) (one population/one individual); and
- *Trachymene villosa* (Priority 1) (10 populations/46 individuals).

17 FLORA OF 'OTHER CONSERVATION SIGNIFICANCE

Nominated for Priority Flora status (pers comm. Dr Russell Barrett):

Brachychiton multicaulis;

Stemodia sp. Tanami (P. K. Latz 8218);

New Record for Western Australia

Goodenia goodeniacea;

Sesbania muelleri;

High Range Extension

Cyperus haspan subsp. *?juncoides;*

Euphorbia armstrongiana var. *?distans*;

Goodenia arachnoidea;

Polymeria lanata (s. l.);

Vigna vexillata var. *angustifolia;*

Medium Range Extension

Corynotheca micrantha var. *gracilis*

Euphorbia ?inappendiculata;

Exocarpos latifolius;

Fimbristylis pauciflora (s. l.);

Gomphrena flaccida;

Swainsona ?formosa;

Whiteochloa airoides;

Undescribed Species

Goodenia ?sp. nov. (an undescribed species);

INTRODUCED SPECIES (WEEDS)

- populations of two aggressive species on haul road and isolated in main Study Area – *Cenchrus setiger* and *Stylosanthes hamata; and*
- Limited numbers of *Echinochloa colona, Malvastrum americanum* and *Panicum antidotale*.

SUMMARY OF VEGETATION VALUES OF THE BROWNS RANGE STUDY AREA

No Threatened Ecological Communties or Priority Ecological Communities

23 vegetation associations/mosaic associations

19 associations with a limited extent (<5%) mapped in the Study Area:

- Five are not within the Development Footprint (**No Impact**) (VA3, VA5, VA7, VA8, VA11);
- Five with less than 5% in the Development Footprint (**Negligible Impact**) (VA 2, VA 14, VA18, VA6/10 and VA12/15);
- Three with 5-20% in the Development Footprint (**Low Impact**) (VA9, VA15, VA12/14);
- Five with greater than 20% in the Development Footprint (**Moderate Impact**) (VA 4, VA16, VA17, VA19, VA20); and
- One with 94% in the Development Footprint (**High Impact**) (VA13).

Vegetation associations VA10, VA11, VA12, VA14, VA15 are likely to be dependent on the maintenance of surface water flows

Vegetation association V3 is unique in its topographic and hydrological setting and supports two Short Range Endemic invertebrate species and has been excluded from the development.

***Eucalyptus victrix* woodlands in vegetation associations VA13, VA 15 and VA12/15 however they are not intercepted by the drawdown zones of influence from pit dewatering and groundwater extraction from bores.**

APPENDIX L

Assessment Against the Ten Clearing Principles

Principle Number	Principle	Assessment	Outcome
(a)	**Native vegetation should not be cleared if it comprises a high level of biological diversity.**	The main Study Area and part of the haul road is within the Ruby Plains pastoral lease and the vegetation is in Excellent condition. The proposed haul road follows an existing track which traverses a DEC Redbook Recommended Conservation Reserve. The Study Area is located within a relatively poorly surveyed bioregion. Other flora and vegetation surveys have been conducted for mining exploration and gold projects within the Tanami bioregion; however the data available from these assessments was limited or not readily comparable, particularly as projects were relatively large distances from this Study Area and the data was often not comprehensive. Twenty three vegetation associations were recorded in the Study Area and none of these were listed as a Threatened Ecological Community or Priority Ecological Community. The majority (82%) of the Study Area and Development Footprint comprised four vegetation associations and the other associations provided less than 5% each. The majority of these seemingly poorly represented associations were a consequence of small sections of the haul road corridor intercepting widespread vegetation associations. However three associations were considered to be locally significant VA3, VA4 and VA13. Vegetation association VA3 and VA13 have been excluded from the Project area because they are in a relatively unique topographic setting and VA3 supports two Short Range Endemic invertebrates. Vegetation association VA4 extends outside of the Study Area although its regional status is not certain and 34.01% of its mapped extent is within the Development Footprint. It is possible that the scattered damplands in this association could be largely avoided during construction of the haul road. The number of vegetation associations recorded in the Study Area is considered to be moderate, reflecting the relative lack of topographic relief and geological features in the local area and bioregion. The species diversity, with a total of 392 taxa and 58 families for the Study Area, was slightly higher than anticipated based on FloraBase	The proposal is not at variance to the principle

Principle Number	Principle	Assessment	Outcome
		records; however this likely reflects the limited number of multi-season surveys within the bioregion. Four Priority Flora species, *Eleocharis ochrostachyys, Goodenia crenata, Heliotropium uniflorum* and *Trachymene villosa* were recorded in the Study Area providing a significant number of new populations for the WA Herbarium database. ALA records indicated that all except 43 species had been recorded previously in the Tanami and these species were reviewed to ascertain whether they represented significant range extensions. Seventeen species were reviewed as species of 'Other Conservation Significance' but populations of only two of these (*Brachychiton multicaulis* and *Stemodia* sp. Tanami (P.K. Latz 8218), are located within the Development Footprint.	
(b)	**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.**	Only one vegetation association in the Study Area was considered to comprise the whole or a part of, significant habitat for fauna indigenous to Western Australia, namely VA 3 (drainage basins amongst rocky hills). Two species of Short Range Endemic invertebrates were recorded only within this vegetation association, which has unique topography and hydrology and thus is likely to remain damp for extended periods compared to the surrounding areas. This area was recognised as of significance following the 2012 surveys and was excluded from development and buffered to ensure that the Short Range Endemic species were not impacted by the Project. These areas will not be subject to clearing.	The proposal is not at variance to the principle.
(c)	**Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.**	No Threatened flora species listed under the *WC Act* or *EPBC Act* have been recorded in the Study Area.	The proposal is not at variance to the principle.
(d)	**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.**	There are no Threatened Ecological Communities listed for the Tanami bioregion, nor any Priority Ecological Communities. Therefore the clearing of land for the Development Footprint will not affect any of these.	The proposal is not at variance to the principle.

Principle Number	Principle	Assessment	Outcome
(e)	**Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.**	At a regional scale the vegetation within and surrounding the Study Area is largely undisturbed with the majority of the pre-European vegetation associations described by J. S. Beard considered to be 99% (895); 99.85 % (91) and 100% (218) remaining. Some minor impacts from grazing, vehicular access, clearing and weed infestations were noted in the Study Area, but primarily on and adjacent to the existing track to the Study Area.	The proposal is not at variance to the principle.
(f)	**Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.**	Vegetation association 13 is a wetland area on a clay substrate in a low lying depression encircled by *Eucalyptus victrix*. VA13 was recorded in only one small area (22.6 ha). The wetland was quite dry at the time of the survey but numerous crab-holes in the clay surface indicated that this area becomes either inundated or very wet during favourable climatic conditions. In earlier versions of the Development Footprint, the majority (94%) was required for the construction of a tailings dam (proposed clay extraction area), however this has since been removed from the Development Envelope and will no longer be impacted by the project.	The proposal is not at variance to the principle.
(g)	**Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.**	Project infrastructure has been located in areas that are outside of major floodplains and areas that may be eroded. The soils in the Study Area were characterised (Outback Ecology 2014) and none were considered to be problematic in terms of their erodibility and surface soils were largely classified as 'non-dispersive' or 'partially-dispersive'. Soils from deeper in the profile tended to be more dispersive however the high amount of coarse material present is likely to mitigate against erosion and provide surface stability. Clearing of 711 ha of vegetation in this area is highly unlikely to cause any appreciable land degradation.	The proposal is not at variance to the principle.
(h)	**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 haul road section of the Development Envelope crosses the proposed Gardner Range conservation estate. There is an existing road through this area and this will be widened to safely accommodate haul trucks. The area to be cleared within the proposed conservation estate is relatively small however there are several populations of the invasive species **Stylosanthes hamata*. If populations of this species are controlled during the road widening operations then there is likely to be a positive impact on the environmental values of the proposed reserve. However given	The proposal is not at variance to the principle.

Principle Number	Principle	Assessment	Outcome
		the road bisects a portion of the reserve, speed limits may need to be imposed to reduce th e likelihood of fauna casualties, particularly if the gazettal of the conservation estate proceeds.	
(i)	**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 soils in the Study Area are generally non-saline, non-dispersive or partially dispersive and neutral to slightly acidic (Outback 2014). Clearing of vegetation for the Development Footprint is therefore highly unlikely to cause deterioration in the quality of surface or underground water, particularly if hydrocarbons and contaminants from heavy machinery and light vehicles are managed and appropriate materials are used for the construction of the TSF so as to minimise the loss of fines into the environment.	The proposal is not at variance to the principle.
(j)	**Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.**	The Study Area has relatively low relief with large, broad drainage areas which are in places, currently subject to inundation during favourable seasons. Occasional low rocky hills are interspersed throughout. The Development Footprint includes mining areas and associated infrastructure including an airstrip, evaporation pond, tailings dam, gravel and clay pits, haul road and offices. The placement of these facilities has taken into consideration existing environmental values and sensitive vegetation, flora and fauna; derived from desktop assessments and field surveys in 2012 and 2013. If water sensitive mining and construction approaches are followed it is highly unlikely that any changes to surface water hydrology will occur.	The proposal is not at variance to the principle.