Tropicana Gold Project

Gas Pipeline Desktop Assessment
Flora and Fauna
December 2008

Conospermum toddii (AngloGold Ashanti Australia)

Molloch horridus (AngloGold Ashanti Australia)

TROPICANA
JOINT VENTURE

ANGLOGOLD ASHANTI
AUSTRALIA

INDEPENDENCE GROUP NL

Executive Summary

360 Environmental Pty Ltd was commissioned by the Tropicana Joint Venture (TJV) to undertake a desktop assessment of two potential gas pipeline routes north-east of Kalgoorlie. The Goldfields Gas Transmission - Pinjin Pipeline Option (GGT survey area) is located within the Murchison Interim Biogeographic Regionalisation of Australia (IBRA) regions and the Murrin Murrin Lateral Pipeline Option (Murrin survey area) borders the Murchison and Great Victoria Desert (GVD) IBRA regions (Figure 1).

A desktop assessment for flora, fauna and ecological communities of conservation concern was carried out for both alignments and the adjacent areas. In addition, vegetation types, landforms and soil types were described for both survey areas at a high level. These desktop studies were required to ensure environmental constraints were identified to enable the TJV to make an informed decision regarding an appropriate power supply for the proposed Tropicana Gold Project.

Findings of the assessment include:

- The major vegetation communities described by Beard (1975) occur within both survey areas are:

  Acacia forests and woodlands;

  Acacia shrublands;

  Acacia open woodlands; and

  Hummock grassland – this vegetation community is more dominant in the GGT survey area.

- Flora species of conservation concern that potentially occur within the survey areas are:
  - o *Conospermum toddii* - identified by an Environmental Protection and Biodiversity Conservation (EPBC) Protected Matters database search as potentially occurring in the Murrin and Pinjin survey area. *C. toddii* was recorded in the Pinjin survey area. This species is considered Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and is also considered as 'Declared Rare Flora' (DRF) under the *Wildlife Conservation Act 1950* (WC Act).
  - o *Gastrolobium graniticum* was identified by an EPBC Protected Matters database search as potentially occurring on the GGT survey area. This species is considered Endangered under the EPBC Act and is also considered a DRF under the WC Act.
  - o *Eucalyptus articulate* was identified as potentially occurring on the GGT survey area. This species is considered Vulnerable under the EPBC Act and is also considered a DRF under the WC Act.
  - o A further 25 species listed as 'Priority' be the Department of Environment and Conservation (DEC) may occur within the Murrin survey area and 16 in the GGT survey area.
  - o A further six Priority species may occur within the GGT survey area.
- Fauna species of conservation concern potentially occurring within the Murrin survey area are:

  - o the Mulgara, Southern Marsupial Mole, Sandhill Dunnart, Slender-billed Thornbill, Malleefowl, Princess Parrot, Rainbow Bee-eater, Great Egret, Oriental Plover, Fork-tailed Swift and the Great Desert Skink identified by an EPBC Protected Matters database search.
  - o In addition, species protected under the WC Act or listed as Priority species by the DEC that have been recorded in the Murrin survey area include the Banded Hare Wallaby, Numbat, Australian Bustard, Peregrine Falcon, and a species of Fairy Shrimp (Department of Environment Threatened Fauna Database).

- Fauna species potentially occurring within the GGT survey area:
  - o Fauna including the Mulgara, Malleefowl, Slender-billed Thornbill, Rainbow Bee-eater, Great Egret, Fork-tailed Swift, Hooded Plover have been identified by an EPBC Protected Matters database search as potentially occurring within the survey area.
  - o In addition, species protected under the WC Act or listed as Priority species by the DEC that have been recorded in the GGT survey area include the Australian Bustard, and the Woma Python (DEC Threatened Fauna Database).
- The DEC Threatened Ecological Communities (TEC) database indicates there are two Priority Ecological Communities (PECs) that may potentially occur in the vicinity of the Murrin survey area:

  Mount Jumbo Range vegetation complex; and

  Mount Linden Range banded ironstone ridge vegetation complex.
- The GGT survey area incorporates a portion of the Goongarrie National Park. There are no nature reserves located within either survey area.

The main environmental constraints to the gas pipelines under consideration are:

- Clearing impacts including loss of threatened species or their habitat.
- Disturbance to the hydrology or hydrogeology of Lake Marmion, Lake Rebecca in the GGT survey area and Lake Carey in the Murrin survey area.
- Introduction and/or spread of weeds.
- Introduction and/or spread of feral animal species to the area.
- Increased risk of anthropogenic fire.

Table of Contents

1 INTRODUCTION

360 Environmental Pty Ltd (360 Environmental) was commissioned by the Tropicana Joint Venture (TJV) to undertake a desktop assessment of two potential gas pipeline options. A gas pipeline is being considered as an option to supply fuel for an on-site power station at the proposed Tropicana Gold Project (TGP). The proposed TGP is located approximately 330 km (450 km by road) east northeast of Kalgoorlie in Western Australia. This desktop assessment considers the gas pipeline options (survey areas) in terms of environmental constraints that may be impacted by the installation of a pipeline.

2 BACKGROUND

The main components of the TGP are:

- Operational area: open pits, processing plant, village, ancillary buildings, reverse osmosis plant and other necessary infrastructure.
- Water Supply Area.
- Infrastructure Corridor.

An onsite power station with a power generation capacity of up to 40 MW will provide the mine and other infrastructure at the Operational Area with power. The TJV is considering several fuel sources for the power station, these include diesel, natural gas, and solar thermal (with fossil fuel back-up 25%). The back-up option for the solar thermal could be either diesel or coal. If gas is determined to be the preferred power option, a gas pipeline will be required to link existing gas infrastructure to the TGPs Operational Area.

3 PURPOSE

The TGP has selected two potential gas pipeline routes, the Goldfields Gas Transmission (GGT) - Pijnin Pipeline Option that will connect with the Pinjin Infrastructure Corridor, and the Murrin Murrin Lateral Pipeline Option (Figure 1). Each option will connect with a current gas pipeline. The purpose of this document for each option is to:

- Describe the regional setting of both pipeline options;
- Identify environmental constraints; and
- Present a preliminary indication of potential environmental impacts and management.

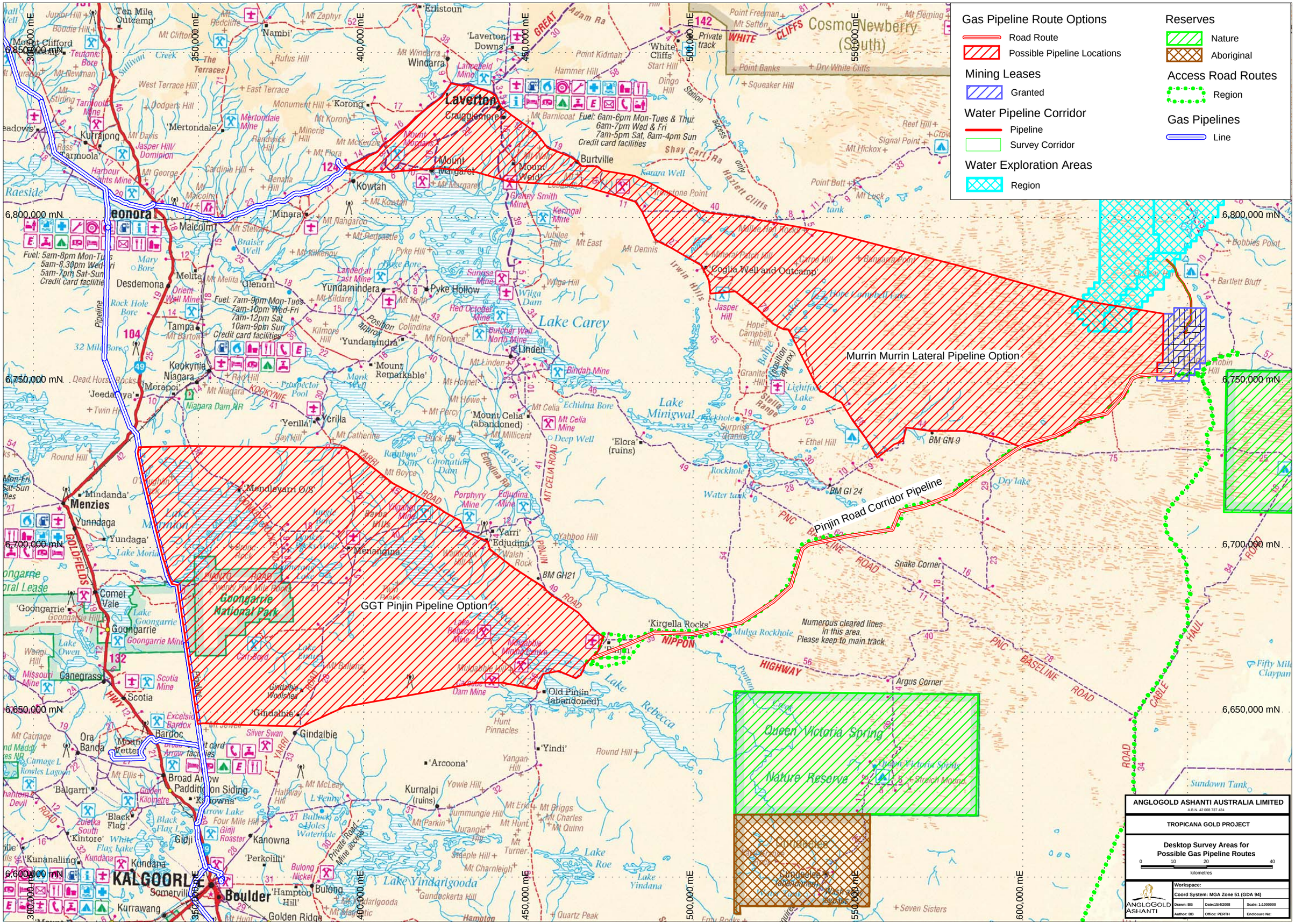
The TJV has undertaken a Level 1 flora and vegetation of the Pinjin Infrastructure Corridor (Mattiske 2008). These results will be incorporated in the findings of this desktop for the GGT.

4 SCOPE OF WORKS

The following scope of work has been carried out and the results reported in this document:

- Description of the proposed gas pipeline options in a regional context incorporating major vegetation types, land forms, soil types and any unusual features of the survey area and surrounding region.

- Desktop search detailing any Declared Rare, Priority or other significant flora (Definitions - Appendix A).
- Desktop search for Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs).
- Desktop search for Threatened Fauna, Priority or other significant fauna (Definitions – Appendix B).
- No site visit was carried out, hence this desktop assessment does not meet all the criteria of a Level 1 Reconnaissance survey under the Environmental Protection Authority's (EPA) Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (2004a) or Guidance Statement No. 56 Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (2004b). However, the intent of this desktop assessment was to be a first-pass only to identify any potential key constraints. If the gas option is selected by the TJV, a site survey visit will be conducted.


Gas Pipeline Route Options
Road Route
Possible Pipeline Locations
Mining Leases
Granted
Water Pipeline Corridor
Pipeline
Survey Corridor
Water Exploration Areas
Region
Reserves
Nature
Aboriginal
Access Road Routes
Region
Gas Pipelines
Line
Murrin Murrin Lateral Pipeline Option
Pinjin Road Corridor Pipeline
GGT Pinjin Pipeline Option
Queen Victoria Spring Nature Reserve
Goongarrie National Park
Lake Carey
Lake Minigwal
Lake Yindarlgooda
Laverton
Menzies
KALGOORLIE
Boulder
Leonora
Cosmo Newberry (South)
Fuel: 6am-6pm Mon-Tues & Thur
6am-7pm Wed & Fri
7am-5pm Sat, 8am-4pm Sun
Credit card facilities
Fuel: 7am-9pm Mon-Tues
7am-10pm Wed-Fri
7am-12pm Sat
10am-9pm Sun
Credit card facilities
Numerous cleared lines in this area. Please keep to main track.
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ANGLOGOLD ASHANTI AUSTRALIA LIMITED
A.B.N. 42 008 737 424
TROPICANA GOLD PROJECT
Desktop Survey Areas for Possible Gas Pipeline Routes
0 10 20 40
kilometres
Workspace:
Coord System: MGA Zone 51 (GDA 94)
Drawn: BB
Date:15/4/2008
Scale: 1:1000000
Author: BB
Office: PERTH
Enclosure No:

5 METHODS

Regional information including climate, geology and soils, vegetation types, and landforms was sourced from current literature, web-based mapping tools and map-based information.

A search of conservation significant flora and fauna species, TECs and PECs potentially occurring within the survey areas was performed using data from the Department of Environment and Conservation (DEC), the Museum of Western Australia (WAM) the Federal Department of the Environment, Water, Heritage and the Arts (DEWHA), various reference books (e.g., Cogger 2000; Pizzey and Knight 2002; Strahan 2002) and local flora and fauna surveys within the Great Victoria Desert (GVD) and Murchison Interim Biogeographic Regionalisation of Australia regions (IBRA).

All species of conservation concern recorded or expected to occur in either survey area were cross-checked against the Federal Environment Protection and Biodiversity Conservation (EPBC) Threatened Matters Database and Government Gazette Number 12 (Government of Western Australia 2008) for their status under the EPBC Act and WC Act, respectively.

6 REGIONAL SETTING

The GGT Pijnin Pipeline Option (GGT survey area) is located east of Menzies, and north east of Kalgoorlie (Figure 1). This option is located in the eastern Murchison IBRA region and covers an area of approximately 1.2 million ha.

The Murrin Murrin Lateral Pipeline Option (Murrin survey area) is located east of Leonora and south-west of Laverton (Figure 1). The Murrin Option passes through the western GVD and eastern Murchison IBRA regions and covers an area of approximately 2.8 million ha.

The exact alignment for a pipeline has not yet been determined; however the study areas indicate the corridors in which a pipeline would lie, avoiding key constraints where possible.

6.1. CLIMATE

The Murchison bioregion has an arid climate with winter rainfall (Commonwealth Government 2008a). The mean average annual rainfall is about 210 mm, ranging from 190 mm in the northeast to 240 mm in the southwest (Commonwealth Government 2008a). Rainfall is unreliable and most years can expect a dry spell of four to six months (Commonwealth Government 2008a). Summers are hot and dry, with the average daytime temperature averaging 38 °C in January and can exceed 40 °C (Commonwealth Government 2008a). Winters are mild with cool nights. Evaporation levels are very high in the summer. Annual evaporation ranges from 3000 mm at Menzies to 3800 mm at Wiluna (Commonwealth Government 2008a).

The climate of the GVD bioregion is arid, with mean annual rainfall ranging from below 150 mm to over 250 mm (Bureau of Meteorology 2008). The GVD does receive seasonal rainfall but shows significant variability between years. Temperatures can be extreme in the desert with large variations in diurnal temperatures with daily temperature ranging from 15 - 45 °C in summer and 0 - 30 °C during winter (Bureau of Meteorology 2008).

6.2. LANDFORMS

The landscape of the Murchison IBRA bioregion comprises low hills, mesas of duricrust separated by flat colluvium and alluvial plains (Commonwealth Government 2008a).

Occurring within the GGT survey area are:

- Lake Marmion
- Lake Rebecca (Figure 1).

The GVD forms the southern part of the anti-clockwise whorl of dunefields of Australia. The dominating landforms are dunes and swales. There are local occurrences of playa lakes, associated lee-sided mounds (lunettes) and rocky prominences (Commonwealth Government 2008b). Playa lakes are a minor, but locally significant landform in the desert, occurring in topographically low-lying regions and many represent the dried remnants of former drainage channels (Shephard 1995).

Occurring within the Murrin survey area is:

- The northern portion of Lake Carey
- Hope Campbell Lake
- Mount Margaret (Figure 1).
- Lightfoot Lake

6.3. GEOLOGY AND SOILS

The Murchison IBRA bioregion is dominated by the Archaean (over 2500 million years ago) granite-greenstone terrain of the Yilgarn Craton (Commonwealth Government 2008a). Alluvial soils and sands mantle the granitic and greenstone units of the Yilgarn Craton. These soils are shallow, sandy and infertile. Underlying the soils in low areas is a red-brown siliceous hard pan (Curry et al. 1994). The soils in the eastern half of the bioregion are typically red sands, lithosols, calcareous red earth soil, duplex soil and clays.

The GVD bioregion consists of active sand-ridge desert of deep Quaternary (less than 65 million years ago) aeolian sands overlying Permian (251 – 298 million years ago) and Mesozoic (65 - 251 million years ago) units of the Office Basin (Commonwealth Government 2008b). The GVD is underlain on its eastern, western and northern margins by an ancient crystalline basement comprising rocks at least 1000 million years old (Shephard 1995).

GGT Pijnin Pipeline Option

The following major soil types described by Australian Geological Survey Organisation Geology Sheets (AGSO) (1995a and 1995b) occur within the GGT survey area:

- Sandplain deposits – unconsolidated yellow sand, minor silt and clay; includes stabilizing dunes.
- Sheetwash deposits – clay, silt, and sand wash as extensive fans; locally ferruginous.
- Colluvium – gravel, sand and silt as proximal sheetwash and talus; locally ferruginous.

The following soil types underlie Lake Marmion:

- Playa deposits – saline and gypsiferous evaporites, clay, silt and sand in playa lakes.
- Dune deposits - sand silt, and gypsum as stabilizing dunes adjacent to playa lakes.
- Ephemeral lake and dune deposits – evaporite, clay, silts and sand in dunes, drainage basins, claypans, and channels surrounding major saline lakes.

The following soil types underlie Lake Rebecca:

- Playa deposits – saline and gypsiferous evaporites, clay, silt and sand in playa lakes.
- Ephemeral lake and dune deposits – evaporite, clay, silts and sand in dunes, drainage basins, claypans, and channels surrounding major saline lakes.

- **Murrin Murrin Lateral Pipeline Option**

The following major soil types described by AGSO (1995c) occur within the Murrin survey area:

- Sheetwash deposits – clay, silt, and sand wash as extensive fans, locally ferruginous.
- Red and yellow quartz sand; aeolian.
- Colluvium – gravel, sand and silt as proximal sheetwash and talus; locally ferruginous.

- Ephemeral lake and dune deposits – evaporite, clay, silt and sand in dunes, drainage basins, claypans, and channels surrounding major saline lakes.
- Clay, silt and sand in saline drainages and marginal to salt lakes.
- Sandplain deposits – unconsolidated yellow sand, minor silt and clay; includes stabilizing dunes.
- Alluvium – clay, silt, sand, and gravel in channels and floodplains.

The following soil types underlie Hope Campbell Lake:

- Lake deposit - clay, silt and sand; saline and gypsiferous.
- Aeolian deposit - lake derived sand and gypsum in dunes and sheets.
- Clay, silt and sand in saline drainages and marginal to salt lakes.
- The following soil types underlie Lightfoot Lake:
- Lake deposit - clay, silt and sand; saline and gypsiferous.
- Aeolian deposit - lake derived sand and gypsum in dunes and sheets.

6.4. VEGETATION TYPES

Vegetation in the Murchison is dominated by *Acacia* woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Halosarcia* shrublands.

The GVD is essentially a sandy region of sand dunes and sandplains with consistent vegetation throughout the range (Beard 1975). Vegetation is primarily a Tree steppe of *Eucalyptus gongylocarpa*, Mulga (*Acacia aneura*) and *E. youngiana* over hummock grassland dominated by *Triodia basedowii* (spinifex) on the aeolian sands (Barton and Cowan 2001).

The major vegetation communities described by Beard (1975) occur within both survey areas and include (Figure 2):

- *Acacia* forests and woodlands
- *Acacia* shrublands
- *Acacia* open woodlands
- Hummock grassland – this vegetation community is more dominant in the Pinjin survey area.

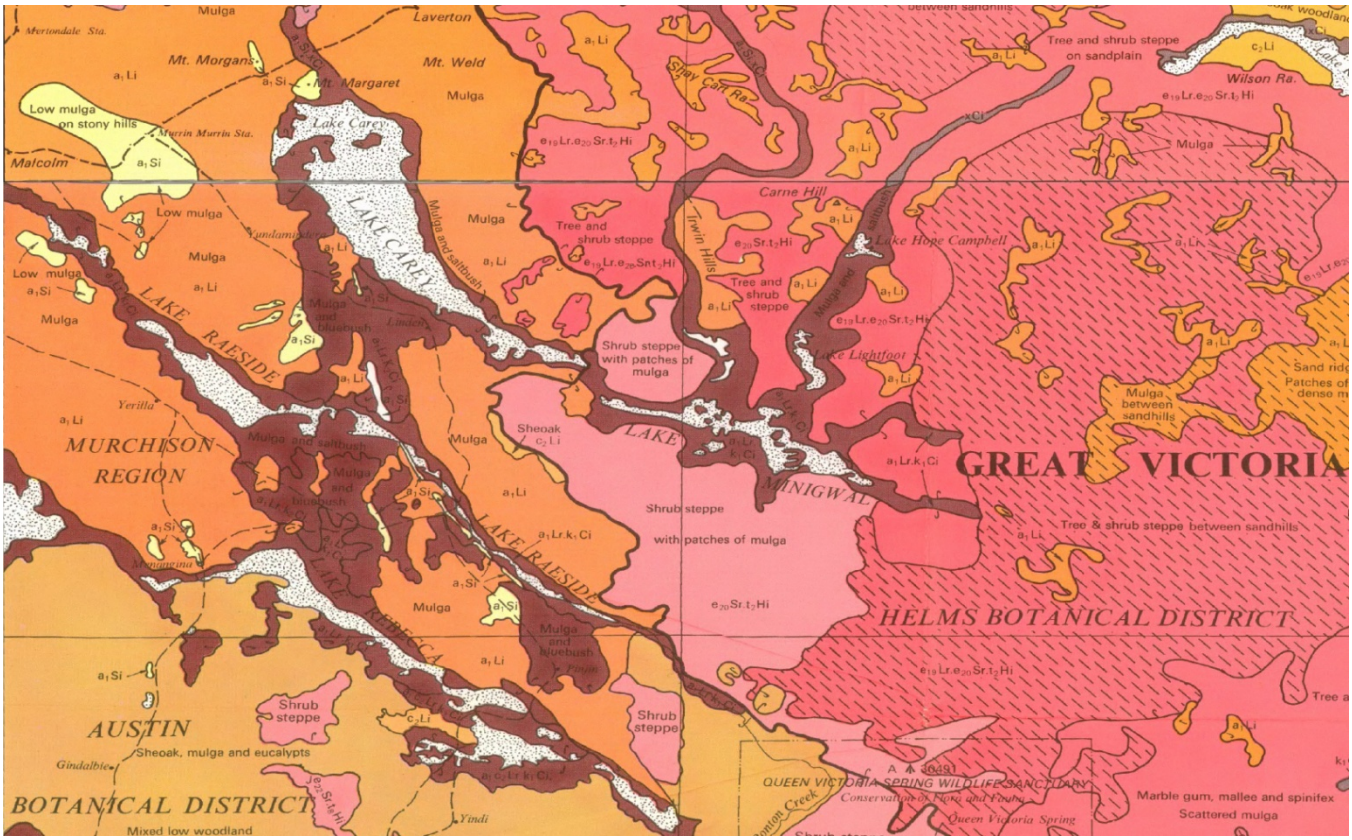

Figure 2: Beard Vegetation Complexes

6.5. LAND TENURE AND USE

GGT Pijnin Pipeline Option

The majority of the land in which the GGT survey area transverse is pastoral lease. Pastoral leases within the vicinity of the GGT Survey Area are:

- Black Flag Pastoral Lease
- Hampton Hill Pastoral Lease
- Pinjin Pastoral Lease
- Yindi Pastoral Lease

There are areas of vacant crown land the Goongarrie National Park, a small area of Reserved Crown Land near Ginaldbie and Private Aboriginal leasehold near Pinjin.

The wider Murchison bioregion is one of the main pastoral (sheep and cattle) and mining (gold, iron and nickel) areas in Western Australia.

Murrin Murrin Lateral Pipeline Option

The majority of the land in which the Murrin survey area lies is vacant crown land and pastoral leases. The Mt Margaret Private Aboriginal leasehold also occurs within the Murrin survey area.

The wider GVD bioregion includes land holdings of the Arangu Pitjantjatjara and part of the Maralinga Tjarutja lands.

7 FLORA OF CONSERVATION CONCERN

A search of the DEC Declared Rare and Priority Flora Database, the WA Herbarium database and the EPBC Protected Matters database identified 33 species of conservation concern potentially occurring within the Murrin and GGT survey areas (Table 1).

Table 1: Flora of conservation concern potentially occurring within the Survey Areas. Note GGT results incorporate species from the Mattiske report. (DRF = Declared Rare Flora) (Definitions Appendix A) * those species recorded in the Mattiske survey.

Flora Species		Protected Under:		Likely Presence	
Species Name	**EPBC Act 1999**	**WC Act 1950**	**DEC Priority**	**GGT**	**Murrin**
Conospermum toddii	Endangered	DRF		✓	✓
Gastrolobium graniticum	Endangered	DRF		✓	
Eucalyptus articulata	Vulnerable	DRF		✓	
Acacia eremophila var. numerous nerved variant			3	✓	
Baeckea sp. Great Victoria Desert			4	✓*	✓
Bossiaea eremaea			3		✓
Caesia rigidifolia			1	✓	

Flora Species	Protected Under:			Likely Presence	
Species Name	**EPBC Act 1999**	**WC Act 1950**	**DEC Priority**	**GGT**	**Murrin**
Calandrinia porifera			3	✓	
Calytrix praecipua			3		✓
Comesperma viscidulum			4	✓*	
Dampiera eriantha			1	✓	
Dicrastylis nicholasii			2	✓*	
Eremophila annosocaulis			1		✓
Eremophila aureivisca			1		✓
Eremophila parvifolia			1	✓	
Eremophila parvifolia subsp. *parvifolia*			4	✓	
Eucalyptus jutsonii			2	✓	
Eucalyptus nigrifunda			4		✓
Eucalyptus pimpiniana			3	✓	
Frankenia georgei			3		✓
Goodenia lyrata			1		✓
Grevillea secunda			2	✓*	✓
Gunniopsis propinqua			3		✓
Gunniopsis rubra			3		✓
Hemigenia exilis			4		✓
Hybanthus floribundus chloroxanthus			3		✓
Isotropis canescens			2	✓	
Lechenaultia aphylla			1		✓
Lepidobolus deserti			4	✓*	
Malleostemon sp. Officer Basin			2	✓	
Melaleuca apostiba			3		✓
Microcorys macredieana			3	✓	
Micromyrtus serrulata			2	✓*	
Micromyrtus stenocalyx			3	✓*	
Mimulus repens			3		✓
Mirbelia stipitata			3		✓
Olearia arida			2	✓*	
Olearia mucronata			3		✓
Persoonia leucopogon			1		✓
Philotheca tubiflora			1		✓

Flora Species	Protected Under:			Likely Presence	
Species Name	**EPBC Act 1999**	**WC Act 1950**	**DEC Priority**	**GGT**	**Murrin**
Phyllanthus baeckeoides			3		✓
Physopsis chrysotricha					
Sauropus ramosissimus			3		✓
Tecticornia cymbiformis			3		✓
Tecticornia mellaria			3		✓
Thryptomene eremaea			2	✓*	
Trachymene pyrophila			2	✓	
Vittadinia cervicularis var. oldfieldii			1		✓
Total Species of Conservation Concern				19	26

For each species of concern the following section provides the distribution, preferred habitat or substrate and a brief description. *Caesia rigidifolia* is not covered in the following chapters as little is known about the species and it is currently under taxonomic revision. Note that the Murrin survey area was larger than the GGT survey area (Figure 1), potentially explaining the higher number of flora species of conservation concern identified in the Murrin surveys area. I think you should expand the survey area of the GGT to incorporate the Pinjin-TGP corridor as well or the results of the Pinjin Survey.

7.1. *CONOSPERMUM TODDII (VICTORIA DESERT SMOKEBUSH)*

Species Information

Conospermum toddii is a shrub less than 2 m with long, fine, thread-like leaves (Plate 1). The small, white flowers are likely to be seen from July to October, particularly following favourable rainfall.

Distribution

C. toddii is known from the Coolgardie, Great Victoria Desert and Murchison IBRA regions (Figure 3).

Preferred Substrate

Crests of sand dunes and interdunal swales between the sand dunes. In recently burnt areas *C. toddii* regenerates from seed.

Conservation Status

C. toddii is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Declared Rare Flora
- EPBC Act – Endangered.

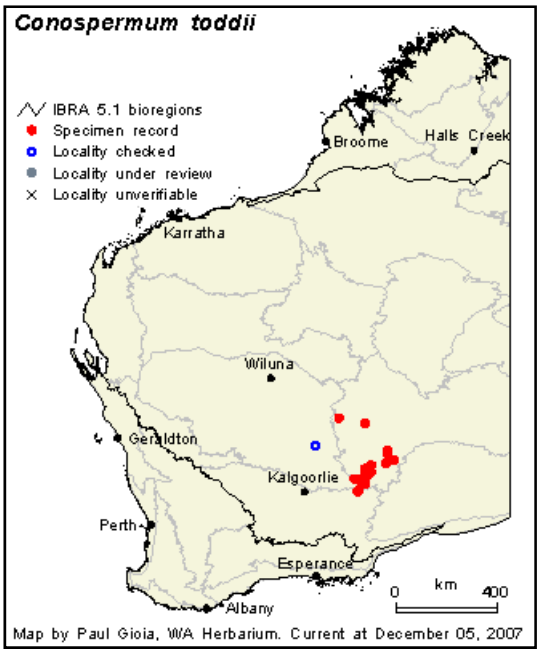

Figure 3: Distribution map for *Conospermum toddii* (http://florabase.calm.wa.gov.au/)

Plate 1: *Conospermum toddii* (http://florabase.calm.wa.gov.au/)

7.2. GASTROLOBIUM GRANITICUM

Species Information

Gastrolobium graniticum is an erect, open shrub that grows to 2.5 m high (Plate 2). The flowers of *G.graniticum* are yellow, orange and red and flowering occurs between August and September.

Distribution

G.graniticum is known from the Coolgardie, Swan Coastal Plain and Avon Wheatbelt IBRA regions (Figure 4).

Preferred Substrate

The preferred habitat of *G.graniticum* is sandy soils and granite. The species is found on margins of rock outcrops and along drainage lines.

Conservation Status

G. graniticum is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Declared Rare Flora
- EPBC Act – Endangered.

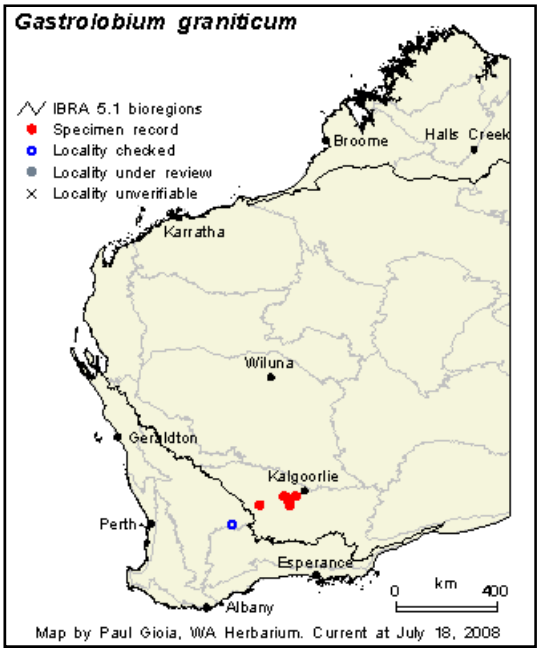

Figure 4: Distribution map for *Gastrolobium graniticum* (http://florabase.calm.wa.gov.au/)

Plate 2: *Gastrolobium graniticum* (http://florabase.calm.wa.gov.au/)

7.3. *EUCALYPTUS ARTICULATA*

Species Information

Eucalyptus articulata is low, straggly (mallee), to 3 m high. (Plate 3).

Distribution

E. articulata is known from the GVD IBRA region (Figure 5).

Preferred Substrate

The preferred substrate of *E. articulata* is red sand, sandy loam, arkose rubble and is often found on sand dunes.

Conservation Status

D. nicholasii is considered to be of conservation concern to the TJV as it is considered by the WC Act to be a:

- Declared Rare Flora.

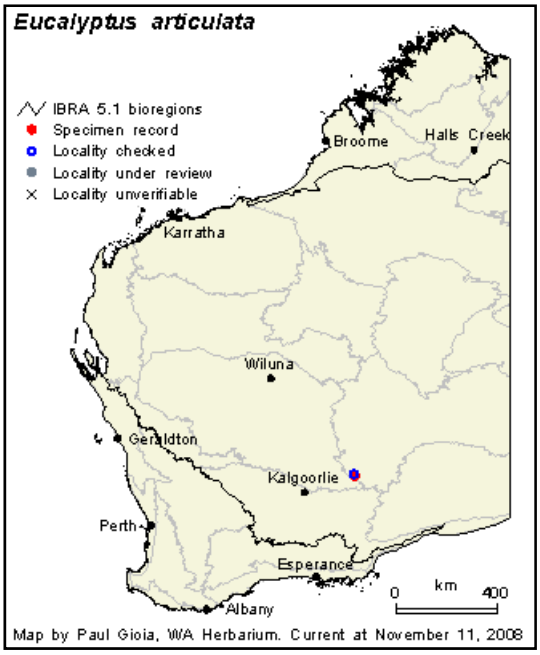

Figure 5: Distribution map for *Eucalyptus articulata* (http://florabase.calm.wa.gov.au/)

Plate 3: *Eucalyptus articulata* (http://florabase.calm.wa.gov.au/)

7.4. *ACACIA EREMOPHILA VAR. NUMEROUS-NERVED*

Species Information

Acacia eremophila is a dense spreading shrub that grows between 1 and 2 m in height (Plate 4). The flowers are yellow and flowering occurs in September.

Distribution

A. eremophila is known from the GVD, Coolgardie, Nullarbor and Murchison IBRA regions (Figure 6).

Preferred Substrate

The preferred substrate of *A. eremophila* is sandy soils and flats.

Conservation Status

A. eremophila is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

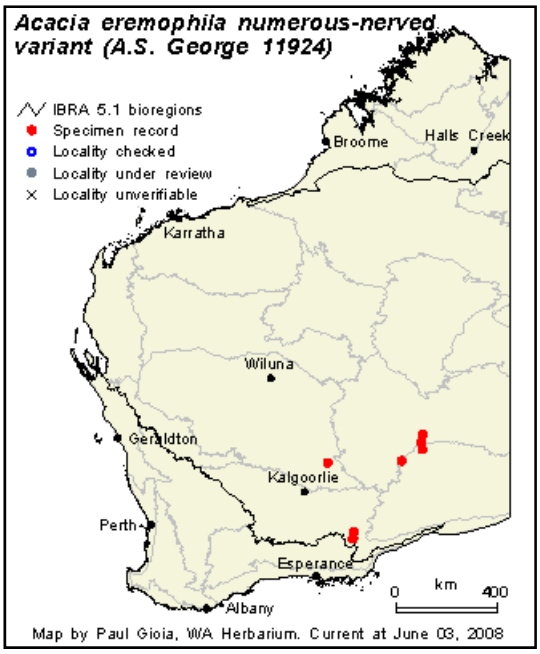

Figure 6: Distribution map for *Acacia eremophila* (http://florabase.calm.wa.gov.au/)

Plate 4: *Acacia eremophila* WA Herbarium

7.5. *Baeckea* sp. Great Victoria Desert

Species Information

Baeckea sp. Great Victoria Desert is a shrub that grows to 1 m with small pink to white flowers (Plate 5). Flowering occurs from April to June. The leaves are yellowish green, small and tuberculata.

Distribution

The *Baeckea* sp. Great Victoria Desert is known from the GVD and Murchison IBRA regions (Figure 7).

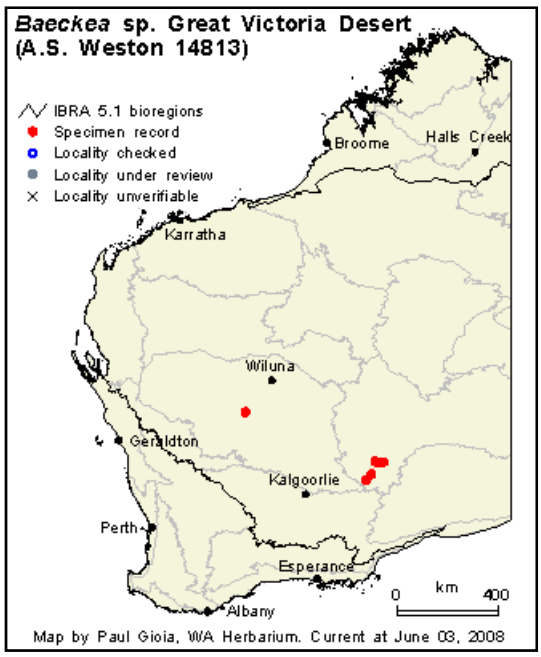

Figure 7: Distribution map for *Baeckea* sp. Great Victoria Desert (http://florabase.calm.wa.gov.au/)

Preferred Substrate

Substrates recorded from previous collections include red sand, yellow sandy loam, undulating plains and gentle slopes.

Conservation Status

Baeckea sp. Great Victoria Desert is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 - Poorly Known Taxa.

Plate 5: *Baeckea* sp. Great Victoria Desert (ecologia 2008)

7.6. *BOSSIAEA EREMAEA*

Species Information

Bossiaea eremaea is a divaricately-branched, spreading shrub, to 1.2 m high (Plate 6). Flowers are red, yellow, purple, brown, and flowering occurs from July–September.

Distribution

B. eremaea is known from the GVD and Murchison IBRA regions (Figure 8).

Preferred Substrate

The preferred substrate of *B. eremaea* is deep red sand.

Conservation Status

B. eremaea is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

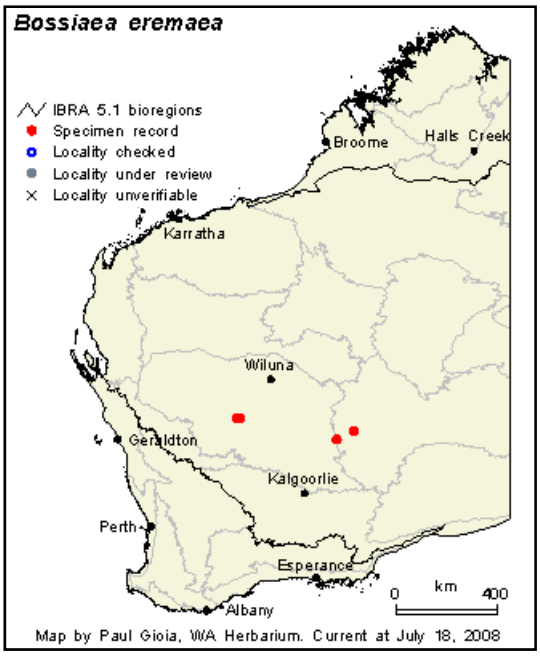

Figure 8: Distribution map for *Bossiaea eremaea* (http://florabase.calm.wa.gov.au/)

Plate 6: *Bossiaea eremaea* (WA Herbarium)

7.7. *CALANDRINIA PORIFERA*

Species Information

Calandrinia porifera is a prostrate herb with pink flowers, flowering occurs in September (Plate 7).

Distribution

C. porifera is known from the Coolgardie, GVD, and the Avon Wheatbelt IBRA regions (Figure 9).

Preferred Substrate

The preferred substrate of *C. Porifera* is granite rock.

Conservation Status

C. porifera is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

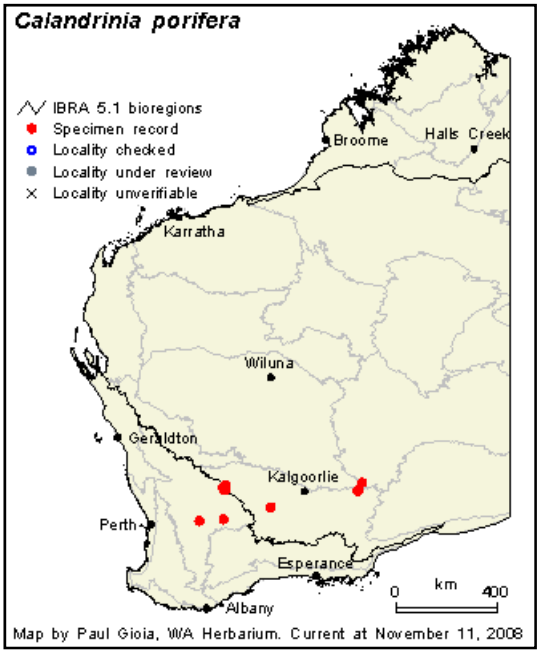

Figure 9: Distribution map for *Calandrinia porifera* (http://florabase.calm.wa.gov.au/)

Plate 7: *Calandrinia porifera* (WA Herbarium)

7.8. *CALYTRIX PRAECIPUA*

Species Information

*Calytrix praecipua is a s*hrub that grows 0.3–0.7 m high (Plate 8). The flowers are pink and white, flowering occurs from June–November.

Distribution

C. praecipua is known from the GVD, Murchison, Gascoyne and Little Sand Desert IBRA regions (Figure 10).

Preferred Substrate

The preferred substrate of *C. praecipua* is skeletal sandy soils over granite or laterite. Breakaways, outcrops.

Conservation Status

C. praecipua is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

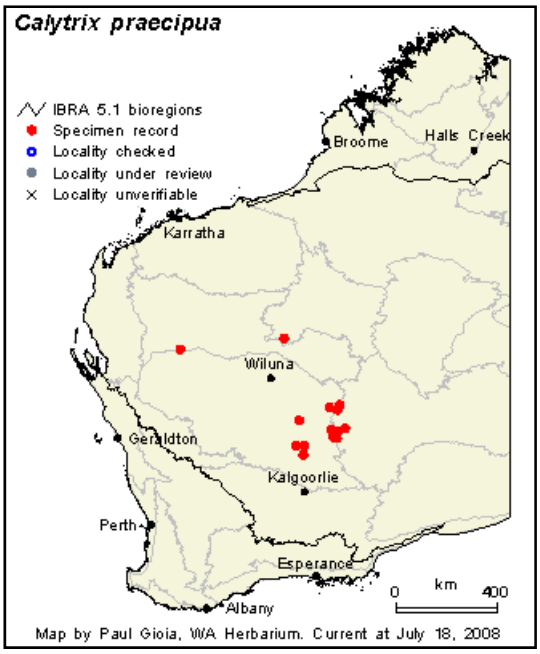

Figure 10: Distribution map for *Calytrix praecipua* (http://florabase.calm.wa.gov.au/)

Plate 8: *Calytrix praecipua* (WA Herbarium)

7.9. *COMESPERMA VISCIDULUM*

Species Information

Comesperma viscidulum This species is a shrub to 70cm tall that has been reported as flowering cream, purple (Plate 9).

Distribution

C. viscidulum is known from the Central Ranges, GVD and Little Sandy Desert IBRA regions (Figure 11).

Preferred Substrate

The preferred substrate of *C. viscidulum* is orange and orange yellow sandy loam and sand flats, undulating plains and upper slopes.

Conservation Status

C. viscidulum is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 4 – Rare taxa.

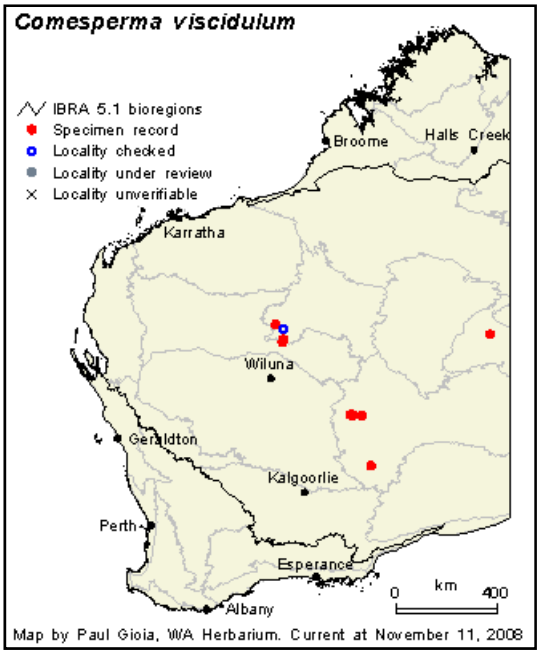

Figure 11: Distribution map for *Comesperma viscidulum* (http://florabase.calm.wa.gov.au/)

Plate 9: *Comesperma viscidulum* (WA Herbarium)

7.10. *DAMPIERA ERIANTHA*

Species Information

Dampiera eriantha is an erect perennial, herb that grows to 0.6 m high (Plate 10).

Distribution

D. eriantha is known from the GVD IBRA region (Figure 12).

Preferred Substrate

The preferred substrate of *D. eriantha* is yellow sand dunes.

Conservation Status

D. eriantha is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 - Poorly Known Taxa.

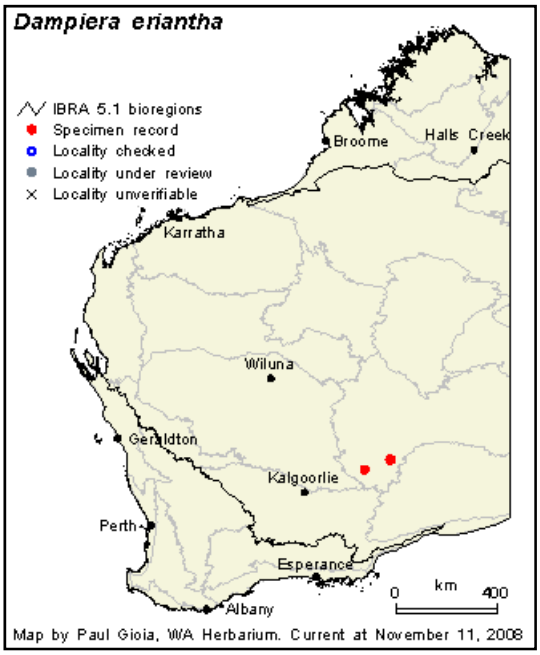

Figure 12: Distribution map for *Dampiera eriantha* (http://florabase.calm.wa.gov.au/)

Plate 10: *Dampiera eriantha* (WA Herbarium)

7.11. *DICRASTYLIS NICHOLASII*

Species Information

Dicrastylis nicholasii has been described as an erect, woolly shrub to 60cm tall (Plate 11).

Distribution

D. nicholasii is known from the GVD IBRA region (Figure 13).

Preferred Substrate

The preferred substrate of *D. nicholasii* is red sandy loam.

Conservation Status

D. nicholasii is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 - Poorly Known Taxa.

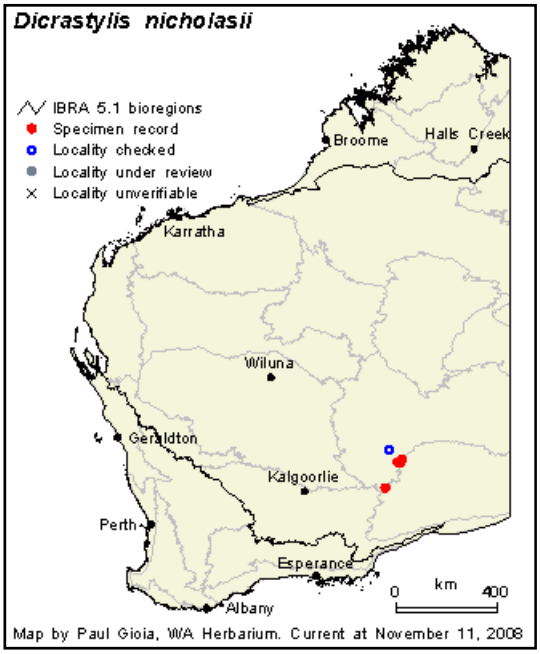

Figure 13: Distribution map for *Dicrastylis nicholasii* (http://florabase.calm.wa.gov.au/)

Plate 11: *Dicrastylis nicholasii* (*ecologia 2008*)

7.12. *EREMOPHILA ANNOSOCAULIS*

Species Information

Eremophila annosocaulis is a shrub, with purple flowers. Flowering occurs in September (Plate 12).

Distribution

E. annosocaulis is known from the GVD IBRA region (Figure 14).

Preferred Substrate

Stony, flat, sandy plain. Red sand or On stony loams (ironstone laterite).

Conservation Status

Eremophila annosocaulis is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 - Poorly Known Taxa.

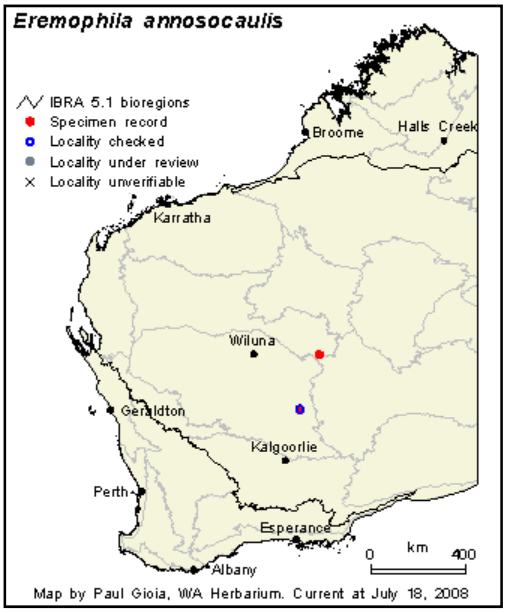

Figure 14: Distribution map for *Eremophila annosocaulis* (http://florabase.calm.wa.gov.au/)

Plate 12: *Eremophila annosocaulis* (http://florabase.calm.wa.gov.au/)

7.13. *EREMOPHILA AUREIVISCA*

Species Information

Eremophila aureivisca is a dense much-branched shrub, approximately 1 m high (Plate 13). The flowers are blue and purple, and flowering occurs in September.

Distribution

E. aureivisca is known from the GVD IBRA region (Figure 15).

Preferred Substrate

The preferred substrate of *E. aureivisca* is stony and skeletal red clay. *E. aureivisca* occurs between breakways & claypans.

Conservation Status

E. aureivisca is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 - Poorly Known Taxa.

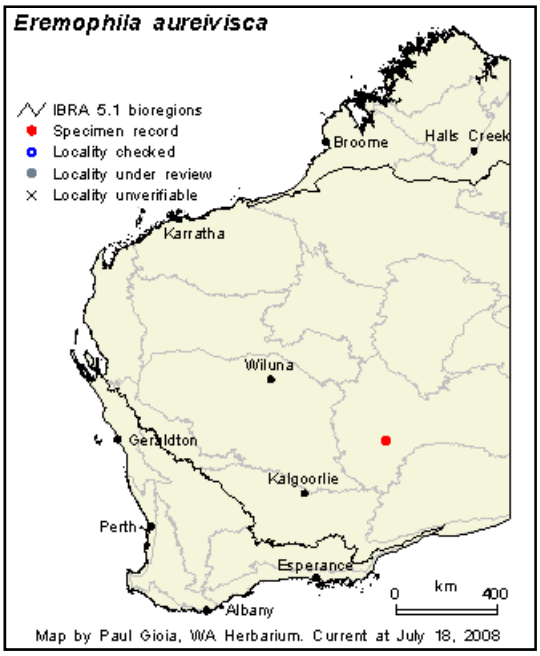

Figure 15: Distribution map for *Eremophila aureivisca* (http://florabase.calm.wa.gov.au/)

Plate 13: *Eremophila aureivisca* (http://florabase.calm.wa.gov.au/)

7.14. *EREMOPHILA PARVIFOLIA*

Species Information

Eremophila parvifolia is a shrub between 0.1–1.5 m high (Plate 14. Flowers are blue and purple, flowering occurs June - April.

Distribution

E. parvifolia is known from the Coolgardie, Murchison, Nullarbor, Swan Coastal Plain and the Mallee IBRA regions (Figure 16).

Preferred Substrate

The preferred substrate of *E. parvifolia* is red or yellow sand, clay, loam, limestone, sandplains, claypans, and salt lake margins.

Conservation Status

E. parvifolia is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 - Poorly Known Taxa.

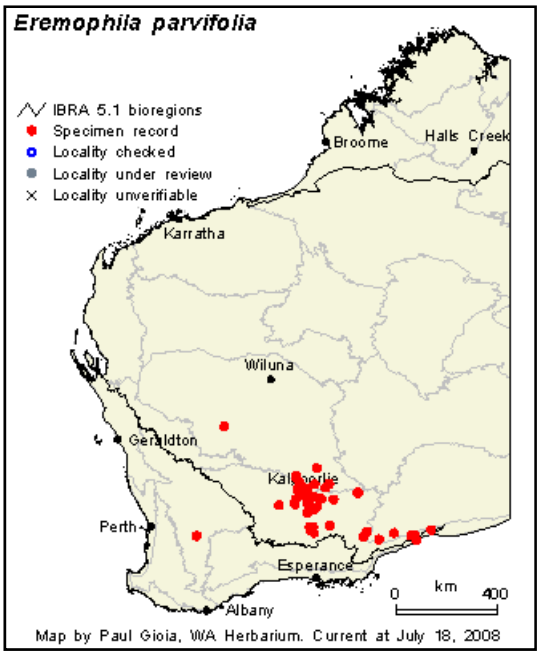

Figure 16: Distribution map for *Eremophila parvifolia* (http://florabase.calm.wa.gov.au/)

Plate 14: *Eremophila parvifolia* (http://florabase.calm.wa.gov.au/)

7.15. *EREMOPHILA PARVIFOLIA SUBSP. PARVIFOLIA*

Species Information

Eremophila parvifolia subsp. *parvifolia* is a low divaricate shrub, 0.15 – 0.7 m high (Plate 15). Flowers are blue and purple, flowering occurs in June–October and January–February.

Distribution

E. parvifolia subsp. *parvifolia* is known from the Coolgardie, Nullarbor, Swan Coastal Plan and Mallee IBRA regions (Figure 17).

Preferred Substrate

The preferred substrate of *E. parvifolia* subsp. *parvifolia* is loam, yellow sand, clay, and limestone. *E. parvifolia* subsp. *parvifolia* occurs on plains and claypans.

Conservation Status

E. parvifolia subsp. *parvifolia* is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 4 – Rare Taxa.

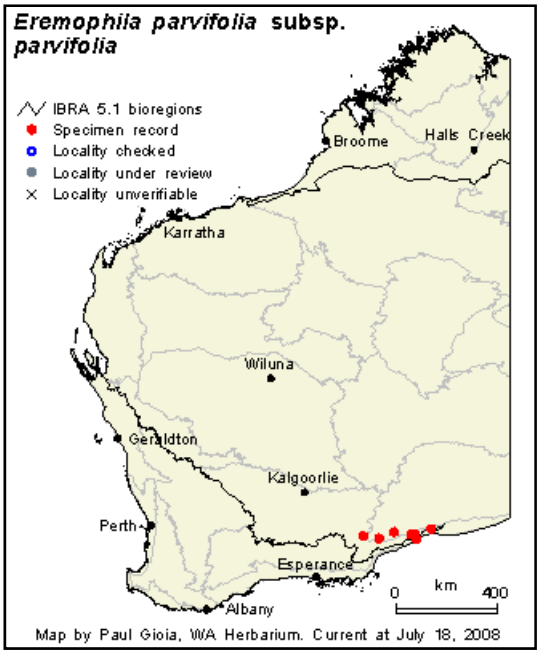

Figure 17: Distribution map for *Eremophila parvifolia* subsp. *parvifolia* (http://florabase.calm.wa.gov.au/)

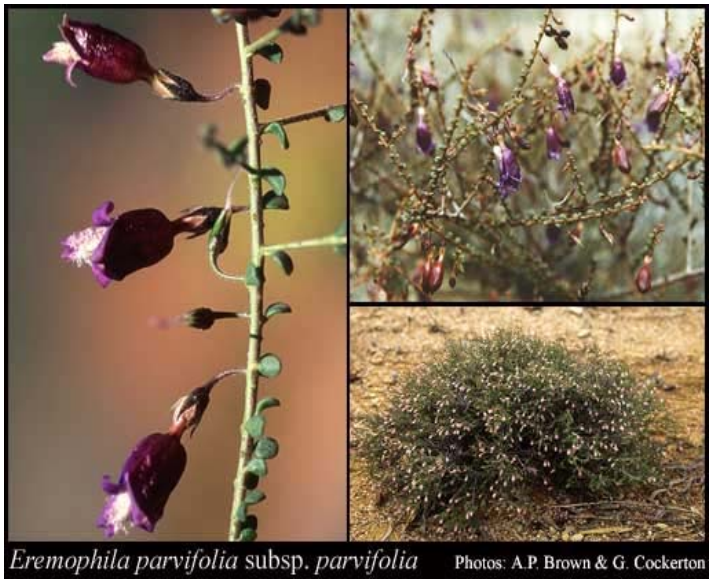

Plate 15: *Eremophila parvifolia* subsp. *parvifolia* (http://florabase.calm.wa.gov.au/)

7.16. *EUCALYPTUS JUTSONII*

Species Information

Eucalyptus jutsonii is a mallee, 4 – 8 m high, with rough, fibrous bark (Plate 16). The flowers of *E. jutsonii* are white, flowering occurs in November and March.

Distribution

E. jutsonii is known from the Coolgardie, Murchison and Yalgoo IBRA regions (Figure 18).

Preferred Substrate

The preferred substrate of *E. jutsonii* is deep yellow to orange to red sand occurring on sandplains and sandhills.

Conservation Status

E. jutsonii is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 - Poorly Known Taxa.

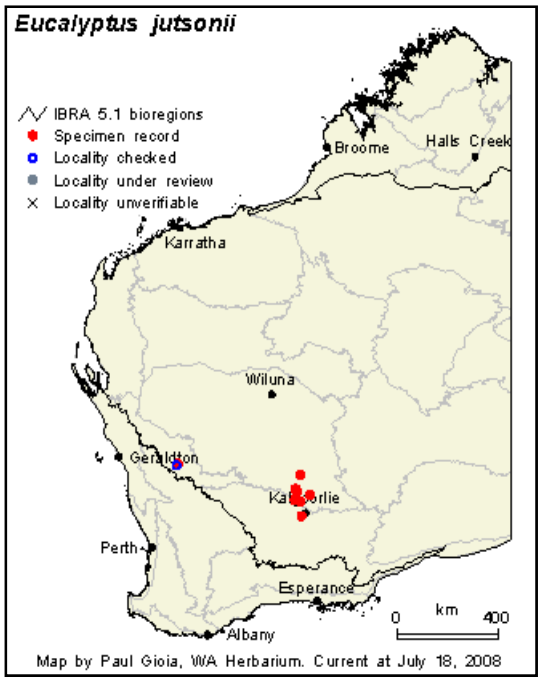

Figure 18: Distribution map for *Eucalyptus jutsonii* (http://florabase.calm.wa.gov.au/)

Plate 16: *Eucalyptus jutsonii* (WA Herbarium)

7.17. *EUCALYPTUS NIGRIFUNDA*

Species Information

Eucalyptus nigrifunda is a tree that grows to 5 – 7 m high; the bark is rough and black on the trunk (Plate 17).

Distribution

E. nigrifunda is known from the GVD and Murchison IBRA regions (Figure 19).

Preferred Substrate

The preffered substrate of *E. nigrifunda is* sandy clay. *E. nigrifunda* occurs on breakaways of decomposing granite.

Conservation Status

E. nigrifunda is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 4 - Rare Taxa.

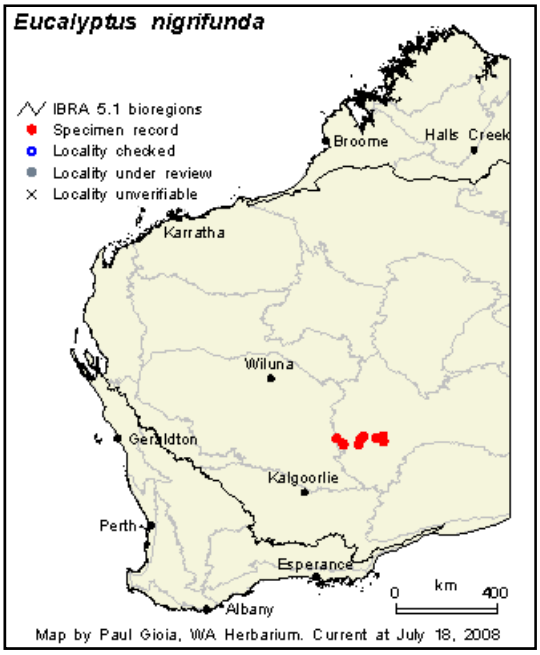

Figure 19: Distribution map for *Eucalyptus nigrifunda* (http://florabase.calm.wa.gov.au/)

Plate 17: *Eucalyptus nigrifunda* (WA Herbarium)

7.18. *EUCALYPTUS PIMPINIANA*

Species Information

Eucalyptus pimpiniana is a straggly shrubby mallee with smooth bark that grows between 0.7–2 m high. Flowers are white (Plate 18).

Distribution

E. pimpiniana is known from the GVD and Nullarbor IBRA regions (Figure 20).

Preferred Substrate

The preffered substrate of *E. pimpiniana* is red sand, sand dunes and plains.

Conservation Status

E. nigrifunda is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Rare Taxa.

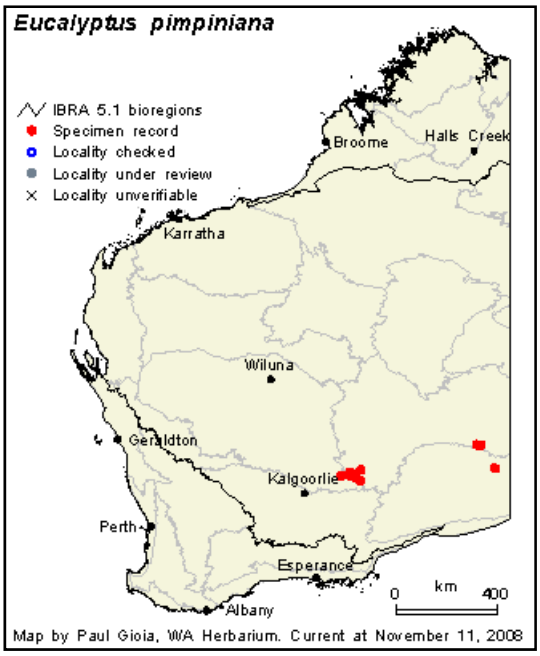

Figure 20: Distribution map for *Eucalyptus pimpiniana* (http://florabase.calm.wa.gov.au/)

Plate 18: *Eucalyptus pimpiniana* (http://florabase.calm.wa.gov.au/)

7.19. *FRANKENIA GEORGEI*

Species Information

Frankenia georgei is a small shrub with pink flowers (Plate 19). Flowering occurs in December.

Distribution

F. georgei is known from the Coolgardie, Gascoyne, Little Sandy Desert and the Murchison IBRA regions (Figure 21).

Preferred Substrate

The preferred substrate of *F. georgei* is rocky slopes.

Conservation Status

F.georgei is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 – Poorly Known Taxa.

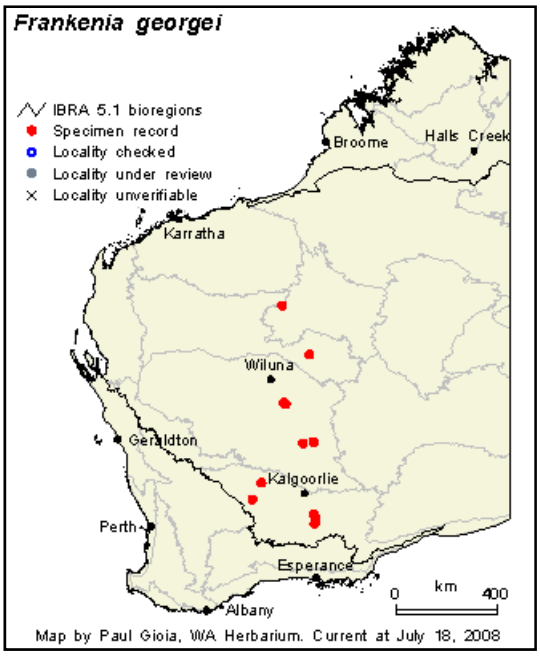

Figure 21: Distribution map for *Frankenia georgei* (http://florabase.calm.wa.gov.au/)

Plate 19: *Frankenia georgei* (http://www.chah.gov.au/cgi-bin/phtml?pc=wa&pn=144&size=3)

7.20. GOODENIA LYRATA

Species Information

Goodenia lyrata is a prostrate herb, with lyrate leaves (Plate 20). Flowers are yellow and usually seen in August.

Distribution

G. lyrata is known from the Gibson Desert, Pilbara and Murchison IBRA regions (Figure 22).

Preferred Substrate

The preferred substrate of *G. lyrata* is red sandy loam. *G. lyrata* generally occurs near claypans.

Conservation Status

G. lyrata is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 – Poorly Known Taxa.

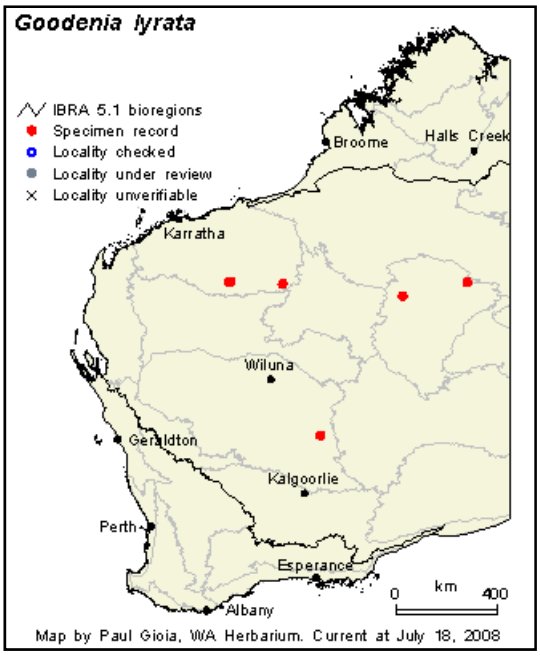

Figure 22: Distribution map for *Goodenia lyrata* (http://florabase.calm.wa.gov.au/)

Plate 20: *Goodenia lyrata* (WA Herbarium)

7.21. *GREVILLEA SECUNDA*

Species Information

Grevillea secunda is a low, spreading shrub that grows between 0.3 m - 0.8 m in height and usually flowers between September and October (Plate 21). Flowers are red and arranged in groups at the ends of the horizontal stems, and the fruits have thin, woody shells.

Distribution

G. secunda is known from the GVD, Murchison and Coolgardie IBRA regions (Figure 23).

Preferred Substrate

G. secunda is often found on yellow or red sand, sand dunes and sand plains.

Conservation Status

G. secunda is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

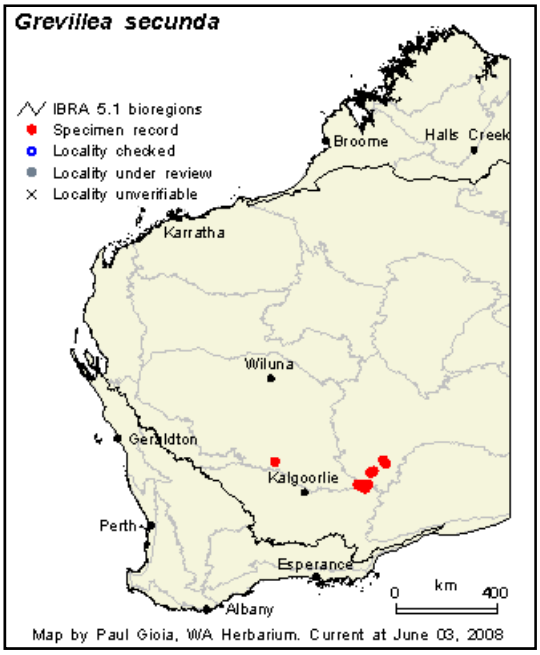

Figure 23: Distribution map for *Grevillea secunda* (http://florabase.calm.wa.gov.au/)

Plate 21: *Grevillea secunda* (http://florabase.calm.wa.gov.au/)

7.22. GUNNIOPSIS PROPINQUA

Species Information

Gunniopsis propinqua is a prostrate annual or perennial herb that grows between 0.03 – 0.1 m high (Plate 22). Flowers are white and pink, flowering occurs between August and September.

Distribution

G. propinqua is known from the Gascoyne and Murchison IBRA regions (Figure 24).

Preferred Substrate

The preferred substrate of *G. propinqua* is stony sandy loam. *G. propinqua* has been recorded from lateritic outcrops, winter-wet sites.

Conservation Status

G. propinqua is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

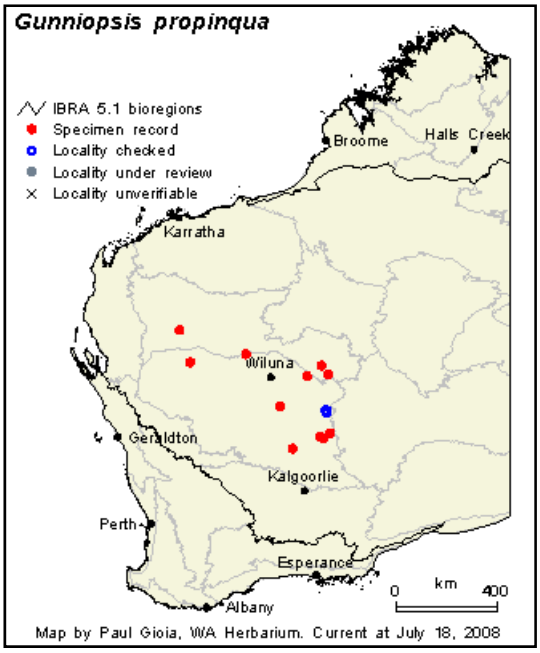

Figure 24: Distribution map for *Gunniopsis propinqua* (http://florabase.calm.wa.gov.au/)

Plate 22: *Gunniopsis propinqua* (WA Herbarium)

7.23. *GUNNIOPSIS RUBRA*

Species Information

Gunniopsis rubra is a prostrate annual, herb, 0.01 – 0.03 m high with green flowers (Plate 23). Flowering occurs in September.

Distribution

G. rubra is known from the Coolgardie, Murchison, Yalgoo, Swan Coastal Plain and Avon Wheatbelt IBRA regions (Figure 25).

Preferred Substrate

The preferred substrate of *G. rubra* is sandy loam.

Conservation Status

G. rubra is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

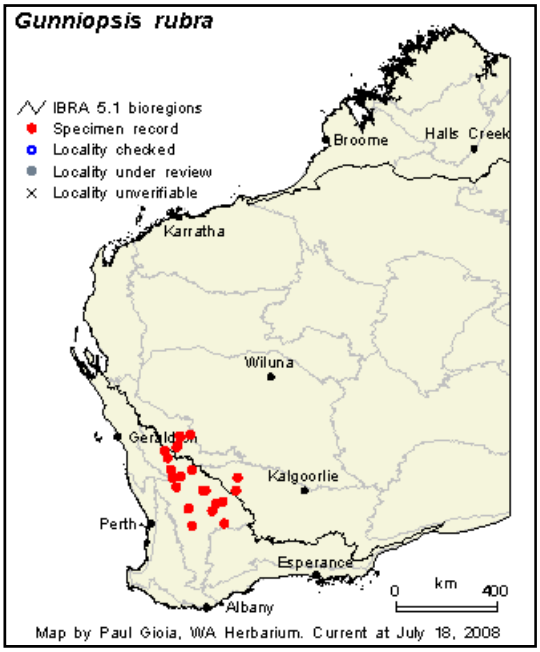

Figure 25: Distribution map for *Gunniopsis rubra* (http://florabase.calm.wa.gov.au/)

Plate 23: *Gunniopsis rubra* (http://florabase.calm.wa.gov.au/)

7.24. *HEMIGENIA EXILIS*

Species Information

Hemigenia exilis is an erect, multi-stemmed shrub, 0.5 – 2 m high (Plate 24). Flowers are blue, purple, and white and flowering occurs April – November.

Distribution

H. exilis is known from the Murchison IBRA region (Figure 26).

Preferred Substrate

The preferred substrate of *H. exilis* is laterite. The species is known to occur on breakaways and slopes.

Conservation Status

H. exilis is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 4 – Rare taxa.

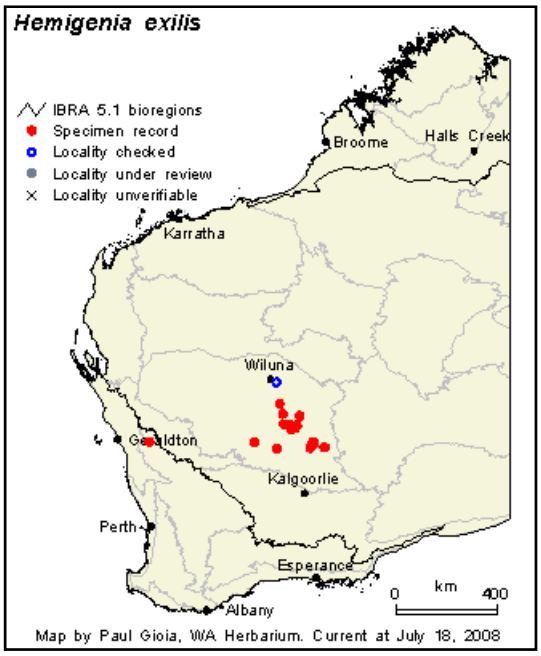

Figure 26: Distribution map for *Hemigenia exilis* (http://florabase.calm.wa.gov.au/)

Plate 24: *Hemigenia exilis* (WA Herbarium)

7.25. *HYBANTHUS FLORIBUNDUS SUBSPECIES CHLOROXANTHUS*

Species Information

H. floribundus chloroxanthus is a multi-stemmed shrub, to 0.7 m high (Plate 25). Flowers are blue, and white, flowering occurs from August - October.

Distribution

H. floribundus chloroxanthus is known from the Murchison IBRA region (Figure 27).

Preferred Substrate

The preferred substrate of *H. floribundus chloroxanthus* is dark red-brown soil (never sandy), rich in iron oxide, and laterite. The species is known to occur on rocky areas, creek banks, and along drainage lines.

Conservation Status

H. floribundus chloroxanthus is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

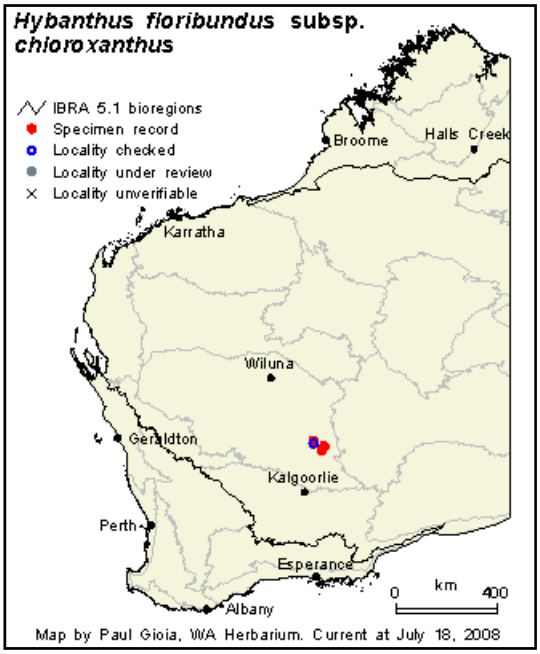

Figure 27: Distribution map for *Hybanthus floribundus* subsp. *chloroxanthus* (http://florabase.calm.wa.gov.au/)

Plate 25: *H. floribundus* subspecies *chloroxanthus* (WA Herbarium)

7.26. *ISOTROPIS CANESCENS*

Species Information

Isotropis canescens is a prostrate perennial, herb, grows to 0.3 m high and the flowers are yellow and red (Plate 26).

Distribution

I. canescens is known from the GVD and Yalgoo IBRA regions (Figure 28).

Preferred Substrate

The preferred substrate of *I. canescens* is yellow clayey sand and sandplains.

Conservation Status

D. nicholasii is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 - Poorly Known Taxa.

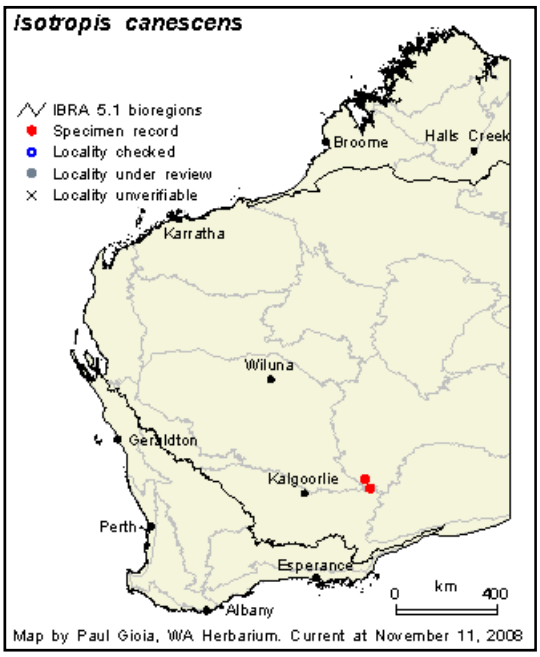

Figure 28: Distribution map for *Isotropis canescens* (http://florabase.calm.wa.gov.au/)

Plate 26: *Isotropis canescens* (WA Herbarium)

7.27. LECHENAULTIA APHYLLA

Species Information

Lechenaultia aphylla is a small, tangled shrub, 0.3 m high, appearing to be leafless (Plate 27).

Distribution

L. aphylla is known from the GVD IBRA region (Figure 29).

Preferred Substrate

L. aphylla is found in red sand, slopes and drainage areas.

Conservation Status

L. aphylla is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 - Rare Taxa.

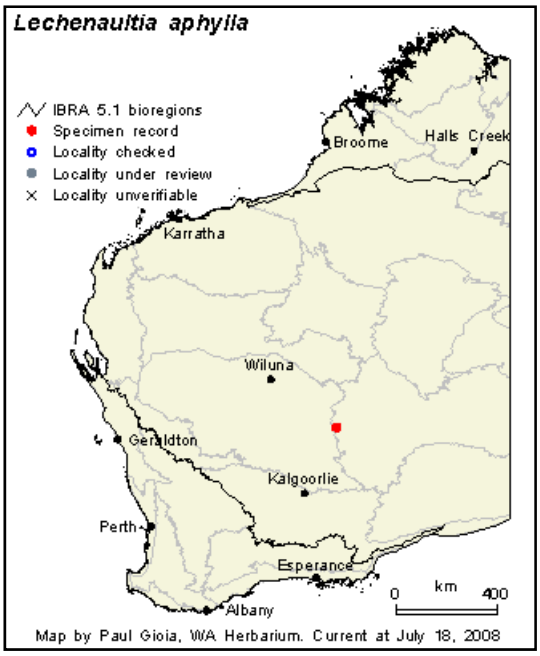

Figure 29: Distribution map for *Lechenaultia aphylla* (http://florabase.calm.wa.gov.au/)

Plate 27: *Lechenaultia aphylla* (http://www.environment.sa.gov.au/biodiversity/yellabinna.html)

7.28. *LEPIDOBOLUS DESERTI - DESERT TWINE RUSH*

Species Information

Lepidobolus deserti is a perennial sedge-like herb between 0.15 and 0.45 m (Plate 28). It grows in tufts and has wiry leafless stems that grow to about 40 cm.

Distribution

L. deserti is known from the GVD, Murchison and Coolgardie IBRA regions (Figure 30).

Preferred Substrate

L. deserti occurs in low woodland or with Mulga, or among mallee and taller shrubs with spinifex (*ecologia* 2008). It tends to be found on flat, red, loamy sand plains.

Conservation Status

L. deserti is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 4 - Rare Taxa.

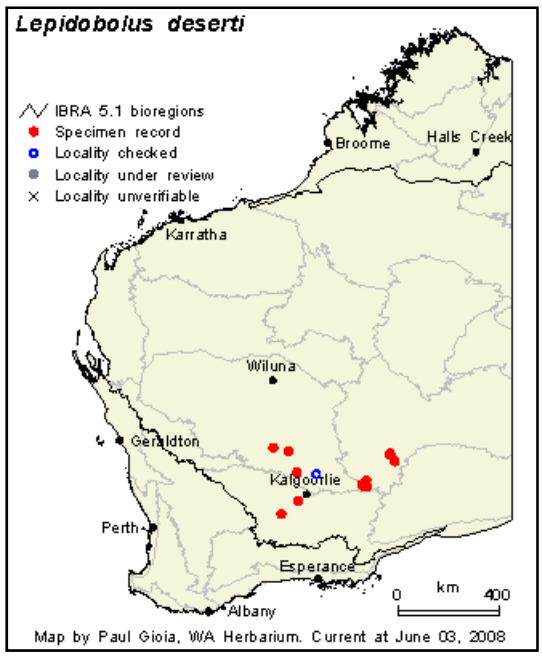

Figure 30: Distribution map for *Lepidobolus deserti* (http://florabase.calm.wa.gov.au/)

Plate 28: *Lepidobolus deserti* (http://florabase.calm.wa.gov.au/)

7.29. *Malleostemon sp. Officer Basin*

Species Information

M*alleostemon* sp. Officer Basin is a shrub, 1–3 m high, flowers are white and occur in December. (Plate 29).

Distribution

M*alleostemon* sp. Officer Basin is known from the GVD IBRA region (Figure 31).

Preferred Substrate

The preferred substrate of M*alleostemon* sp. Officer Basin is yellow sand and dune slopes.

Conservation Status

M*alleostemon* sp. Officer Basin is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 - Poorly Known Taxa.

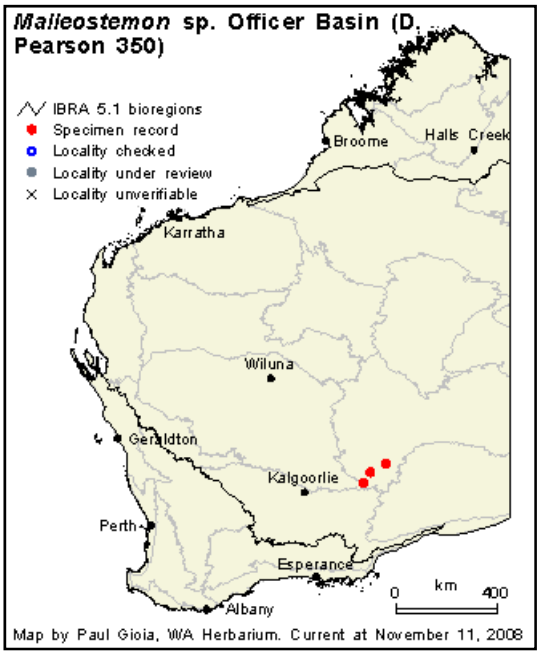

Figure 31: Distribution map for M*alleostemon* sp. Officer Basin (http://florabase.calm.wa.gov.au/)

Plate 29: *Malleostemon* sp. Officer Basin (*ecologia* 2008)

7.30. *MELALEUCA APOSTIBA*

Species Information

Melaleuca apostiba is a spreading shrub, up to 2 m high, with grey fissured bark and dull green leaves (Plate 30). Flowers are red and flowering occurs in January and May – June.

Distribution

M. apostiba is known from the GVD IBRA region (Figure 32).

Preferred Substrate

Deep red sand associated with salt lake.

Conservation Status

M. apostiba is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

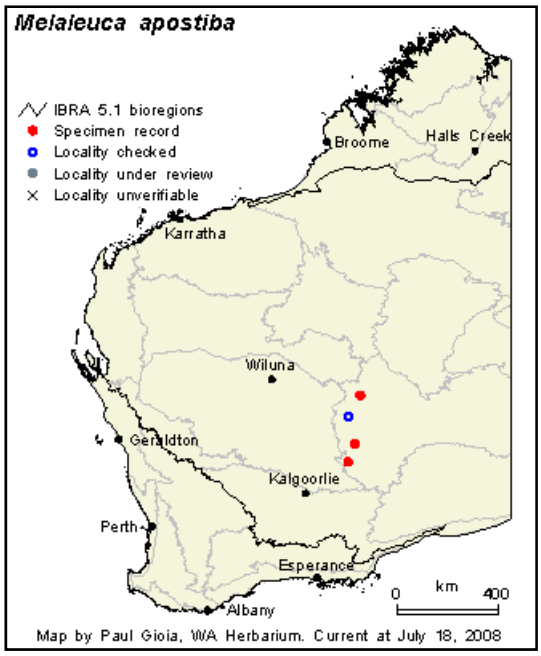

Figure 32: Distribution map for *Melaleuca apostiba* (http://florabase.calm.wa.gov.au/)

Plate 30: *Melaleuca apostiba* (WA Herbarium)

7.31. *MICROCORYS MACREDIEANA*

Species Information

Microcorys macredieana is a broom-like shrub, that grows to 0.2–1.5 m high. Flowers are white (Plate 31).

Distribution

M. macredieana is known from the Coolgardie, GVD, Little Sandy Desert and the Central Ranges IBRA regions (Figure 33).

Preferred Substrate

The preferred substrate of *M. macredieana* is yellow sand dunes and sandplains.

Conservation Status

M*alleostemon* sp. Officer Basin is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

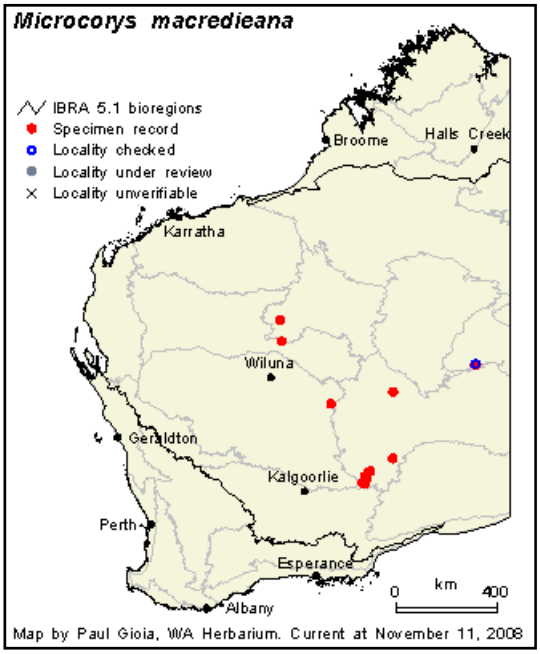

Figure 33: Distribution map for *Microcorys macredieana* (http://florabase.calm.wa.gov.au/)

Plate 31: *Microcorys macredieana* (http://florabase.calm.wa.gov.au/)

7.32. *MICROMYRTUS SERRULATA*

Species Information

Micromyrtus serrulata is an erect or somewhat spreading shrub that grows between 0.4–1.5 m high. Flowers are white (Plate 32).

Distribution

M. serrulata is known from the Coolgardie and Murchison IBRA regions (Figure 34).

Preferred Substrate

The preferred substrate of *M. serrulata* is brownish sandy and clayey soils over granite.

Conservation Status

M. serrulata is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 - Poorly Known Taxa.

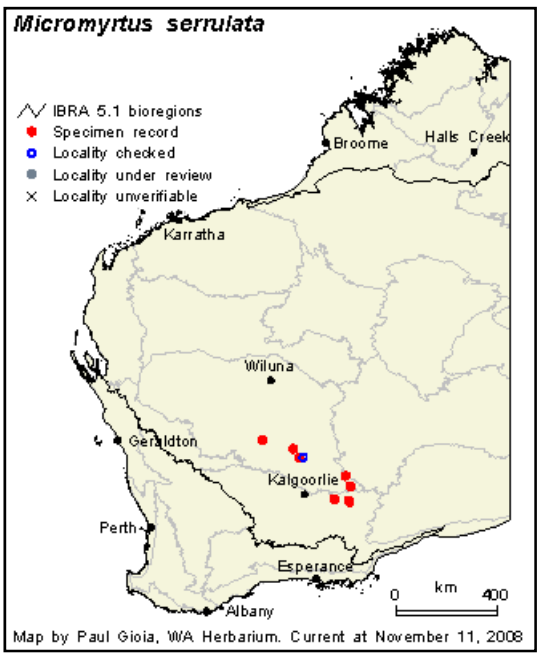

Figure 34: Distribution map for *Micromyrtus serrulata* (http://florabase.calm.wa.gov.au/)

Plate 32: *Micromyrtus serrulata* (WA Herbarium)

7.33. *MICROMYRTUS STENOCALYX*

Species Information

Micromyrtus stenocalyx is a straggly or widely spreading shrub that grows between 0.3–1.5 m high. Flowers are white (Plate 33).

Distribution

M. stenocalyx is known from the Coolgardie, GVD and Murchison IBRA regions (Figure 35).

Preferred Substrate

The preferred substrate of *M. stenocalyx* is yellow or rarely red soils.

Conservation Status

M. stenocalyx is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

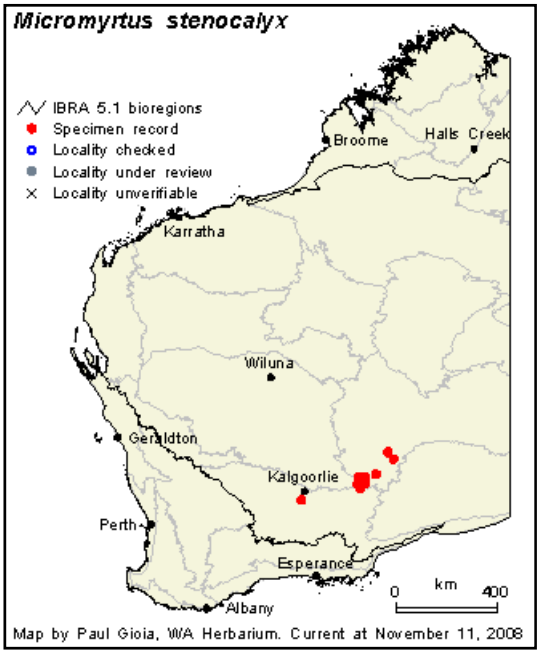

Figure 35: Distribution map for *Micromyrtus stenocalyx* (http://florabase.calm.wa.gov.au/)

Plate 33: *Micromyrtus stenocalyx* (ecologia 2008)

7.34. *MIMULUS REPENS*

Species Information

Mimulus repens is a prostrate annual or perennial, herb (Plate 34). Flowers are blue and purple, Flowering occurs from August–November.

Distribution

*M. repens i*s known from the Gascoyne, AS, Murchison; Avon Wheatbelt, Geraldton Sandplains IBRA regions (Figure 36).

Preferred Substrate

The preferred substrate of *M. repens* is sand, clay. Margins of lakes & watercourses.

Conservation Status

M. repens is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 – Poorly Known Taxa.

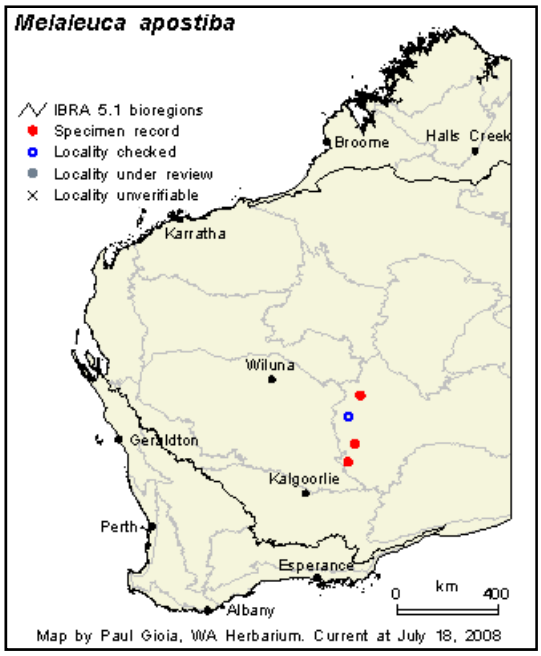

Figure 36: Distribution map for *Mimulus repens* (http://florabase.calm.wa.gov.au/)

Plate 34: *Mimulus repens* (http://narrung.blogspot.com/2008/05/why-narrung-peninsula-is-worth-saving.html)

7.35. *MIRBELIA STIPITATA*

Species Information

Mirbelia stipitata is a spiny shrub, 0.6 m high (Plate 35). Flowering occurs in August.

Distribution

M. stipitata is known from the Murchison IBRA region (Figure 37).

Preferred Substrate

The preferred substrate of *M. stipitata* is red sandy loam.

Conservation Status

M. stipitata is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 – Poorly Known Taxa.

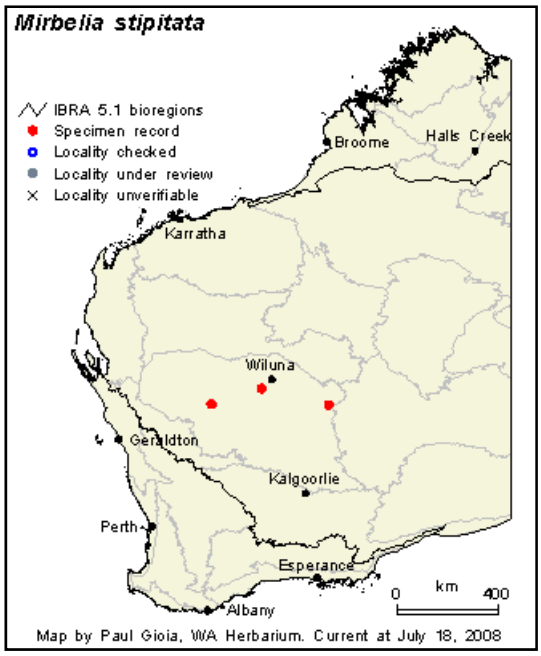

Figure 37: Distribution map for *Mirbelia stipitata* (http://florabase.calm.wa.gov.au/)

Plate 35: *Mirbelia stipitata* (WA Herbarium)

7.36. *OLEARIA MUCRONATA*

Species Information

Olearia mucronata is a densely branched, unpleasantly aromatic shrub, 0.6 – 1 m high (Plate 36). The flowers are white and yellow, flowering occurs August – January.

Distribution

O. mucronata is known from the Murchison and Pilbara IBRA regions (Figure 38).

Preferred Substrate

The preferred substrate of *O. mucronata* is Schistose hills, along drainage channels.

Conservation Status

O. mucronata is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 – Poorly Known Taxa.

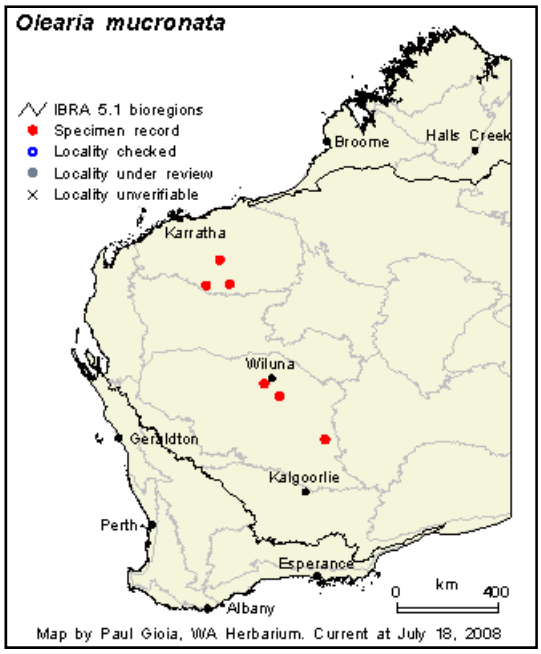

Figure 38: Distribution map for *Olearia mucronata* (http://florabase.calm.wa.gov.au/)

Plate 36: *Olearia mucronata* (WA Herbarium)

7.37. *PERSOONIA LEUCOPOGON*

Species Information

Persoonia leucopogon is an erect or decumbent shrub, 0.3 – 0.6 m high (Plate 37). Flowers are yellow and green and flowering occurs from October–December.

Distribution

P. leucopogon is known from the Coolgardie, Murchison and Avon Wheatbelt IBRA regions (Figure 39).

Preferred Substrate

The preferred substrate of *P. leucopogon* is yellow sand or sandy clay.

Conservation Status

P. leucopogon is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 – Poorly Known Taxa.

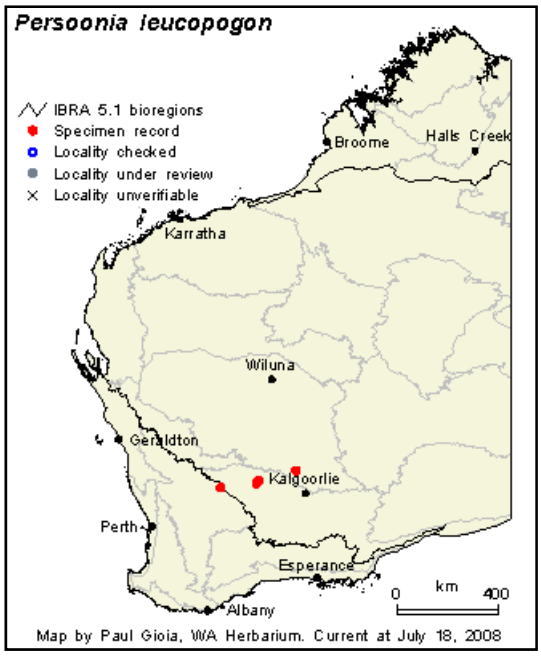

Figure 39: Distribution map for *Persoonia leucopogon* (http://florabase.calm.wa.gov.au/)

Plate 37: *Persoonia leucopogon* (WA Herbarium)

7.38. PHILOTHECA TUBIFLORA

Species Information

Philotheca tubiflora is a compact, much-branched shrub, 0.2 – 0.6 m high (Plate 38). Flowers are pink and white, flowering occurs from June – October.

Distribution

P. tubiflora is known from the GVD and Murchison IBRA regions (Figure 40).

Preferred Substrate

The preferred substrate of *P. tubiflora* is rocky rises, hills, and outcrops.

Conservation Status

P. tubiflora is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 - Rare Taxa.

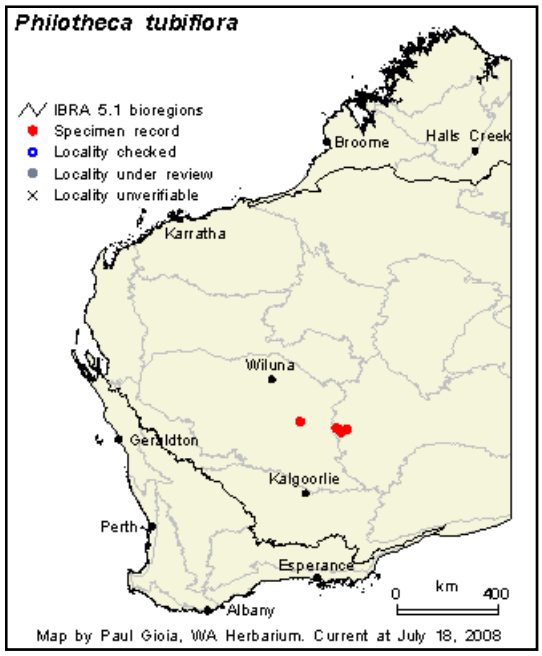

Figure 40: Distribution map for *Philotheca tubiflora* (http://florabase.calm.wa.gov.au/)

Plate 38: *Philotheca tubiflora* (WA Herbarium)

7.39. *PHYLLANTHUS BAECKEOIDES*

Species Information

Phyllanthus baeckeoides Shrub, 0.5 – 1.5 m high (Plate 39). Flowers are white, yellow and green. Flowering occurs July – September.

Distribution

P. baeckeoides is known from the GVD and Murchison IBRA regions (Figure 41).

Preferred Substrate

The preferred substrate of *P. baeckeoides* is red lateritic and sandy clay soils. The species is known to occur on granite outcrops.

Conservation Status

P. baeckeoides is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 - Poorly Known Taxa.

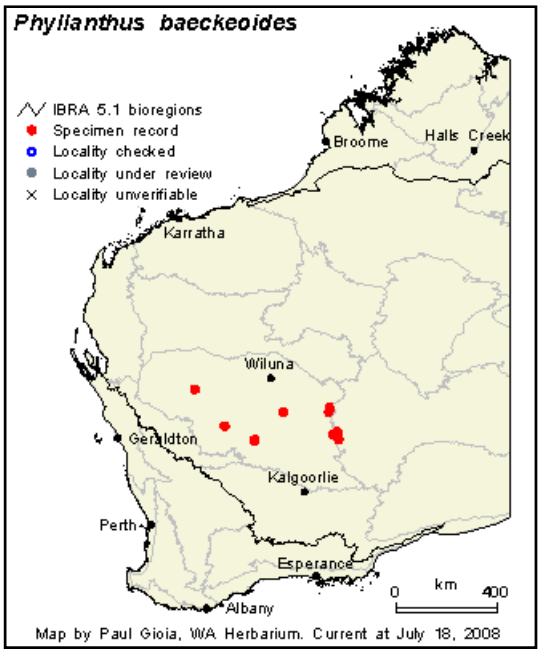

Figure 41: Distribution map for *Phyllanthus baeckeoides* (http://florabase.calm.wa.gov.au/)

Plate 39: *Phyllanthus baeckeoides* (WA Herbarium)

7.40. *PHYSOPSIS CHRYSOTRICHA*

Species Information

Physopsis chrysotricha is a shrub. Flowers are yellow and white (Plate 40).

Distribution

P. chrysotricha is known from the GVD and Gibson IBRA regions (Figure 42).

Preferred Substrate

The preferred substrate of *P. chrysotricha* is red sand over calcrete.

Conservation Status

P. chrysotricha is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 - Poorly Known Taxa.

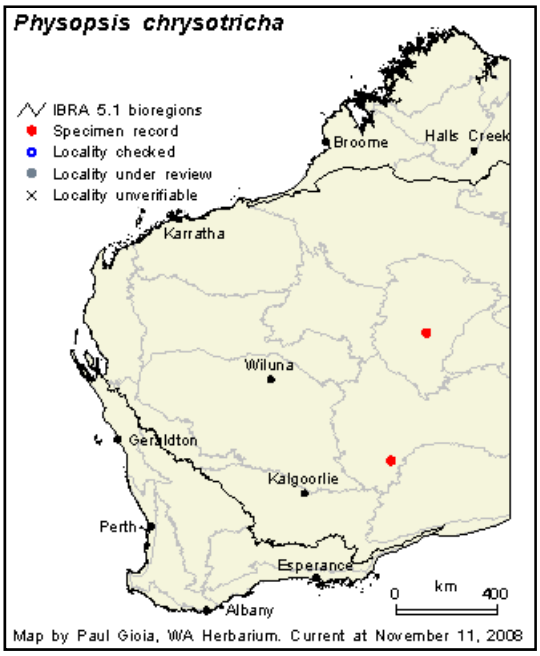

Figure 42: Distribution map for *Physopsis chrysotricha* (http://florabase.calm.wa.gov.au/)

Plate 40: *Physopsis chrysotricha* (WA Herbarium)

7.41. *SAUROPUS RAMOSISSIMUS*

Species Information

Sauropus ramosissimus is a slender, much-branched shrub, to 0.3 m high (Plate 41).

Distribution

S. ramosissimus is known from the Gascoyne, Gibson Desert, GVD and Murchison IBRA regions (Figure 43).

Preferred Substrate

The preferred substrate of *S. ramosissimus* is unknown

Conservation Status

S. ramosissimus is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 – Poorly Known Taxa.

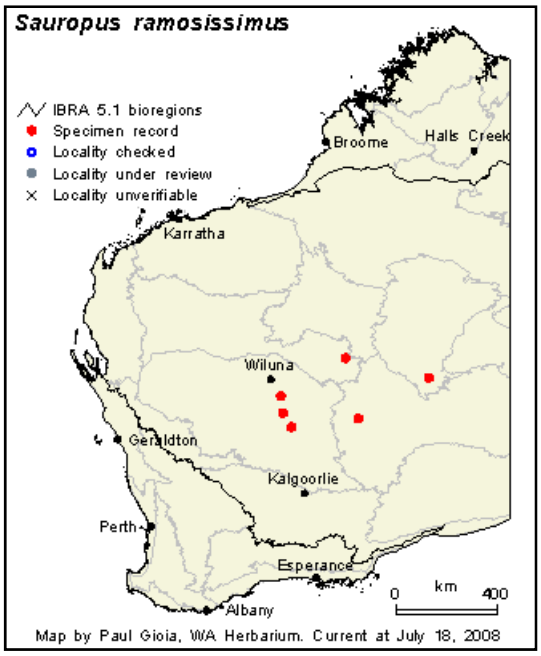

Figure 43: Distribution map for *Sauropus ramosissimus* (http://florabase.calm.wa.gov.au/)

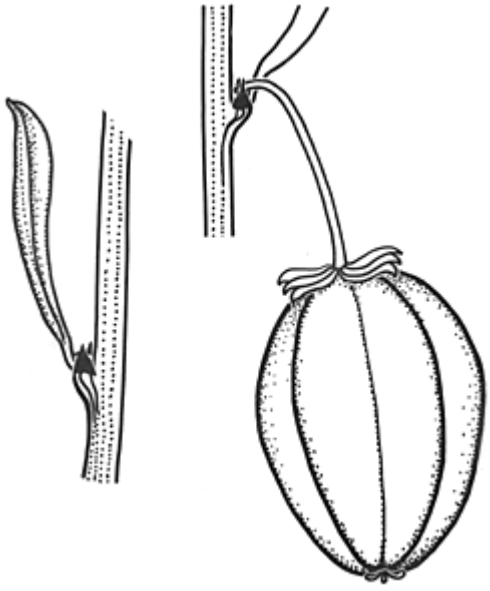

Plate 41: *Sauropus ramosissimus* (http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Sauropus~ramosissimus)

7.42. *TECTICORNIA CYMBIFORMIS*

Species Information

Tecticornia cymbiformis is an erect, perennial shrub, 0.3 – 0.5 m high (Plate 42). Flowering occurs March – May.

Distribution

T. cymbiformis is known from the Murchison and Yalgoo IBRA regions (Figure 44).

Preferred Substrate

The preferred substrate of *T. cymbiformis* is Saline soils, along the edge of creeklines.

Conservation Status

T. cymbiformis is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 3 – Poorly Known Taxa.

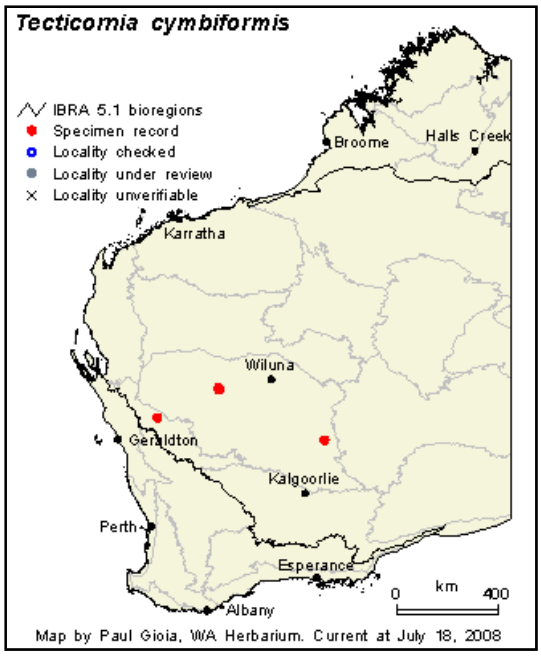

Figure 44: Distribution map for *Tecticornia cymbiformis* (http://florabase.calm.wa.gov.au/)

Plate 42: *Tecticornia cymbiformis* (http://florabase.calm.wa.gov.au/)

7.43. TECTICORNIA MELLARIA

Species Information

Tecticornia mellaria is an erect, perennial shrub, 0.2 – 0.4 m high (Plate 43). Flowering occurs September–October.

Distribution

T. mellaria is known from the Murchison IBRA regions (Figure 45).

Preferred Substrate

The preferred substrate of *T. mellaria is* well-drained red gypseous sand and clay. The species is known to occur on gypseous dunes, margins of playa lakes, and on clay pans.

Conservation Status

T. mellaria is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 – Poorly Known Taxa.

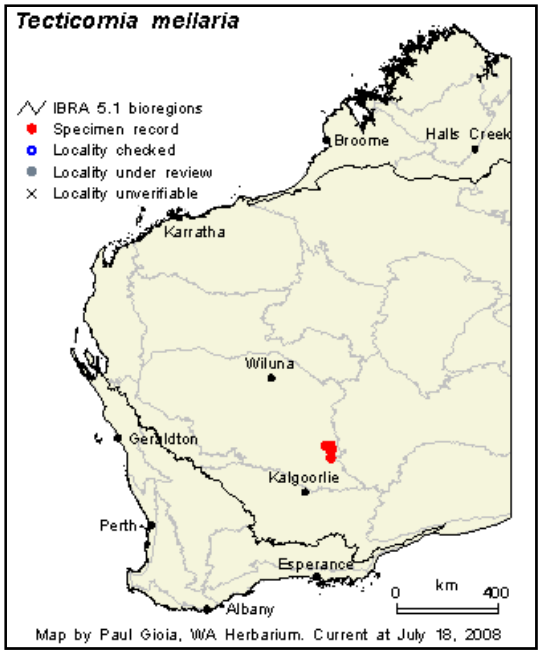

Figure 45: Distribution map for *Tecticornia mellaria* (http://florabase.calm.wa.gov.au/)

Plate 43: *Tecticornia mellaria* (http://florabase.calm.wa.gov.au/)

7.44. *TRACHYMENE PYROPHILA*

Species Information

Trachymene pyrophila is an annual, herb that grows between 0.1–0.5 m high. Flowers are white (Plate 44).

Distribution

T. pyrophila is known from the GVD and Gibson IBRA regions (Figure 46).

Preferred Substrate

The preferred substrate of *T. pyrophila* is ellow or orange sand and sandplains, germinating after fire or other disturbances

Conservation Status

T. pyrophila is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 - Poorly Known Taxa.

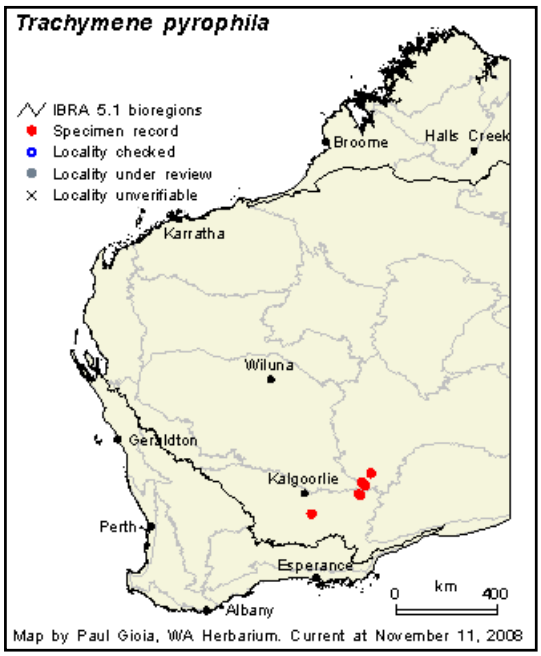

Figure 46: Distribution map for *Trachymene pyrophila* (http://florabase.calm.wa.gov.au/)

Plate 44: *Trachymene pyrophila* (WA Herbarium)

7.45. THRYPTOMENE EREMAEA

Species Information

Thryptomene eremaea is an erect open shrub that grows between 0.5 – 1.5 m in height (Plate 45). The flowers are pink and white, and flowering occurs between July and September.

Distribution

T. eremaea is known from the GVD IBRA region (Figure 47).

Preferred Substrate

T. eremaea usually occurs on red or yellow sand and sandplains.

Conservation Status

T. eremaea is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 2 – Poorly Known Taxa.

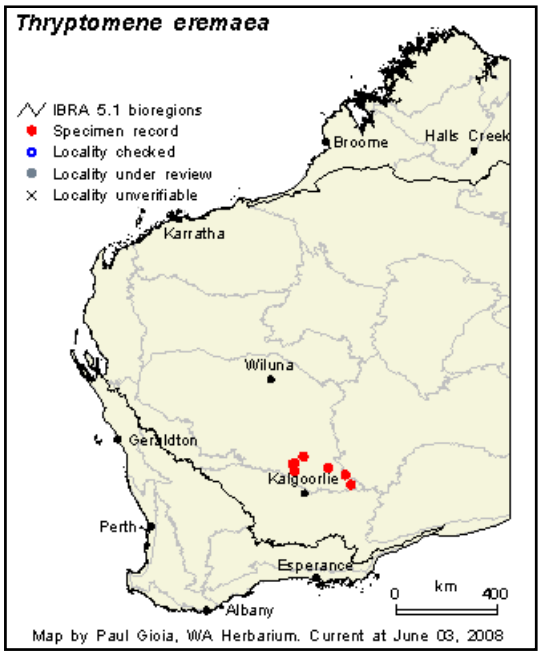

Figure 47: Distribution map for *Thryptomene eremaea* (http://florabase.calm.wa.gov.au/)

Plate 45: *Thryptomene eremaea* (WA Herbarium)

7.46. VITTADINIA CERVICULARIS VAR. OLDFIELDII

Species Information

Vittadinia cervicularis var. *oldfieldii* is an annual herb, 0.1 – 0.3 m high (Plate 46). Flowers are white, purple and blue, flowering occurs August – September.

Distribution

V. cervicularis var. *oldfieldii* is known from the Murchison and Avon Wheatbelt IBRA regions (Figure 48).

Preferred Substrate

The preferred substrate of *V. cervicularis* var. *oldfieldii* is alluvium.

Conservation Status

V. cervicularis var. *oldfieldii* is considered to be of conservation concern to the TJV as it is considered by the DEC to be a Priority species:

- Priority 1 – Poorly Known Taxa.

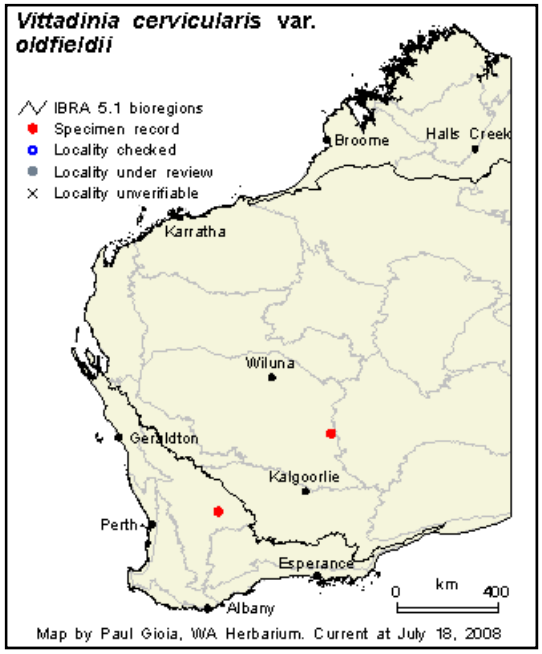

Figure 48: Distribution map for *Vittadinia cervicularis* var. *oldfieldii* (http://florabase.calm.wa.gov.au/)

Plate 46: *Vittadinia cervicularis* var. *oldfieldii* (WA Herbarium)

8 FAUNA OF CONSERVATION CONCERN

A search of the DECs Threatened and Priority Fauna Database, the Museum's Faunabase, the EPBC Protected Matters database and regional sources was undertaken to identify fauna species of conservation concern that potentially occur within the survey areas (Table 2).

Table 2: Fauna species of conservation concern potentially occurring within the Survey Areas.

Fauna Species		Protected Under:				Likely Presence	
Common Name	**Species Name**	**EPBC Act 1999**	**WC Act 1950**	**DEC Priority**	**IUCN**	**GGT**	**Murrin**
Mammals							
Banded Hare-wallaby, Mernine[1]	*Lagostrophus fasciatus fasciatus*	Vulnerable	Schedule 1		Vulnerable		✓
Mulgara	*Dasycercus cristicauda*	Vulnerable	Schedule 1		Vulnerable	✓	✓
Numbat, Walpurti	*Myrmecobius fasciatus*	Vulnerable	Schedule 1		Vulnerable		✓
Sandhill Dunnart	*Sminthopsis psammophila*	Endangered	Schedule 1		Endangered		✓
Southern Marsupial Mole	*Notoryctes typhlops*	Endangered	Schedule 1		Endangered		✓
Birds							
Australian Bustard	*Ardeotis australis*			P4		✓	✓
Fork-tailed Swift	*Apus pacificus*	Migratory			Least Concern	✓	✓
Great Egret, White Egret	*Ardea pacificus*	Migratory				✓	✓
Hooded Plover	*Charadrius rubricollis*	Marine		P4	Near Threatened	✓	
Malleefowl	*Leipoa ocellata*	Vulnerable	Schedule 1		Vulnerable	✓	✓
Oriental Plover, Oriental Dotterel	*Charadrius veredus*	Migratory			Least Concern		✓
Peregrine Falcon	*Falco peregrinus*		Schedule 4		Least Concern		✓
Princess Parrot, Alexandra's Parrot	*Polytelis alexandrae*	Vulnerable	Schedule 1		Near Threatened		✓
Rainbow Bee-eater	*Merops ornatus*	Migratory			Least Concern	✓	✓
Slender-billed Thornbill (western)	*Acanthiza iredalei iredalei*	Vulnerable	Schedule 1		Least Concern	✓	✓
Reptiles							
Great Desert Skink, Tjakura, Warrarna,	*Egernia kintorei*	Vulnerable	Schedule 1		Vulnerable		✓

Fauna Species			Protected Under:			Likely Presence	
Common Name	**Species Name**	**EPBC Act 1999**	**WC Act 1950**	**DEC Priority**	**IUCN**	**GGT**	**Murrin**
Mulyamiji							
Woma Python	*Aspidites ramsayi*			P1		✓	
Crustaceans							
Fairy Shrimp	*Branchinella apophysata*			P1	Vulnerable		✓
Total Species of Conservation Concern						9	16

1: The probability of the Banded Hare Wallaby being present in the Murrin survey area is low, see Section 8.1

For each species of concern the following section provides the distribution, preferred habitat or substrate and a brief description. Note that the Murrin survey area was larger (by how much) than the GGT survey area (Figure 1), potentially explaining the higher number of fauna species of conservation concern identified in the Murrin surveys area. I think you should incorporate the area between Pinjin and the TGP as with the flora section.

8.1. Banded Hare Wallaby - Lagostrophus fasciatus fasciatus

The probability that the Banded Hare Wallaby (Figure 35 and Plate 34) actually occurs in either survey area is very low. However, a reported day sighting was made in the Murrin survey area according to the DEC database (the date of which is unknown). A more likely candidate is the Rufous Hare Wallaby (*Lagorchestes hirsutus*) (Figure 36 and Plate 35), or alternatively the Central Hare Wallaby (*Lagorchestes asomatu*) which is known from a single specimen collected in the Northern Territory (Aitken et al. 2002). The species distribution and conservation status are described in Table 3. The TJV should consider the possibility that hare wallabies do exist in the area.

Table 3: Distribution and conservation status of hare wallabies potentially recorded in the Murrin survey area.

Species	Distribution	EPBC Act 1999	WC Act 1950
Banded Hare Wallaby - *Lagostrophus fasciatus fasciatus*	Once more widespread, the Banded Hare Wallaby is it now restricted to Bernier and Dorre Islands in Shark Bay (Prince 2002).	Vulnerable	Schedule 1
Rufous Hare Wallaby – *Lagorchestes hirsutus*	The Rufous Hare Wallaby persisted in the Great Sandy and Gibson Deserts until the 1950s but its Western Australian distribution is now thought to be restricted to Bernier and Dorre Islands in Shark Bay (Johnson and Burbidge 2002).	Endangered	Schedule 1
Central Hare Wallaby – *Lagorchestes asomatus*	This species is known to science from only one adult skull extracted from a fresh carcass at an undetermined locality along a 130 km strip of country between Mount Farewell and Lake Mackay, Northern Territory (Aitken et al. 2002).	Extinct	Extinct

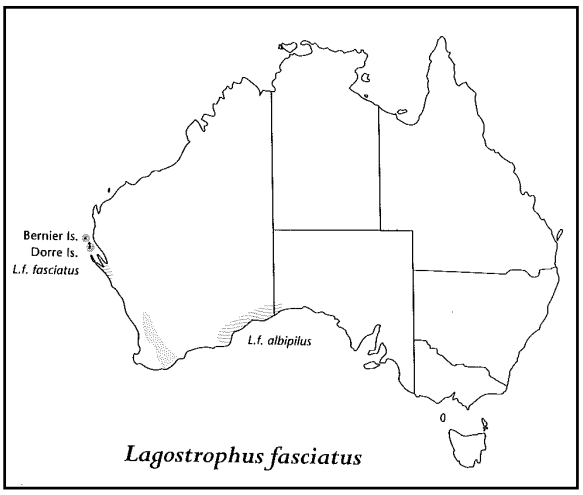

Figure 35: Distribution map of the *Lagostrophus fasciatus fasciatus* (Strahan 2002)

Plate 34: Banded Hare Wallaby - *Lagostrophus fasciatus fasciatus* (Strahan 2002)

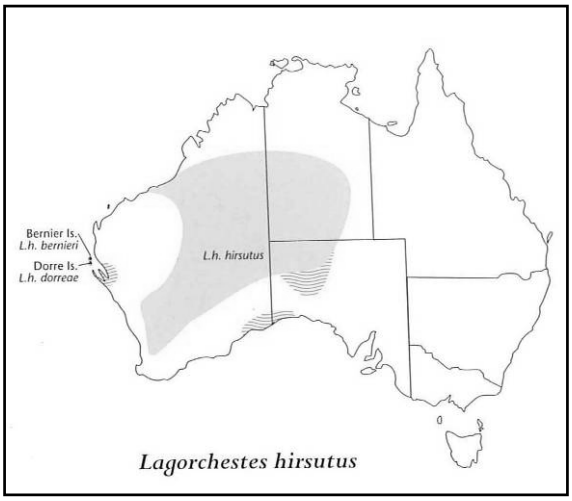

Figure 36: Distribution map of the *Lagorchestes hirsutus* (Strahan 2002)

Plate 35: Rufous Hare Wallaby – *Lagorchestes hirsutus* (Strahan 2002)

8.2. MULGARA - DASYCERCUS CRISTICAUDA

SPECIES INFORMATION

There has been considerable taxonomic confusion and re-sorting of the Mulgaras. For most of the last 30 years only one species, *D. cristicauda,* was recognised. However, Woolley (2005, 2006) re-assigned the species to the brush-tailed mulgara *D. blythi* and crest-tailed mulgara *D. cristicauda*. Both species have a wide geographic range in the arid zone of Australia, and overlapping distributions. Of the two species, *D. cristicauda* is the most likely species to be recorded within either survey areas.

The species can be distinguished by the form of the tail, the number of upper premolar teeth in each jaw and, in the female, by the number of nipples in the pouch (Woolley 2005). *D. cristicauda* has a crested tail (Plate 36), three upper premolars and eight nipples (Woolley 2005). *Dasycercus blythi* has a non-crested tail (Plate 37), two upper premolars and six nipples.

Plate 36: Tail of *D. cristicauda* (Woolley 2005)

Plate 37: Tail of *D. blythi* (Woolley 2005)

The Mulgara is a carnivorous marsupial that lives in the deserts of central Australia. *D. cristicauda* is roughly 12-22 cm long and 130 g with a 7-13 cm tail with sand coloured fur on the back fading to pale grey on the underbelly and chin (Woolley 2002) (Plate 38). The first half of the tail has the same colouration as the body; the second half of the tail bears a dorsal crest (Woolley 2005).

The Mulgara is a nocturnal and burrowing marsupial which digs on the flats between low sand-dunes or the slopes of high dunes (Woolley 2002). The Mulgara burrows are usually in the flat areas between sand dunes or on the lower margins of the dunes. The Mulgara burrows can often be found in groups. Burrows can vary in complexity from burrows with single-entrance holes and minimal tunnelling to multi-entrance holes with deep and complex tunnels and branches. Complex burrows will also often have numerous 'pop' holes for alternative access and observation points. Mulgara will retreat into their burrows to escape the heat of the day, particularly in summer, although they have been observed to bask in the sun during winter.

The Mulgara tend to maintain a permanent home rather than migrating to follow food sources, so a permanent cover of spinifex is important, not only to provide refuge, but also to provide habitat for prey species and cover to move around and hunt. Even when rainfall is low, Mulgara tend not to migrate and population size is regulated by the presence of adequate water and food resources. The diet of the Mulgara includes insects, other arthropods and small vertebrates (Woolley 2002).

Little is known regarding breeding in the wild but females with up to eight young have been captured between June and December (Woolley 2002). The breeding season occurs from June through December (Woolley 2002).

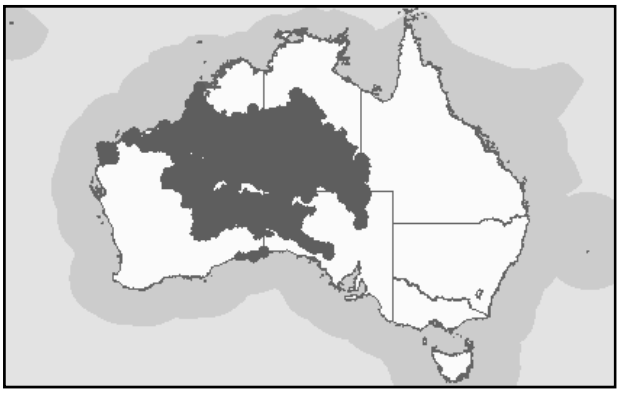

Figure 37: Distribution Map of the Mulgara (http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=328)

Plate 38: The Mulgara, *Dasycercus cristicauda* (Northern Territory Government 2008)

DISTRIBUTION

Because most previous records did not distinguish among the two species of mulgara now recognised, there is ambiguity about the distribution of both species.

D. cristicauda has a patchy but widespread distribution in sandy regions of arid central Australia and Western Australia (Figure 37) (Menkhorst and Knight 2004). Although the range of the mulgaras is large, the density across that area is low, with local communities inhabiting the spinifex clumps across the arid sandy region. The main populations appear to be found in the Northern Territory and Western Australia at present, with the main presence being in the Pilbara, Tanami Desert and Great Sandy Desert.

The distribution of the Mulgara at any one time appears to be affected by local rainfall which affects the availability of food resources. However, predation by introduced animals such as Wild Dogs, Feral Cats and European Foxes along with the encroachment on available habitat by anthropogenic activities are likely to have also had an effect.

PREFERRED HABITAT

The main vegetation of inhabited areas, specifically *Triodia basedowii*, provides refuge from the heat and cover for the entrance to their burrows. As noted above, Mulgara live in burrows which they dig on the flats between low sand-dunes or on the lower edges of dunes (Woolley 2002).

CONSERVATION STATUS

D. cristicauda is considered to be of conservation concern for the TJV as it is listed under State and Federal legislation:

- WC Act 1950 – Schedule 1 - Fauna that is likely to become extinct
- EPBC Act – Vulnerable.

It is also listed by the IUCN as Vulnerable.

8.3. NUMBAT - MYRMECOBIUS FASCIATUS

SPECIES INFORMATION

The Numbat is a marsupial with reddish-brown fur and prominent white, transverse stripes (Plate 39). It also has a dark stripe running across the eye from the ear to the mouth. The Numbat can grow to 27.4 cm long and weigh up to 715 g. It has a bushy tail which can grow to 21 cm long (Friend 2002).

Females occupy exclusive home ranges but overlap with those of males. During the non-breeding months, males also occupy exclusive home ranges but roam extensively in the months preceding and during mating (Friend 1987). Breeding occurs in January and up to four pouch young are carried until they are approximately six months old when the female deposits them in one of her dens. Young begin foraging at about eight months and disperse in December (Friend 1989). The Numbat feeds exclusively on termites.

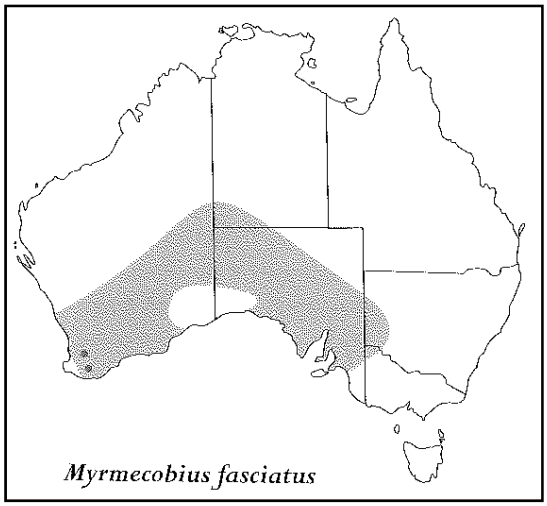

Figure 38: Distribution map of the *Myrmecobius fasciatus* (Strahan 2002)

Plate 39: Numbat - *Myrmecobius fasciatus* (Strahan 2002)

DISTRIBUTION

The Numbat was originally widespread across southern semi-arid and arid Australia, from western NSW through SA and southern NT to the south-west of WA (Figure 38) (DEWHA 2008a). There are currently two remnant native populations at Dryandra and Perup, WA and several reintroduced populations including Boyagin Nature Reserve, Tutanning Nature Reserve, Batalling block and Karroun Hill Nature Reserve (DEWHA 2008a). The only known occurrence of the Numbat in the Laverton area recorded in the DEC database was from one sighting at Ida Hill Mine in 1918.

PREFERRED HABITAT

The remaining populations of the Numbat are in eucalypt forests and woodlands dominated by *E. marginata, E. calophylla* and *E. wandoo* (DEWHA, 2008a). Numbat nests in hollow logs or in burrows.

CONSERVATION STATUS

The Numbat is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Schedule 1 - Fauna that is likely to become extinct
- EPBC Act – Vulnerable.

It is also listed by the IUCN as Vulnerable.

8.4. SANDHILL DUNNART - SMINTHOPSIS PSAMMOPHILA

SPECIES INFORMATION

The Sandhill Dunnart (*Sminthopsis psammophila*) is a small carnivorous Australian marsupial of the family Dasyuridae. The Sandhill Dunnart is one of the largest and rarest dunnarts. They are characterized by their long pointed snouts, large eyes and ears, and relatively long slender hind feet (Churchill 2001) (Plate 40). They weigh between 25 - 45 grams and have a distinctive tail that has a crest of stiff black hairs on the underneath surface at the end of the tail (Pearson 2002).

The Sandhill Dunnart is nocturnal and insectivorous. Limited data suggests reproduction occurs in spring and early summer with young being born in September/October; and pouch young weaned in December/January.

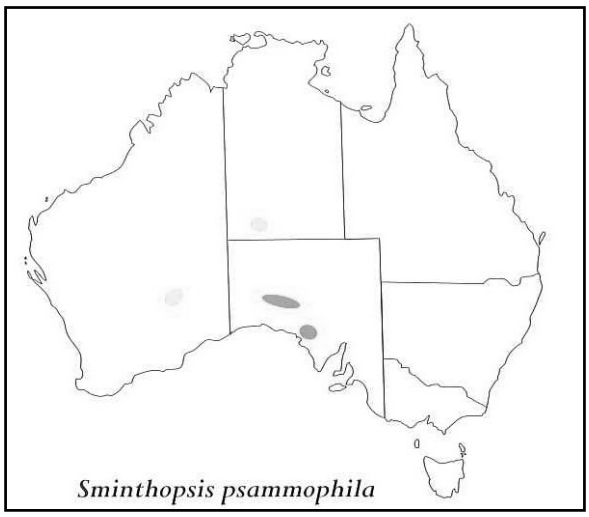

Figure 39: Distribution map of the Sandhill Dunnart (Strahan 2002) (Note that this distribution is based on incomplete data)

Plate 40: The Sandhill Dunnart, *Sminthopsis psammophila* (www.wilderness.org.au/regions/sa/extinctions/)

DISTRIBUTION

The Sandhill Dunnart is known from four scattered arid areas of Australia: near Lake Amadeus in Northern Territory, the central Eyre Peninsula in South Australia, the Yellabinna Sand Dunes in South Australia and a restricted zone around the Queen Victoria Spring Nature Reserve at the southwestern

edge of the GVD in Western Australia, however it has not been recorded in the Northern Territory since 1894 or the Eyre Peninsula since 1969 (Figure 39). As is the case with many desert species, the actual distribution of the Sandhill Dunnart is likely to be under-represented by current knowledge.

PREFERRED HABITAT

Sandhill Dunnarts prefer sandy soils, typically low parallel sand dune habitat with a diverse understorey and a ground cover of spinifex (*Triodia*). Spinifex size is variable in preferred habitat; dunnarts show a preference for large hummocks approximately 40 cm high and 70 - 100 cm diameter as nest sites. The large hummocks may form an intact mound (Figure 40) or may have begun to die off in the centre (Figure 41).

The Sandhill Dunnart builds a nest in the centre of the hummock, usually this is just a spherical hollow of 10 - 15 cm diameter. These nests can be seen most easily in spinifex hummocks that have started to die off in the centre. In some cases they dig a burrow under the spinifex. The burrow usually starts slightly off-centre beneath the spinifex and spirals down underneath the plant. They may extend for up to 100 cm but most extend only 20-30 cm.

Other vegetation in preferred habitats varies but is most commonly mallee or Marble Gum (*Eucalyptus gongylocarpa*), often with *Callitris verrucosa* and a complex shrub understorey (Churchill 2001).

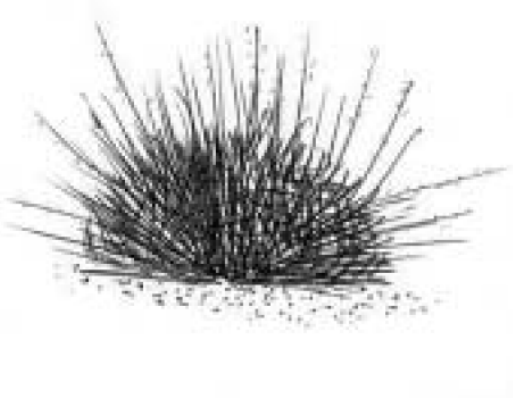

Figure 40: Large intact spinifex hummock

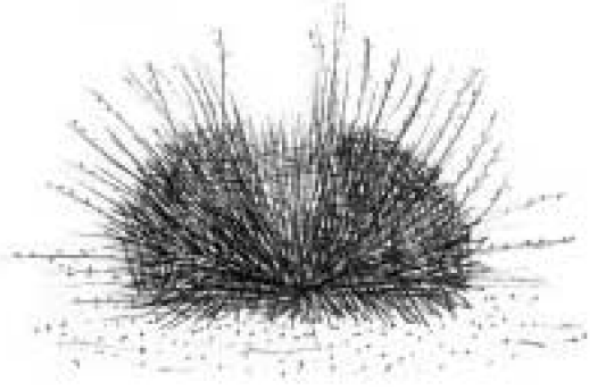

Figure 41: Hummock that has started to die-off in the centre

CONSERVATION STATUS

The Sandhill Dunnart is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Schedule 1 - Fauna that is likely to become extinct
- EPBC Act – Endangered.

It is also listed by the IUCN as Endangered.

8.5. SOUTHERN MARSUPIAL MOLE - NOTORYCTES TYPHLOPS

SPECIES INFORMATION

Marsupial Moles comprise their own order within the marsupials; the Notoryctemorphia (Benshemesh 2004). Recent genetic and morphological analyses suggest that there are three distinct lineages of marsupial moles: *Notoryctes caurinus* (Northern Marsupial Mole) and *N. typhlops* (Southern Marsupial Mole: northern and southern forms) (Benshemesh 2004). The distribution of these lineages are undetermined however it appears that they occupy broadly different areas (Benshemesh 2004).

The SMM (Southern Marsupial Mole) is a small animal (30 - 60 g) that is adapted to digging and a life underground (Johnson 2002) (Plate 41). Little is known regarding the cryptic SMM. They occur in remote areas, are morphologically specialised and exhibit extraordinary features. The SMM has a distinct tubular body shape, lacks external ears, and has heavily keratinised skin on the snout, a reduced tail and short dense fur (Johnson 2002). The limbs of the SMM are adapted to burrowing, being short and powerful and bear large triangular claws forming a cleft-like spade (Johnson 2002). As with other burrowing marsupials, the pouch of the SMM opens backwards (Benshemesh 2004).

Little is known regarding the habitat preference for the SMM. They are most often recorded in arid regions in sand dune area associated with various *Acacia* sp. and shrubs (Benshemesh 2004). It has been suggested that they require soft sand and are unable to tunnel through hard or loamy substrate, which often occur in swales between widely spaced dunes (Benshemesh 2004). There is evidence that SMM do occur in substrate between the dunes where deep sand rather than loam occurs. The SMM may also occur in sandy plains. Marsupial mole tunnels have been found in association with patches of mallee (*Eucalyptus gamophylla*) with an open under storey of spinifex (*Triodia basedowii*) (Benshemesh 2004). The TJV has also recorded evidence of the marsupial mole in association with *Callitris verrucosa* and Marble Gum (*E. gongylocarp*).

SMM are insectivorous, existing on predatory ants, seed-eating ants, termites and other arthropods (Johnson 2002). Additional food of the SMM includes the eggs, larvae and pupae of various species, including beetles, moths, ants and sawflies captured underground (Johnson 2002).

Little is known about the reproduction cycle of the SMM (Johnson 2002). The breeding season is believed to be November when one or two young are born and these are nursed in the pouch (Benshemesh 2004). It is believed they are solitary for most of their life, how they find reproductive partners is unclear (Benshemesh 2004).

The SMM spends the majority of its time burrowing and backfilling through sand, but it is not known whether they build a nest or form permanent burrows (Benshemesh 2004). They leave no open tunnel, just the circular trace of its passage approximately 30 – 40 cm below the surface (small, circular impression visible in a soil profile) (Benshemesh 2004). The SMM is believed to come to the surface briefly, most often after rain and in the cooler seasons (Johnson 2002; Pearson & Turner 2000) or to move between dunes where the swale substrate is inhospitable (Benshemesh 2004). While on the surface, the SMM is probably most susceptible to predation.

DISTRIBUTION

The SMM is known to occur in the sandy deserts of central and eastern WA, northern SA and the NT (Figure 42) (Johnson 2002; Pearson and Turner 2000; Benshemesh 2004). The species range appears to be restricted to sandy soils in the central desert region encompassing the Great Sandy, Little Sandy, Gibson, Tanami, Great Victoria and western Simpson Deserts. Unfortunately, much of the distribution information is based on sighting information where the animal was not identified to species level, thus this distribution may incorporate sighting records of the Northern Marsupial Mole.

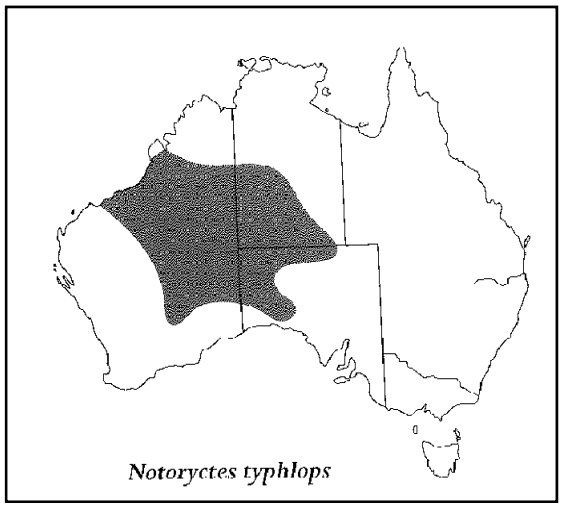

Figure 42: Distribution map of Southern Marsupial Mole (www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)

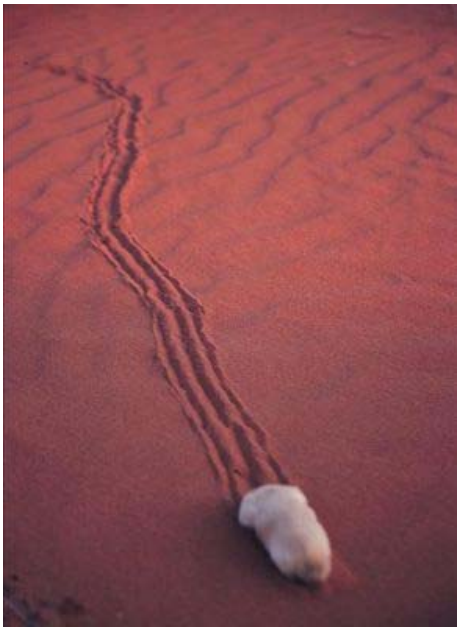

Plate 41: The Southern Marsupial Mole, *Notoryctes typhlops* (Dept. of Environment & Conservation)

PREFERRED HABITAT

SMM inhabits spinifex dominated sand dune and sand plain country. The sand in these regions tends to be loose and free of gravels. The SMM appears to have a preference for substrate with compactness at the level of <10 drops per 150 mm to a depth of at least 450 mm when measured using a penetrometers (*ecologia* Environment 2007).

CONSERVATION STATUS

The SMM is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Schedule 1 - Fauna that is likely to become extinct
- EPBC Act – Endangered.

They are considered to be Endangered by the IUCN.

8.6. AUSTRALIAN BUSTARD - ARDEOTIS AUSTRALIS

SPECIES INFORMATION

The Australian Bustard is an upstanding large bird of the open country. Bustards weigh 14 kg, stand 120 cm tall with a wingspan of around 2 m (Plate 41). They have a pale grey neck and belly, and freckled brown wings and tail; males have a black crown, females blue (Pizzey & Knight 2002).

Bustards breed from August-November in Southern Australia (Pizzey & Knight 2002). They usually lay one egg directly on the ground, typically along a boundary between open grasslands and more protective shrubland or woodlands. Bustards are unique among Australia's birds in that they exhibit what is known as an 'exploded lek' mating system. Leks are tight aggregations of males that come together to display in specific areas, in order to attract females. They appear to move nomadically in response to local variations in the supply of their preferred diet of insects, small vertebrates, seeds and fruit.

DISTRIBUTION

The Australian Bustard was once widespread on mainland Australia, however the species has suffered historic decline, and now they are rarely recorded in south eastern Australia (Figure 43). They are still common away from settlements in parts of eastern inland, inland northern Australia and WA (Pizzey & Knight 2002).

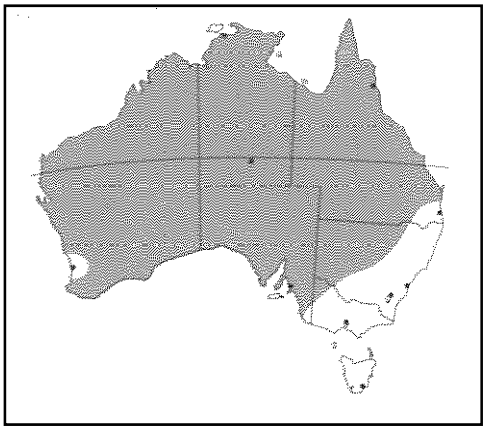

Figure 43: Distribution map of the Australian Bustard (Pizzey & Knight 2002)

Plate 42: The Australian Bustard, *Ardeotis australis* (www.australianwildlife.org/)

PREFERRED HABITAT

Australian Bustards are found in tussock grassland, *Triodia* hummock grassland, grassy woodland, low shrublands. They will also use denser vegetation when recent burning has temporarily opened up these areas.

CONSERVATION STATUS

The Australian Bustard is not listed under State or Federal legislation. The IUCN categorises the Bustard as 'Near threatened', and it is considered to be Priority 4 (Taxa in need of monitoring) by the DEC.

8.7. MALLEEFOWL – LEIPOA OCELLATA

SPECIES INFORMATION

The Malleefowl is a large and distinctive ground-dwelling bird that grows up to 60 cm in length and can weigh up to 2.5 kg (Pizzey & Knight 2002) (Plate 42). The Malleefowl is a mainly terrestrial species; it rarely flies, preferring to walk slowly across the terrain.

The Malleefowl is a generalist forager. It feeds mainly on seeds, but also takes other plant material (mostly flowers, fruits and foliage), invertebrates (mainly insects including ants, beetles and cockroaches), lerp (a sugary substance secreted by psyllid insects), fungi and tubers. They peck food items from the ground and from low vegetation (mostly herbs and shrubs) and use their feet to search among leaf-litter and to scratch at the soil to expose tubers and invertebrates.

Adult Malleefowl usually occur singly when away from their breeding mounds, and in pairs when present at active mounds (Plate 43) (Benshemesh 1999). They breed in solitary pairs.

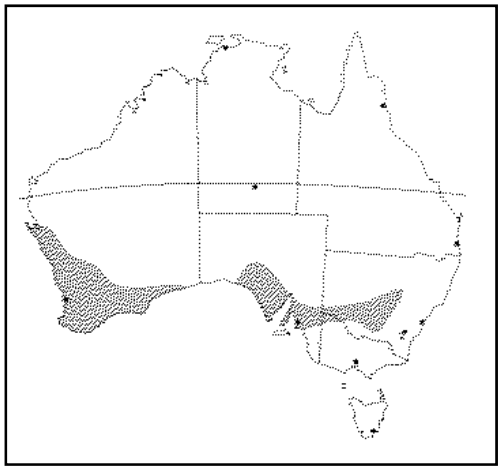

Figure 44: Distribution map of Malleefowl (www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)

Plate 42: The Malleefowl, *Leipoa ocellata* (http://www.malleefowl.com.au/)

DISTRIBUTION

The Malleefowl inhabits semi-arid regions of southern Australia (Benshemesh 2000). The Malleefowl is found in New South Wales, Victoria, South Australia and Western Australia (Figure 44). The distribution of the Malleefowl is severely fragmented which increases their risk of extinction (Benshemesh 2000).

Plate 43: Malleefowl working its nest (www.arkive.org/malleefowl/leipoa-ocellata)

PREFERRED HABITAT

The Malleefowl is found principally in semi- arid to arid shrublands, low woodlands dominated by mallee and associated habitats such as broombush (*Melaleuca uncinata*). In the GVD, Malleefowl appear to prefer the smaller desert-mulga *Acacia minyura.* Studies have shown that the birds use vegetation adjacent sand plain areas for foraging where food resources are more common. The birds also occur in denser Mallee (*E. socialis, E. oxymitra*, and *E. gammophylla*). Typically, these Mallee areas have an understorey of *Triodia basedowii* or other *Triodia* species, and shrub thickets on the ridges where *Acacia ligulata* and other seed bearing shrubs are often common.

The breeding habitat of the Malleefowl is characterised by light soil and an abundant leaf litter, which is used in the construction of the nest mound.

CONSERVATION STATUS

The Malleefowl is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Schedule 1 - Fauna that is likely to become extinct
- EPBC Act – Vulnerable.

The IUCN consider the Malleefowl to be Vulnerable.

8.8. *Peregrine Falcon Falco peregrinus*

SPECIES INFORMATION

The male Peregrine is 355 - 390 mm and 420 - 480 g, the female is 415 - 460 mm and 765 - 960 g (Johnstone and Storr 1998). The adults head, nape and cheeks are black or blackish brown and the underparts are white or buff (Plate 44) (Pizzey and Knight 2002). The back, wings and tail coverts bluish grey, feathers barred blackish brown or greyish brown (Johnstone and Storr 1998).

The Peregrine feeds predominantly on other birds, it 'stoops' on birds such as pigeons, parrots and galahs. They nest mainly on ledges, granite outcrops and cliffs, the eggs are laid mainly in September.

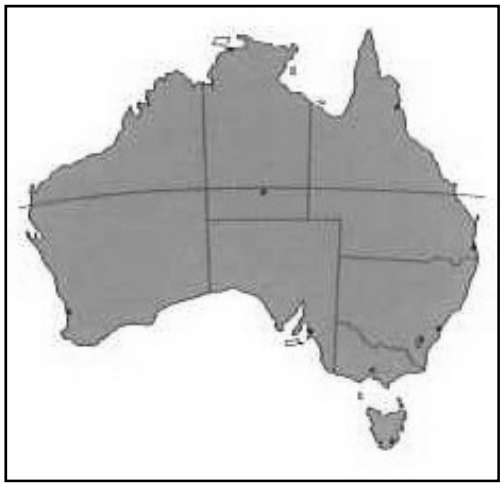

Figure 45: Distribution Map of *Falco peregrines* (Pizzey and Knight 2002)

Plate 44: *Falco peregrines* (http://animals.nationalgeographic.com/animals/birds/peregrine-falcon.html)

DISTRIBUTION

The Peregrine is uncommon with a wide distribution in Australia, but absent from most deserts and the Nullarbor Plain (Figure 45).

PREFERRED HABITAT

The species prefers habitat with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land.

CONSERVATION STATUS

The Peregrine Falcon is considered to be of conservation concern to the TGP as it is listed under State legislation:

- WC Act – Schedule 1 - Fauna that is likely to become extinct.

8.9. PRINCESS PARROT - POLYTELIS ALEXANDRAE

SPECIES INFORMATION

The Princess Parrot is a very distinctive bird, which is slim in build, brightly coloured, and has a very long, tapering tail (Pavey 2006) (Plate 45). It is a medium-sized parrot with total length of 40 - 45 cm and body mass of 90 - 120 g (Pizzey & Knight 2002). The basic colour is dull olive-green; paler on the underparts. It has a red bill, blue-grey crown, pink chin, throat and foreneck, prominent yellow-green shoulder patches, bluish rump and back, and blue-green uppertail (Pizzey & Knight 2002).

The Princess Parrot is highly nomadic and occurs in small flocks of 10 - 20; however, groups of up to 100 birds do occur (Pavey 2006).

Breeding takes place in hollows in large eucalypts. Breeding colonies of up to 10 pairs are sometimes recorded but solitary nesting also occurs (Pavey 2006). The Princess Parrot feeds on the ground and in flowering shrubs and trees. The diet consists mostly of seeds with flowers, nectar and leaves being of secondary importance.

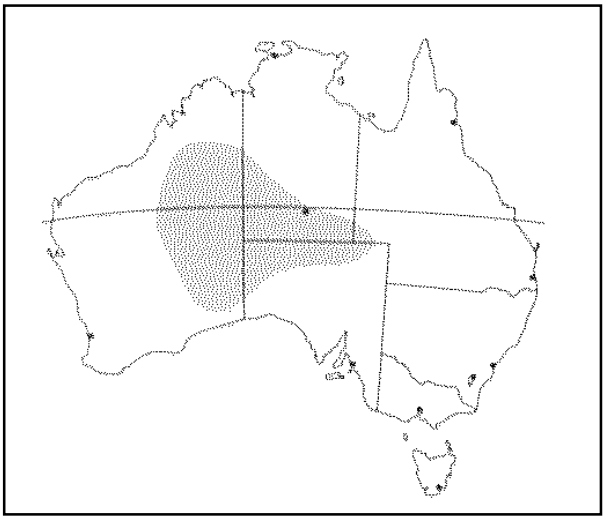

Figure 46: Distribution map of the Princess Parrot (www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)

Plate 45: The Princess Parrot, *Polytelis alexandrae* (www.nt.gov.au/nreta/wildlife/animals/threatened/pdf/birds/princess_parrot_vu.pdf)

DISTRIBUTION

This species has a patchy and irregular distribution in arid Australia. The species is believed to exist in inland Australia, from south-west Queensland to the GVD in Western Australia (Figure 46) (Pizzey & Knight 2002).

PREFERRED HABITAT

The Princess Parrot usually occupies swales between sand dunes and is occasionally seen on slopes and crests of dunes. This habitat consists mostly of shrubs such as *Eremophila*, *Grevillea*, and *Hakea* and scattered trees. Some records are from riverine forest, woodland and shrubland. Breeding takes place in hollows in large eucalypts, particularly river red gums *E. camaldulensis*, and also in desert oaks *Allocasuarina decaisneana*.

CONSERVATION STATUS

The Princess Parrot is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Schedule 1 – Fauna that is likely to become extinct
- EPBC Act – Vulnerable.

The IUCN considers the Princess Parrot to be Near Threatened.

8.10. SLENDER-BILLED THORNBILL - ACANTHIZA IREDALEI IREDALEI

SPECIES INFORMATION

The western subspecies of the Slender-billed Thornbill is a small bird, with head and body length of 9 - 10 cm and a mass of about 5 - 6 g (Pavey 2006) (Plate 46). The upperparts are light olive-grey to dark olive-brown (Pavey 2006). The rump and base of tail are buff-yellow to yellow-olive. The forehead and cheeks are scalloped and flecked pale to deep cream (Pavey 2006). The underparts are uniformly cream-white to cream-buff. The bill is dark and the eye pale (Pavey 2006).

The western Slender-billed Thornbill usually occurs in pairs, or in small flocks of up to 10 birds (Baxter & Paton 1998). Little is known about the breeding biology of the western Slender-billed Thornbill. It appears to breed in solitary pairs (DEWHA 2008b). However, based on behaviour recorded in other thornbill species, breeding may also be assisted by other birds in a co-operative breeding system (Recher & Davis 2000). Breeding activity has been recorded from July to October but the breeding season may also extend into November (Recher & Davis 2000).

The nests are dome-shaped or globular, have a side entrance and are usually placed amongst the upper branches of small samphire shrubs (Johnstone & Storr 2004), or occasionally in other shrubs such as *Acacia aneura* (Birds Australia Nest Record Scheme, unpublished data).

The western Slender-billed Thornbill feeds on invertebrates, mostly insects (including caterpillars, grasshoppers, beetles, bees and ants) spiders and, occasionally, centipedes (Recher and Davis 2000). It also feeds on the stems and/ or foliage of *Maireana sedifolia, M. pyramidata, Atriplex vesicaria, Acacia tetragonophyllya* and *Acacia aneura* (Matthew 1994).The western Slender-billed Thornbill forages on the ground and in low shrubs (Johnstone & Storr 2004; Recher & Davis 2000). Food items are mainly taken from foliage, but they may also be collected from twigs and flowers, and occasionally from branches or the air. Foraging takes placed throughout the day (Recher & Davis 2000).

DISTRIBUTION

The western Slender-billed Thornbill is endemic to Australia and occurs in arid and semi-arid regions of southern Western Australia and south-western South Australia (Figure 47) (Pavey 2006).

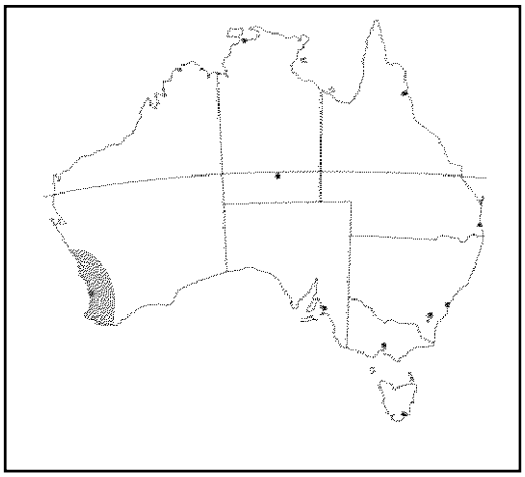

Figure 47: Distribution map of the Western Slender Thornbill (www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)

Plate 46: The western Slender Thornbill, *Acanthiza iredalei iredalei* (www.nt.gov.au/nreta/wildlife/animals/threatened/pdf/birds/slenderbilled_thornbill_ex.pdf)

PREFERRED HABITAT

The western Slender-billed Thornbill occurs in shrubland, typically in areas of saltmarsh dominated by samphire, bluebush (*Maireana*) or saltbush (*Atriplex*) around salt lakes or low heath on sand plains (DEWHA 2008b).

CONSERVATION STATUS

The western Slender-billed Thornbill is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Schedule 1 – Fauna that is likely to become extinct
- EPBC Act – Vulnerable.

The IUCN considers the western Slender-billed Thornbill as fauna of 'Least Concern'.

8.11. GREAT DESERT SKINK EGERNIA KINTOREI

SPECIES INFORMATION

The Great Desert Skink (GDS) or Tjakura is a large burrowing lizard which weighs up to 350 g and is about 440 mm from the snout to the tip of the tail (DEWHA 2008c) (Plate 47). They have reddish-tan smooth upper scales while the under-parts range from vivid lemon yellow to creamy grey (DEWHA 2008c). The tail is longer than the body, and in good seasons the base of the tail becomes swollen with stored fat reserves.

The GDS lives communally in burrow systems of up to 10 m in diameter, with multiple entrances (McAlpin 2001). The mating season occurs in spring and summer. Dispersal occurs when lizards reach maturity in their second year, with young lizards often living alone in small burrow systems (McAlpin 2001). It is at this time that predation pressure is likely to be greatest (McAlpin 2001).

Lizards may move up to 100 m from their burrow when foraging. Individuals may move 10 km or more to colonise new areas (McAlpin 2000).

The GDS feeds on termites and supplements this diet with cockroaches, beetles, spiders and ants (Cogger 2000). Most of their burrow systems are located close to termite nests, and the lizards catch termites when they come to the surface to harvest grasses or during dispersal of winged adults. Most foraging is done in the early evening or during the night in hotter months. The GDS hibernates within specially constructed chambers in their burrow systems over the cooler months. Most lizards enter hibernation by the end of May, though some may wait until mid June. Lizards emerge in September or October (McAlpin 2007).

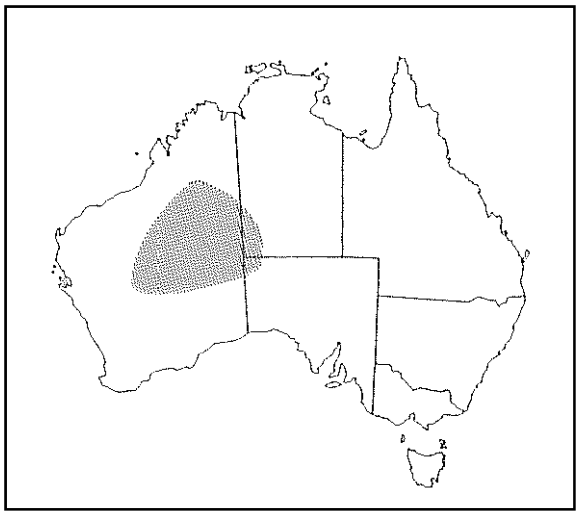

Figure 48: Distribution map of the Great Desert Skink (www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)

Plate 47: The Great Desert Skink, *Egernia kintorei* (www.abc.net.au/nature/australasia/)

DISTRIBUTION

The GDS inhabits the sandy desert regions of central Australia. The largest populations survive in the Tanami and GVD regions, with smaller fragmented populations existing in the Gibson, GVD and Great Sandy Desert regions of Western Australia, and a very small population known from the northern Anangu-Pitjantjatjara (Figure 48) (DEWHA 2008c).

PREFERRED HABITAT

The species generally occurs on red sand plains and sand ridges and they generally prefer spinifex (*Triodia* species and *Plectrachne* species) grassland sand plains and some adjacent dune field swales (Cogger 2000). Regenerating vegetation appears to be a critical habitat requirement (McAlpin 1997). Skinks appear to prefer a mosaic landscape of different aged vegetation and inhabit sites that have been burnt in the previous 3 - 15 years (McAlpin 1998). Preferred habitat has at least 50 % bare ground (McAlpin 1998). Regenerating areas may provide ample food while unburnt patches provide shelter (Pearson et al. 2001). The reproductive output of burrows is highest in areas burnt in the previous 10 years (McAlpin 2001).

CONSERVATION STATUS

The GDS is considered to be of conservation concern to the TJV as it is listed under State and Federal legislation:

- WC Act – Schedule 1 - Fauna that is likely to become extinct
- EPBC Act – Vulnerable.

The IUCN considers the GDS as Vulnerable.

8.12. MIGRATORY BIRDS

Migratory birds potentially occurring within the surveys areas are listed in Table 4. Human activities have threatened many migratory bird species. Birds are vulnerable to the effects of urbanization and development, especially with the reduction of nesting and feeding habitats. The main threats to migrating birds are habitat loss, habitat degradation and harvesting (DEWHA 2008c). The distances involved in bird migration mean that they often cross political boundaries of countries and conservation measures require international cooperation. The Australian Government uses the EPBC Act to protect and manage threatened migratory species.

Table 4: Migratory birds protected by the EPBC Act that potentially occurring within either survey area.

Scientific Name	Common Name	Comment
Apus pacificus	Fork-tailed Swift	This species is widely distributed in Australia and is categorized as 'Least Concern' by the IUCN.
Ardea alba	Great Egret, White Egret	This species is widely distributed in Australia and is categorized as 'Least Concern' by the IUCN.
Charadrius veredus	Oriental Plover, Oriental Dotterel	This species is widely distributed in Australia and is categorized as 'Least Concern' by the IUCN.
Leipoa ocellata	Malleefowl	See section 8.7
Merops ornatus	Rainbow Bee-eater	The Bee-eater is a common migratory visitor to Australia with a distribution covering all states. It is capable of flying long distances and therefore is unlikely to be negatively impacted by the proposed action. It is categorized as 'Least Concern' by the IUCN.

All of the migratory birds listed in Table 3 with the exception of the Malleefowl have a wide distribution covering all states in Australia therefore it is unlikely they will be negatively impacted by a gas pipeline.

8.13. WOMA PYTHON - ASPIDITES RAMSAYI

SPECIES INFORMATION

The Woma Python is one of the fifteen different species of python endemic to Australia (Cogger 2000). The Woma Python can grow up to 2.7 m in length, average length is 1.5 m. The head is narrow and the eyes are small. The body is broad and flattish in profile while the tail tapers to a thin point (Cogger 2000) (Plate 48). The colour pattern consists of a ground colour that varies from medium brown and olive to lighter shades of orange, pink and red, overlaid with a striped or brindle (tiger-striped) pattern (Cogger 2000). The belly is cream or light yellow with brown and pink blotches. The scales around the eyes are usually a darker colour than the rest of the head (Cogger 2000).

The Woma Python is a nocturnal, terrestrial snake which shelters in hollow logs, animal burrows or thick herbage during the day (Cogger 2000). Woma Pythons are constricting snakes, they kill their prey by wrapping their body around it until it cannot breathe, when the prey is dead, the python widens its mouth by dislocating its jaw and swallows the prey whole (ARAZPA Org 2007). The main prey of the Woma Python include small mammals, ground birds and reptiles (Cogger 2000).

Woma Pythons lay their eggs in hidden and humid locations. The female stays coiled around the clutch of 4 - 28 eggs for 50 - 70 days until they hatch (ARAZPA Org 2007).

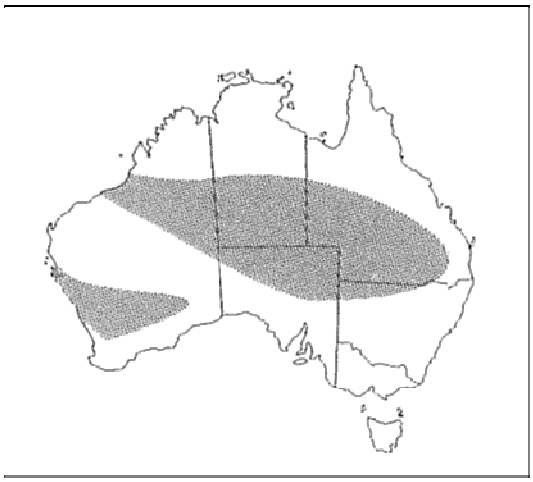

Figure 49: Distribution map of the Woma Python (Wilson and Swan 2003)

Plate 48: The Woma Python, *Aspidites ramsayi* (www.pilbarapythons.com/womapython.htm)

DISTRIBUTION

The distribution of the Woma Python is generally the desert and adjacent areas of the central parts of Australia (Figure 49). They range from Western Australia through southern Northern Territory and northern South Australia to southern Queensland and northern New South Wales. Their range may be discontinuous.

PREFERRED HABITAT

The Woma Python is generally found in sandy arid habitats including desert sand hills and dunes as well in a variety of other subtropical, temperate, arid and semi-arid regions (Cogger 2000). Generally Woma Pythons are strongly associated with red desert and spinifex (ARAZPA Org 2007).

CONSERVATION STATUS

The Woma Python is considered to be of conservation concern to the TJV as it is listed under state legislation:

- WC Act – Schedule 4 - Other specially protected fauna.
- The IUCN places the Woma Python as Endangered.

8.14. BRANCHINELLA APOPHYSATA

SPECIES INFORMATION

Branchinella apophysata is a species of crustacean belonging to a group commonly referred to as Fairy Shrimp (Plate 49). The species are animals are small to medium in size (up to 50 mm), with short distal endites, a frontal appendage consisting of a long trunk and two (usually simple) branches, and swellings lateral to the pene (Timms 2001). The species are planktonic and swims with the ventral surface uppermost.

DISTRIBUTION

B. apophysata is known only from a single location near Mt Margaret. The only record of the species was in 1937.

PREFERRED HABITAT

The preferred habitat of *B. apophysata* is temporary freshwater. This species is known from pools occurring on Mt Margaret.

Plate 49: *Branchinella sp.* (Hawking and Smith 1997)
(Note this is not *Branchinella apophysata*, but a related species)

8.15. ECOLOGICAL COMMUNITIES

A search of the DEC's Threatened Ecological Communities database, found that the following Priority Ecological Communities (PECs) occur within the vicinity of the Murrin survey area:

- Mount Jumbo Range vegetation complex – occurs in the Laverton area and northeast goldfields of the East Murchison IBRA region.

- Mount Linden Range banded ironstone ridge vegetation complex - occurs in the East Murchison IBRA regionAreas of Conservation Significance

The eastern portion of the Goongarrie National Park lies within the GGT survey area (Figure 1). The Goongarrie National Park holds a pastoral station with cottages, shearing sheds, a caravan park and is used for recreation purposes such as camping and bushwalking (Commonwealth Government 2008a).

There are no nature reserves or regionally significant features such as protected wetlands occurring within either survey area.

9 RISKS/THREATENING PROCESSES

This desktop assessment highlights the distinct lack of baseline information regarding threatened DRF and Priority Flora species in the survey areas. Without this baseline information on the species biology it is difficult to be confident in determining potential impacts on threatened flora and regionally significant vegetation communities.

Land clearing of terrestrial native vegetation for the installation of a gas pipeline and associated activities presents a potential threat to the local environment. Clearance of native vegetation reduces the continuous natural range of ecosystems as well as the diversity of habitats and can impede ecological processes occurring within them.

The installation of the gas pipeline raises the following potential threats to flora and vegetation:

- Loss of flora due to excessive or poorly planned vegetation clearing.
- Changes to the local topography through gas pipeline installation may impact the natural vegetation and flora that occur along the gas pipeline route (e.g., through alterations to water flows).
- The introduction of weeds to an area has the potential to degrade an ecosystem, either by interfering with natural function, displacing native species, inhibiting regeneration, affecting nutrient cycling, changing fire characteristics, or by out-competing native species for resources. Weeds are often disturbance opportunists, responding rapidly to land or human disturbance.
- Bushfires and changes to the local fire regime, such as increased frequency and/or intensity of fires, have the potential to impact negatively on local flora.

  Bushfires generated by human activity/ construction activities have the potential to reduce the size of patches of fire sensitive vegetation, alter the structure, composition and abundance of vegetation, change the timing of fruiting and seeding of species and increase the prevalence of fire-promoting grasses (LandCare 2005).

  Changed fire regimes (changes in intensity and/ or frequency) pose a significant threat to threatened flora species that are fire sensitive.

  Some species respond positively to fire including *Conospermum toddii* and Marble Gum thus an increase in fire may increase the presence of these species in the area, which may in turn result in decreases in other species currently present.

Clearing of native vegetation for the installation of the gas pipeline may result in:

- Changes to the local surface water flow patterns (i.e. through the construction of service infrastructure and diversions).
- Decline of surface water quality due to erosion from disturbed areas.
- Loss or deterioration of ecological communities and adverse impacts on flora and fauna species.

Surface groundwater disturbance from the gas pipeline and associated traffic can:

- Alter groundwater recharge.

- Introduce pollutants.
- Generate turbidity-laden run-off.

Due to the specific habitat requirements discussed in this assessment, the fauna species potentially occurring within the survey areas are highly susceptible to perturbation. Specifically the construction of the gas pipeline and associated works poses the following threats:

- Direct mortality and entrapment from gas pipeline construction activities and traffic.
- Habitat loss and degradation.
- Fragmentation of habitat, discontinuity, dispersal reduction and isolation of breeding populations.
- Attraction of pest species from human activity resulting in predation and/or competition with native species.
- Fire resulting in mortality and loss/alteration of significant habitat.

The PECs recognised to occur within the vicinity of the Murrin survey area are known to be threatened by feral animals and grazing pressure by goats and rabbits (Commonwealth Government 2008a).

10 DISCUSSION – MANAGEMENT RECOMMENDATIONS

Best practice management techniques can be used to minimise the potential impacts of the gas pipeline. These should include:

- Minimise the area cleared.
- Identify areas not to be disturbed for conservation reasons (flora and/ or fauna) and ensure that staff and contractors are aware of restrictions.
- Avoid areas that host a number of species of conservation concern.
- Reinstate soil and vegetation where possible after installation within one season to maximise chances of re-colonisation from seed bank.
- Identify and target key flora species for revegetation and seeding programs.
- Fire hazard awareness and management training of TGP personnel and contractors including emergency response procedures.
- Erosion and sedimentation mitigation measures employed where clearing is in close proximity to standing water. Alternatively, carry out installation in the dry season.
- Rehabilitation should occur where practical to provide stability, reduce erosion and restore the original structure and composition.
- All site personnel to be educated in recognising species of conservation concern.
- No access to areas outside of the site to avoid unauthorised disturbance.
- Timing of clearing operations selected to minimise impacts on breeding species, where practicable (e.g., Rainbow Bee-eater which is known to nest in stockpiled soil/ substrate).
- Facilitate recolonisation by local fauna by retaining cleared logs in rehabilitated areas.
- Plan alignment to minimize the number of trees to be felled.
- In the event that tree felling is unavoidable, inspection of felled trees to remove, relocate or rendered assistance to injured fauna should be carried out by an appropriately trained person.
- Limit the length of trench open at any given time so that it can be inspected and animal removed to limit animal depth (no more than 2km at any given time).
- Relocate fauna of conservation concern if found during pipeline installation.
- Isolate and remove all waste, particularly food waste, from the work area.
- Minimise disturbance and control run-off from construction areas.
- Ensure appropriate design of storage areas and temporary drainage systems.

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APPENDICES

Appendix A: Flora Conservation Codes

Protected/	Category	Description

Recoginised Under:		
EPBC Act	Extinct	There is no reasonable doubt that the last member of the species has died.
	Extinct in the Wild	A native species: • is known only to survive in cultivation or as a naturalised population well outside its past range; and, • has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
	Critically Endangered	A native species facing an extremely high risk of extinction in the wild in the immediate future.
	Endangered	A native species: • is not critically endangered; and • is facing a very high risk of extinction in the wild in the near future.
	Vulnerable	A native species: • is not critically endangered or endangered; and • is facing a high risk of extinction in the wild in the medium-term future.
	Conservation Dependent	The species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered.
WC Act	Declared Rare Flora	A native species which has been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.
DEC Priority	Priority 1	A native species which is known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
	Priority 2	A native species which is known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
	Priority 3	A native species which is known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
	Priority 4	A native species which is considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.

Appendix B - Fauna Conservation Codes Definitions

Protected/ Recoginised Under:	Category	Description
EPBC Act	Extinct	There is no reasonable doubt that the last member of the species has died.
	Extinct in the Wild	A native species: • is known only to survive in captivity or as a naturalised population well outside its past range; and, • has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
	Critically Endangered	A native species facing an extremely high risk of extinction in the wild in the immediate future.
	Endangered	A native species: • is not critically endangered; and • is facing a very high risk of extinction in the wild in the near future.
	Vulnerable	A native species: • is not critically endangered or endangered; and • is facing a high risk of extinction in the wild in the medium-term future.
	Conservation Dependent	The species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered.
	Marine	Marine species including some birds.
	Migratory	The entire population, or any geographically separate part of the population of any species or lower taxon of wild animal, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries.
WC Act	Schedule 1	A native species that is rare or likely to become extinct, are declared to be fauna that is in need of special protection.
	Schedule 2	A native species that is presumed to be extinct, are declared to be fauna that is in need of special protection.
	Schedule 3	Birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is in need of special protection.
	Schedule 4	A native species that is in need of special protection, otherwise than for the reasons specified in Schedules 1, 2 and 3.
DEC Priority	Priority 1	A native species that is known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g., agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
	Priority 2	A native species that is known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
	Priority 3	A native species that is known from few specimens or sight records

		from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
	Priority 4	A native species that is considered to have been adequately surveyed, or for which sufficient knowledge is available, and which 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.
	Priority 5	A native species that is not considered threatened but is subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.