Wingellina Nickel Project

Flora and Fauna Desktop Study of Tenement E69/2453

May 2008

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Document Control for Job Number: WMN-VS-0408

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Executive Summary

Metals X Limited (Metals X) proposes to undertake a groundwater exploration program on tenement E69/2453, located approximately 75 km north0east of the Wingellina community and Wingellina Nickel Project, in the Central Ranges region of Western Australia. Metals X have submitted a Clearing Permit Application (CPA) for the area of proposed disturbance, which will involve clearing of up to 5.0 ha within this tenement. The boundary of the proposed CPA area, hereafter referred to as the Project Area, lies in a north-south orientated band which overlies an existing access road, and is approximately 17.7km in length and 3.6km in width.

Metals X commissioned Outback Ecology in April 2008 to conduct a desktop review of information relating to flora and fauna within tenement E69/2453, with the aim of providing information to Metals X to facilitate addressing the "Ten Principles for Clearing Native Vegetation", as listed under Schedule 5 of the *Environmental Protection Act 1986*.

The specific objectives of this study were to:

- Review relevant biological databases and publicly-available literature to compile background information applicable to the Project Area;
- Prepare a list of flora and fauna expected to occur in the Project Area;
- Identify flora and fauna of conservation significance that may be present; and
- Identify significant habitats that may be present.

Results from this desktop study indicate there is a relative paucity of knowledge on the flora and fauna species in the region. Surveys undertaken in the area to date have been limited to sporadic surveys associated with mining development or broad-scale vegetation mapping.

No site assessment was undertaken when preparing this desktop study. The results presented are solely based on a desktop study and review of available aerial imagery. Subsequently the evaluations provided on the likelihood of flora, vegetation, habitat and terrestrial fauna occurring within the Project Area are estimations based on available literature.

Flora species identified from a regional search of federal and state databases revealed that there were a total of ten species of Priority flora (four Priority One taxa, five Priority Three taxa and one Priority Four taxa) recorded in the region. There were no Declared Rare Flora or Threatened Ecological Communities recorded for the region.

Fauna species of conservation significance identified from a regional search of the Department of Environment and Conservation's (DEC) Threatened and Priority Fauna Database include: the Black-footed Rock-wallaby (*Petrogale lateralis* ssp), the Peregrine Falcon (*Falco perregrinus*) and the Bush Stonecurlew (*Burhinus grallarius*).

Other fauna species of conservation significance that may occur in the region include; Mulgara, Greater Bilby, Southern and Northern Marsupial Moles, Malleefowl, Princess Parrot, Major Mitchell's Cockatoo, Australian Bustard, Bush Stone-curlew, Grey Falcon, Rainbow Bee-eater, Slender-billed Thornbill, Great Desert Skink and the Woma.

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1.0 INTRODUCTION

1.1 Project Background

Metals X Limited (Metals X) propose to undertake a groundwater exploration program on tenement E69/2453, located approximately 75km north-east of the Wingellina Nickel Project and Wingellina Aboriginal Community (Irrunytiju) in the Central Ranges region of Western Australia (**Figure 1).**

Metals X have submitted a Clearing Permit Application (CPA) for the area of proposed disturbance, which will involve clearing of up to 5.0 ha within this tenement for the purpose of drilling water exploration drill holes. The boundary of the proposed CPA area, hereafter referred to as the Project Area, lies in a south-west to north-east orientated band which overlies an existing access road, and is approximately 17.7 km in length and 3.6 km in width (**Figure 2**). In accordance with the terms of the Access Agreement that Metals X has with the Traditional Owners on tenement E69/2453, the proposed disturbance activity will be confined to within close proximity of existing access roads.

Metals X commissioned Outback Ecology in April 2008 to a conduct desktop review of information relating to flora and fauna within tenement E69/2453, with the aim of providing information to Metals X to facilitate addressing the “Ten Principles for Clearing Native Vegetation”, as listed under Schedule 5 of the *Environmental Protection Act 1986*.

1.2 Scope and objectives of study

The primary purpose of this desktop study is to provide supporting information to assist the Department of Industry and Resources (DoIR) in the consideration of the CPA for the groundwater exploration program.

The specific objectives of this study were to:

- Review relevant biological databases and publicly-available literature to compile background information applicable to the Project Area;
- Prepare a list of flora and fauna expected to occur in the Project Area;
- Identify flora and fauna of conservation significance that may be present; and
- Identify significant habitats that may be present.

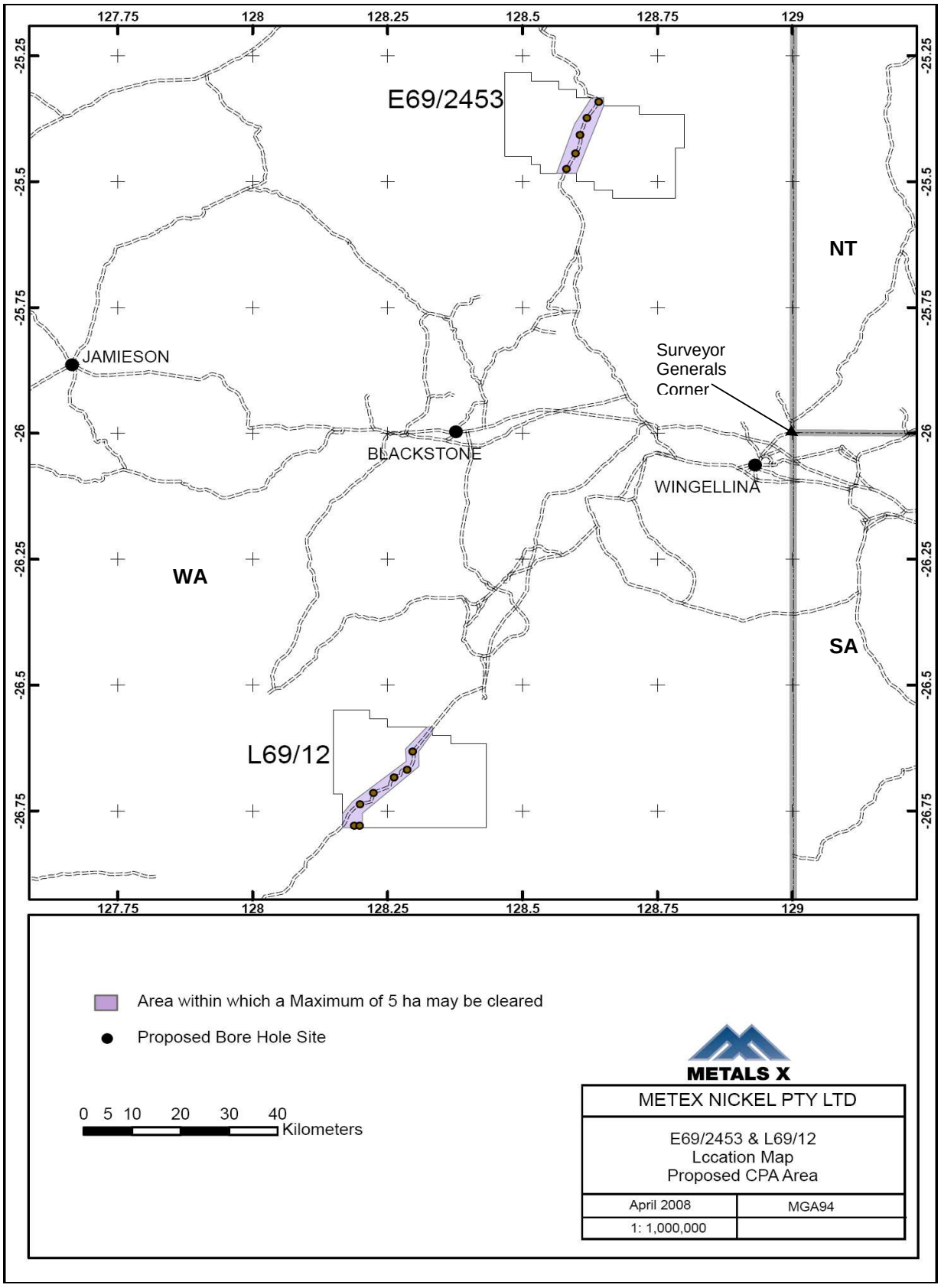

Figure 1 Map showing the regional location of tenement E69/2453

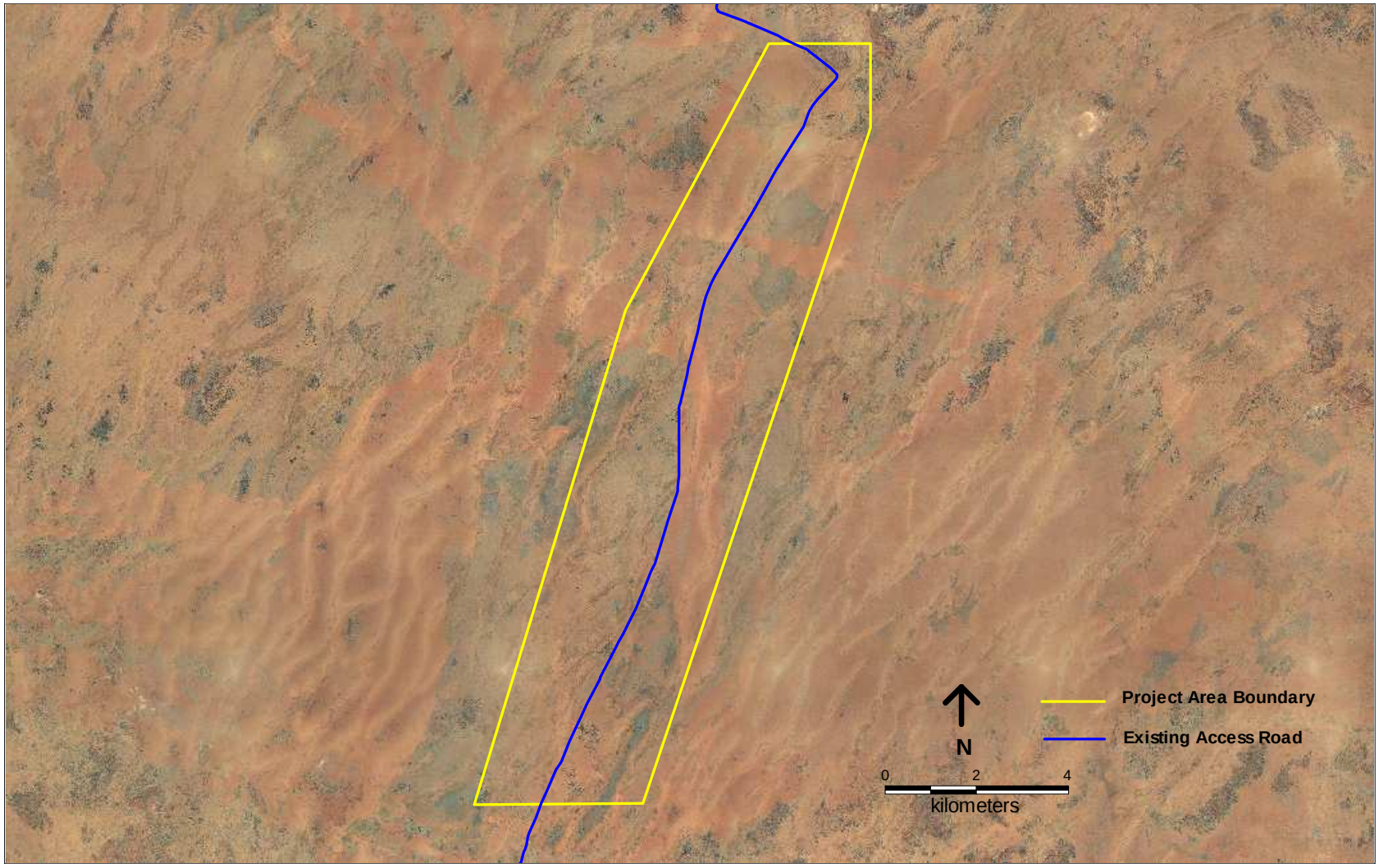

Figure 2 Aerial imagery showing boundary of Project Area within Tenement E69/2453

2.0 EXISTING ENVIRONMENT

2.1 Climate

The climate of the Central Ranges is characterised as a true arid desert, with hot summers and mild winters (BOM, 2008). The region is influenced by a northern tropical/summer climatic pattern. Rainfall is variable, however, the majority is received during summer, largely due to the movement of low pressure troughs and tropical lows associated with monsoon troughs move south in the region. Winters are mild and associated with a high pressure subtropical ridge (BOM, 2008).

The Giles weather station is the nearest registered meteorological station, located approximately 45km to the north-west of tenement E69/2453. Mean annual rainfall recorded at Giles is 283.7mm, with the majority received between November and March (**Figure 3**). Mean maximum daily temperature of 37.2 °C is recorded during January, with the minimum mean temperature of 6.8 °C recorded during July. (BOM, 2008)

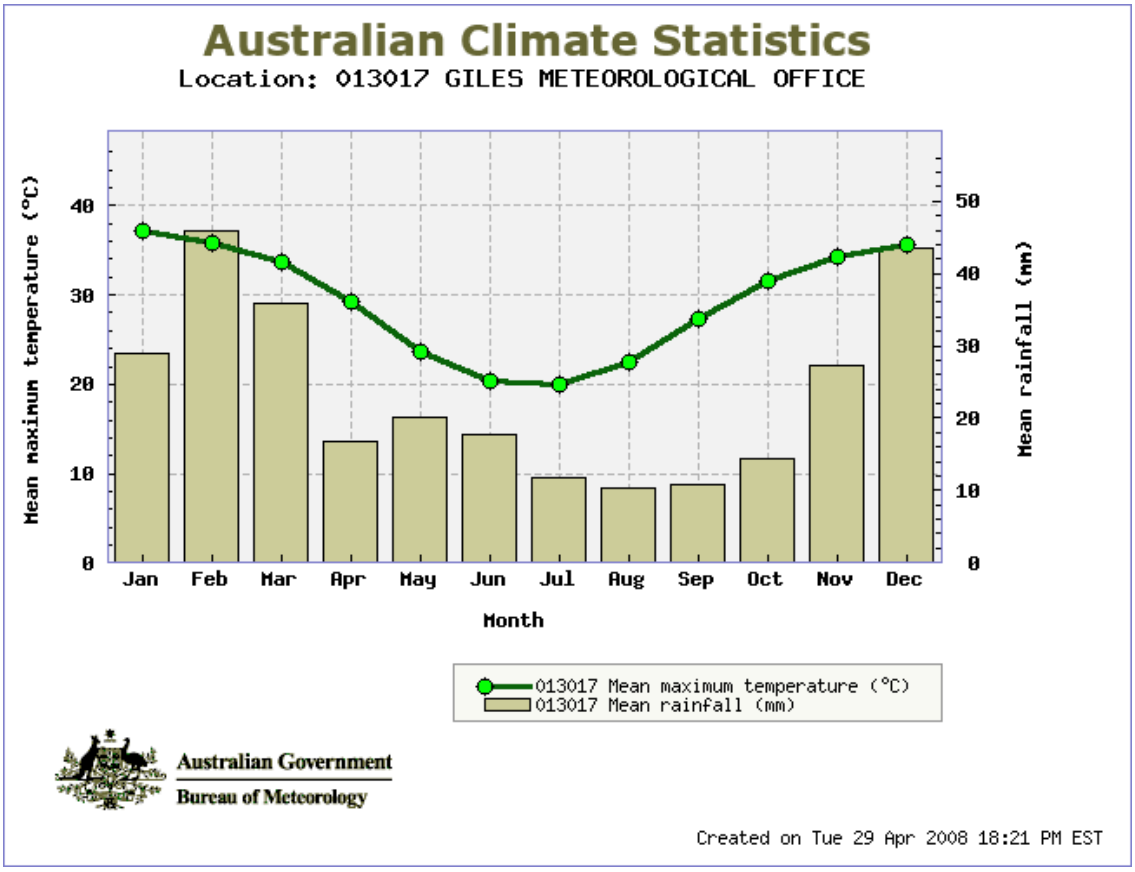

Figure 3 Climate data for Giles Meteorological Office (BOM, 2008)

2.2 IBRA Region

The Interim Biogeographic Regionalisation of Australia (IBRA) recognises 85 bioregions across Australia primarily delineated on the basis of climate, geomorphology, landform lithology, flora and fauna. Tenement E69/2453 is located within the Central Ranges Bioregion. The Central Ranges Bioregion spans the Western Australia, South Australia and Northern Territory borders and is comprised of 3 subregions. The Mann-Musgrave Block (CR1) is the major subregion, with the smaller Wataru and Everard Block Subregions located in South Australia. A map providing the layout of the Central Ranges bioregion and the breakdown of the 3 subregions is provided within **Appendix A**.

Tenement E69/2453 is located specifically in the Mann-Musgrave Block Subregion (CR1). This subregion is characterised by a high proportion of Proterozoic ranges (both volcanic and quartzites) and derived soil plains, interspersed with red Quaternary sandplains with some Permian exposure (Graham and Cowan, 2001).

The sandplains support low open woodlands of either Desert Oak or Mulga over *Triodia basedowii* hummock grasslands, while low open woodlands of Ironwood and Corkwoods over tussock or hummock grasses often fringe the ranges (Graham and Cowan, 2001). The ranges support mixed wattle scrub or C*allitris glaucophylla* woodlands over hummock and tussock grasslands.

A full biodiversity assessment of the Central Ranges Bioregion as reported within the Australian Natural Resource Atlas is provided in **Appendix A**.

3.0 METHODS

3.1 Flora, Vegetation and Ecology

A search of the following databases was undertaken to gather information on the flora, vegetation and ecological communities known or likely to occur within the Project Area and surrounds:

- Department of Environment and Conservation (DEC) Threatened (Declared Rare) Flora database, Western Australian Herbarium (WAHERB) database for priority species that have been opportunistically collected and the DEC Declared Rare and Priority Flora List for rare and priority flora that are declared rare, poorly known or require monitoring (**Appendix B**);
- DEC Threatened Ecological Communities database for listings of communities known, or likely to occur (**Appendix C**); and
- The Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Database for flora of conservation significance and TECs (**Appendix D**).

The database searches encompassed a search area with 100km radius around the Project Area central co-ordinates: **25º24'30" S 128º36'24" E (GDA 94)**

3.2 Terrestrial Fauna and Habitat

A search of the following databases was undertaken to gather information on the fauna and faunal habitat known or likely to occur within the Project Area and surrounds:

- The Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Database for fauna of conservation significance (**Appendix D**);
- DEC Threatened and Priority Fauna Database (**Appendix E**);
- Western Australian Museum (WAM) 'Faunabase' database (**Appendix F**);
- Birds Australia (BA) Atlas Database (**Appendix G**);
- Refugia for Biological Diversity in Arid and Semi-arid Australia (**Appendix H**)
- The Australian Wetlands Database to highlight Ramsar Wetlands (Wetlands of International Importance) and wetlands of National Significance (**Appendix I**).
- The Environment Reporting Tool of the Australian Government Department of Environment, Water, Heritage and Arts (DEWHA) (**Appendix J**);
- The Australian Natural Resources Atlas of the National Land and Water Resources Audit (NLWRA) (**Appendix A**);
- Species Profile and Threats Database (SPRAT)

As per the flora, vegetation and TEC searches, the fauna and habitat database searches encompassed an area with a radius of 100km around the Project Area central co-ordinate:

3.3 Review of Existing Biological Survey Work

Publicly-available literature relevant to the Project Area, and previous biological survey work undertaken in the bioregion was reviewed.

Key documents reviewed included:

- Halpern Glick Maunsell. (2002) *Acclaim Exploration NL Wingellina Baseline Biological Survey*.
- Robinson, A.C., Copley, P.B., Canty, P.D., Baker, L.M., and Nesbitt, B.J. (2003) *A Biological survey of the Anangu Pitjantjatjara Lands, South Australia 1991-2001*.
- Beard, J. (1974). *Great Victoria Desert: Explanatory Notes to Sheet 3. 1:1 000 000 series. Vegetation Survey of Western Australia.*
- Pearson D., Miller J., Butler M., Butler M., Brennan K., Thompson W. (2006). Learning about country. Landscope Vol. 23 No.2 Summer 2007-08 Naturebase. Department of Environment and Conservation.

A summary of the above literature is provided in Section 6.

In April 2008, Outback Ecology conducted a Level 2 flora and fauna survey over Metal X' Wingellina Nickel Project, approximately 75km to the south-west of the Project Area. Findings of this work (currently unpublished) were also given consideration when preparing this desktop study.

3.4 Survey Limitations

Results from this desktop study indicate there is a relative paucity of knowledge on the flora and fauna species in the Central Ranges bioregion. In addition, surveys undertaken in the area to date have been limited to sporadic surveys associated with mining development or broad-scale vegetation mapping. A comprehensive systematic biological survey of the Anangu-Pitjantjatjara lands in South Australia has been carried out, although comparisons to areas surrounding tenement E69/2453 may be of limited use due to differing topography, geology and distance.

No site assessment was undertaken when preparing this document. The results and conclusions presented are based on a desktop study and review of aerial imagery only. A general assessment has been made as to the likelihood of species of conservation significance occurring within the Project Area. Subsequently the evaluations provided on the likelihood of flora, vegetation, habitat and terrestrial fauna occurring within the Project Area are estimations based on available literature.

4.0 RESULTS - FLORA AND VEGETATION

4.1 Declared Rare and Priority Flora

No Declared Rare Flora (DRF), as listed under the Western Australian *Wildlife Conservation Act 1950*, have been recorded within a 100km radius of the Project Area. A total of 10 Priority taxa have previously been collected and vouchered at the WA Herbarium from within this search area (**Table 1**). Of these, four taxa were Priority 1, five were Priority 3 and one was Priority 4 (**Table 1**). Only one species (*Isotropis winneckei*) was listed on the DEC's *Threatened (Declared Rare) Flora* Database (**Appendix B**) and no threatened species were identified within the search area on the EPBC Protected Matters Database (**Appendix D**).

The DEC definitions of DRF and the various categories of Priority flora listings are provided in **Table 2.**

Table 1 Priority flora identified within 100km of the Project Area (Western Australian Herbarium, 2008)

Conservation Code	Species	Records	Habitat	Distance from project area to nearest specimen collected (km)
P1	*Fuirena nudiflora*	1	Found in ephemeral drainage lines, stony creek beds and swamps. Can be found on open sandy areas.	49.8
P1	*Goodenia gibbosa*	1	Found on rocky, sandy loams	42.0
P1	*Isotropis winneckei*	2	Found on sandstone ranges and rocky rises	41.0
P1	*Schoenus centralis*	1	Found on red sand in rocky creek beds and seepage areas	49.8
P3	*Acacia auricoma*	1	Found on rocky creeks with sand traps	60.7
P3	*Calotis latiuscula*	3	Found on loam or loamy soils. Associated with stony ridges, rocky hillsides or creeks. Occasionally found on flats	29.6
P3	*Eucalyptus sparsa*	2	Found on sandy or gravelly loam. Associated with drainage areas	42.8
P3	*Lythrum paradoxum*	1	Found in rocky gullies	29.6
P3	*Prostanthera centralis*	6	Found on gravelly soils and red sand sometimes over quartzite. Associated with upper slopes	34.50
P4	*Comesperma viscidulum*	1	Found on gravely soils and red sand.	40.7

Table 2. Definition of Declared Rare and Priority Flora Species (DEC – *formerly CALM*, 2006)

Conservation Code	Category Description
R	<u>*Declared Rare Flora – Extant Taxa*</u> "Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such."
P1	<u>*Priority One – Poorly Known Taxa*</u> "Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey."
P2	<u>*Priority Two – Poorly Known Taxa*</u> "Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora' but are in urgent need of further survey."

Conservation Code	Category Description
P3	*Priority Three – Poorly Known Taxa* "Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey."
P4	*Priority Four – Poorly Known Taxa* "Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia) are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years."

4.2 Vegetation

A site visit to the Project Area has not been undertaken and subsequently specific data on vegetation associations of the area is lacking. As such, vegetation descriptions have been derived from interpretation of aerial imagery of tenement E69/2453 (**Figure 2**). The descriptions of vegetation are essentially informal and make no representations as to the species present; rather, the intent is to delineate vegetation into clear units based on distinct differences that can be associated with geological features of the Project Area.

The vegetation of the E69/2453 tenement area can be separated into four broad categories;

- **Drainage line vegetation**. Ephemeral drainage lines are observed to occur throughout the tenement, particularly between ridges and sand hills. Drainage channels tend to be areas of high localised diversity and can provide refugia for locally uncommon species, particularly herbaceous annual species. It would be possible that Myrtaceae and Cyperaceae may be found in these drainage channels, particularly if the underlying water table is high. Beard (1974) has described ephemeral creeklines in the region as being vegetated by a tree savanna dominated by large *Eucalyptus* spp. over low grassland. It is also highly likely that *Eucalyptus* spp. would be found along these drainage lines as is consistent with a survey of the nearby Wingellina Project Area (Outback Ecology, unpublished data 2008).
- **Sandhill/quartzite dune vegetation**. A series of parallel ridges/dune formations can be observed across the tenement in a north-easterly to south-west orientation. The vegetation on these ridges tends to be varied and it is likely that abrupt changes in vegetation cover are the result of fire history. Vegetation is likely to consist of mulga woodlands over grassland. A darker signature of *Triodia* spp. is observed to occur across this broad vegetation category.
- **Interdunal sand flats**. The interdunal vegetation appears to be a continuation of vegetation observed on the sandhill/quartzite dune systems, but at a much lower density. Much of the interdunal sand flats have been affected by fire and as such vegetation cover is very scant.
- **Salt lakes and playa vegetation**. This vegetation association appears to be restricted to small pockets surrounding the salt lakes in the area, most notably a salt lake in the north-east part of the tenement. Beard (1974) describes salt lake vegetation of the region

consisting of samphire, *Frankenia, Atriplex* and *Sclerolaena* spp.. Vegetation cover appears to be very open and is likely to be dominated by halophytic vegetation.

4.3 Threatened Ecological Communities

In Western Australia, the DEC recognizes four categories of Threatened Ecological Communities (TECs) within WA, as developed by English and Blyth (1997) (**Table 3)**. At a federal level, TECs are protected under Schedule 2 of the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999.* Approval from the Federal Minister for Environment and Heritage must be sought to undertake any action that is likely to have a significant impact on a listed TEC. There are three categories of TECs under the *EPBC Act 1999* – 'Critically Endangered', 'Endangered' and 'Vulnerable'.

Table 3. DEC descriptions of Threatened Ecological Community classifications

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

The searches conducted of both the Western Australian DEC's Threatened Ecological Communities Database (**Appendix C**) and the Commonwealth *EPBC Act 1999* Protected Matters Database (**Appendix D**), provided no listings of known occurrences of threatened or priority ecological communities within a 100km radius of the Project Area.

4.4 Conservation and Heritage Areas in the Region

A search of the EPBC Act Protected Matters data base indicates that there are no World Heritage Properties, National Heritage Place or Wetlands of International significance within 100km of the Project Area (**Appendix D**).

The Project Area is located within the central region of the Ngaanyatjarra Lands Indigenous Protected Area (**Appendix D and Appendix J**).

5.0 RESULTS - TERRESTRIAL FAUNA

5.1 Broad Fauna Habitat

Aerial imagery, results of database searches and available literature on the region was used to identify the broad terrestrial fauna habitats that are expected to occur over the Project Area.

These broad habitat types are:

- Drainage lines;
- Sandhill / quartzite dunes;
- Interdunal sand flats and hummock grass plains; and
- Salt lakes and playa.

5.2 Current Impacts and Habitat Condition

The National Land and Water Audit (NLWRA, 2008) for the Central Ranges Bioregion highlights threatening impacts that could potentially occur within the Project Area. Ecosystems and species at risk are currently subject to a large number of threatening processes, and the trends are not known in many cases. Impacts identified by the audit of the bioregion include: changed fire regimes; grazing pressure; changed hydrology; feral animals (especially goats, foxes and rabbits, camels); pollution; pathogens; increased vegetation fragmentation; and proximity to mining activities (**Appendix A**).

Examination of Landgate Satellite Remote Sensing Services Fire Scar Mapping (accurate to 1km), indicated that fires had burnt extensive areas of the Project Area over the last ten years, with some areas having been burnt several times (Landgate, 2008).

Nine terrestrial vertebrate species at risk within the bioregion have been identified, and threats to viability described (**Table 4**).

Table 4 Terrestrial vertebrate species at risk and threatening processes within the Central Ranges Bioregion, (NLWRA, 2008)

Species Name	Threatening Processes	Threatening Processes Notes
Great Desert Skink *(Egernia kintorei)*	Changed fire regimes	No data
	Feral animals	Foxes and cats
Western Slender-billed Thornbill *(Acanthiza iredalei iredalei)*	Changed fire regimes	No data
Princess Parrot *(Polytelis alexandrae)*	Grazing pressure	No data
Malleefowl *(Leipoa ocellata)*	Feral animals	Foxes and cats
	Firewood collection	No data

Species Name	Threatening Processes	Threatening Processes Notes
	Grazing pressure	No data
Mulgara *(Dasycercus cristicauda)*	Changed fire regimes	No data
	Feral animals	Foxes and cats
Greater Bilby *(Macrotis lagotis)*	Changed fire regimes	No data
	Feral animals	Foxes
Northern Marsupial Mole *(Notoryctes caurinus)*	Changed fire regimes	No data
	Feral animals	Foxes and cats
Southern Marsupial Mole *(Notoryctes typhlops)*	Changed fire regimes	No data
	Feral animals	Foxes and cats
Black-footed Rock-wallaby (*Petrogale lateralis MacDonnell Ranges race*)	Habitat fragmentation	No data
	Feral animals	Foxes and dingos

Specific threats to terrestrial vertebrate fauna identified within the Central Ranges bioregion include (NLWRA, 2008):

- Feral predators (foxes and cats);
- Grazing pressure;
- Changed fire regimes; and
- Vegetation fragmentation.

Although vegetation clearing is not significant in the region, vegetation and habitat fragmentation can occur through the effects of over-grazing, particularly from large herds of One-humped Camels.

The landscape within which the Project Area is situated is subject to frequent burning, and unnatural fire regimes have been recognised as a major threatening process in the bioregion (NLWRA, 2008). Habitats that provide refuge against frequent fire are important for the maintenance of biodiversity in such a landscape. Habitats such as Mulga woodlands and hummock grass plains will be adversely affected by frequent burning, which in turn, will have a negative influence on fauna species such as the Greater Bilby, Mulgara and the Great Desert Skink.

5.3 Sensitive Fauna Habitats

Fauna that are regarded as “rare and/or endangered”, or habitats which are site or type-specific and possess high ecological value are of state significance. Habitats which exhibit such a level of significance will contain either specific habitat-dependent fauna or high biodiversity and are poorly represented elsewhere. If fauna habitat is poorly-represented in conservation reserves its conservation significance is increased.

The Central Ranges region has been found to contain significant refugia, specifically for the invertebrate terrestrial camaenid land-snails (**Appendix H**). There is evidence to suggest that these

snails have been found on rocky ranges throughout the Mann-Musgrave Block subregion (Morton *et al*, 2004). Subsequently, if rocky ridges and outcrops occur within the Project Area they may be considered as significant habitat for this taxa. It is understood Metals X do not propose to conduct any exploration activity within the vicinity of rocky ridgelines, rocky outcrops or gorges.

The Central Ranges Bioregion contains one wetland of National Significance listed on the Directory of Important Wetlands in Australia: The Walter James Range Rock Pools (**Appendix I)**. These wetlands are >100km from the Project Area. The pools are a permanent breeding site for the frog *Cyclorana maini* and a permanent source of water for birds (Graham and Cowan, 2001).

5.4 Vertebrate Fauna Potentially Occurring Over the Project Area

Species lists of vertebrate fauna previously recorded, or potentially occurring within the Project Area and surrounds are provided in the following sections. Lists have been prepared based on published information relevant to the area and information obtained from database searches.

5.4.1 Mammals

Twenty five species of mammal could potentially occur within Project Area region (WAM, 2008) (**Table 5**). Of these, twenty-four were native species and one introduced. The native species included eight Dasyurids (carnivorous marsupials); one native rodent; one candidae; three macropods; and three bats.

Table 5. Native mammal species potentially occurring over the Project Area.

Family	Common Name	Scientific name
Dasyuridae	Kultarr	*Antechinomys laniger*
	Mulgara	*Dasycercus cristicauda*
	Wongai Ningaui	*Ningaui ridei*
	Fat-tailed Pseudoantechinus	*Pseudoantechinus macdonnellensis*
	Fat-tailed Dunnart	*Sminthopsis crassicaudata*
	Hairy-footed Dunnart	*Sminthopsis hirtipes*
	Long-tailed Dunnart	*Sminthopsis longicaudata*
	Ooldea Dunnart	*Sminthopsis ooldea*
Macropodidae	Rufous Hare-Wallaby	*Lagorchestes hirsutus*
	Euro	*Macropus robustus erubescens*
	Black-footed Rock wallaby	*Petrogale lateralis lateralis*
Molossidae	White-striped Freetail-bat	*Tadarida australis*
Vespertilionidae	Gould's Wattled Bat	*Chalinolobus gouldii*
	Lesser Long-eared Bat	*Nyctophilus geoffroyi*
	Inland Cave Bat	*Vespadelus findlaysoni*
Notoryctidae	Northern Marsupial Mole	*Notoryctes caurinus*

Family	Common Name	Scientific name
	Southern Marsupial Mole	*Notoryctes typhlops*
Peramelidae	Golden Bandicoot	*Isoodon auratus auratus*
Thylacomyidae	Bilby	*Macrotis lagotis*
Muridae	Spinifex Hopping-mouse	*Notomys alexis*
	Sandy Inland Mouse	*Pseudomys hermannsburgensis*
	House Mouse	*Mus musculus*
	Desert Mouse	*Pseudomys desertor*
Myrmecobidae	Numbat	*Myrmecobius fasciatus*
Canidae	Dingo	*Canis lupus dingo*

There are 41 mammal species known from the entire Central Ranges Bioregion (NLWA, 2008). Furthermore, the NLWA (2008) considers that some mammal species no longer occur in the Bioregion, and a number of species are now extinct (e.g. Western Quoll, Central Hare-wallaby, Lesser Stick-nest Rat, Lesser Bilby, Numbat, Long-tailed Hopping-mouse and Cresent Nail-tail Wallaby). Apart from the hopping-mice, all these species are critical weight range (CWR) mammals with weights between 35g and 5,500g. These CWR mammal species have been most affected by environmental changes following European settlement, predominantly due to fox and cat predation (Burbidge and McKenzie, 1998). As a consequence, the bioregion therefore has obtained high 'faunal attrition' and 'faunal contraction' indices at 0.45 and 0.44 respectively (NLWA, 2008).

5.4.2 Birds

The WAM Faunabase database lists 33 bird species that could potentially occur within the Project Area (**Table 6**) compared to 151 species of birds listed in the Birds Australia database search for the Bioregion (**Appendix G**). Differences in numbers are due to differences in survey scale and survey intensity. Scale refers to the size of area surveyed and variability of habitats covered. Survey intensity includes the length of the survey period as well as timing of surveys. For example, Birds Australia data was accumulated over many years over the entire bioregion within numerous habitats.

Table 6. Avian species potentially occurring over the Project Area.

Family	Common Name	Scientific Name
Megapodiidae	Malleefowl	*Leipoa ocellata*
Columbidae	Crested Pigeon	*Ocyphaps lophotes*
	Spinifex Pigeon	*Geophaps plumifera*
Cacatuidae	Galah	*Cacatua roseicapilla*
Psittacidae	Princess Parrot	*Polytelis alexandrae*
	Australian Ringneck	*Platycercus zonarius zonarius*
Cuculidae	Black-eared Cuckoo	*Chrysococcyx osculans*
Podargidae	Tawny Frogmouth	*Podargus strigoides brachypterus*
Acanthizidae	Redthroat	*Pyrrholaemus brunneus*
	Inland Thornbill	*Acanthiza apicalis*
	Southern Whiteface	*Aphelocephala leucopsis*
	Banded Whiteface	*Aphelocephala nigricincta*
Meliphagidae	Grey-headed Honeyeater	*Lichenostomus keartlandi*
	Yellow-throated Miner	*Manorina flavigula*
	White-plumed Honeyeater	*Lichenostomus penicillatus*
	Pied Honeyeater	*Certhionyx variegatus*
Pomatostomidae	White-browed Babbler	*Pomatostomus superciliosus*
Psophodidae /Cinclosomatidae	Chestnut Quail-thrush	*Cinclosoma castanotus*
	Chestnut-breasted Quail-thrush (Western)	*Cinclosoma castaneothorax marginatum*
Pachycephalidae	Grey Shrike-thrush	*Colluricincla harmonica rufiventris*
Dicruridae	Grey Fantail	*Rhipidura fuliginosa*
Cracticidae	Australian Magpie (Black-backed)	*Cracticus tibicen tibicen*
Corvidae	Torresian Crow	*Corvus orru*
Maluridae	Dusky Grasswren	*Amytornis purnelli purnelli*
	Variegated Fairy-wren	*Malurus lamberti assimilis*
	Rufous-crowned Fairy-wren	*Stipiturus ruficeps ruficeps*
	Striated Grasswren	*Amytornis striatus striatus*
	Splendid Fairy-wren	*Malurus splendens musgravi*
Petroicidae	Jacky Winter	*Microeca fascinans assimilis*
Climacteridae	Rufous Treecreeper	*Climacteris rufa*
Otididae	Australian Bustard	*Ardeotis australis*

5.4.3 Reptiles

The Central Ranges Bioregion is rich in reptiles and over 79 species could potentially occur within the Project Area. (**Table 7**).

Table 7. Reptile species potentially occurring over the Project Area

Family	Common name	Species
Agamidae (Dragons)	Mulga Dragon	*Caimanops amphiboluroides*
	Ring-tailed Dragon	*Ctenophorus caudicinctus*
	Mallee Military Dragon	*Ctenophorus fordi*
	Black-collared Dragon	*Ctenophorus clayi*
	Central Netted Dragon	*Ctenophorus nuchalis*
	Central Military Dragon	*Ctenophorus isolepis*
	Western Netted Dragon	*Ctenophorus reticulates*
	Rusty Dragon	*Ctenophorus rufuscens*
	Lozenge-marked Dragon	*Ctenophorus scutulatus*
	Blue-lined Dragon	*Diporiphora winneckei*
	Long-nosed Dragon	*Lophognathus longirostris*
	Dwarf Bearded Dragon	*Pogona minor minor*
	Thorny Devil	*Moloch horridus*
	Centralian Earless Dragon	*Tympanocryptis centralis*
Gekkonidae (Geckos)	Fat-tailed Gecko	*Diplodactylus conspicillatus*
	Sandplain Gecko	*Diplodactylus stenodactylus*
		Diplodactylus pulcher
		Gehyra purpurascens
		Gehyra montium
	Variegated Gecko	*Gehyra variegata*
	Bynoe's Gecko	*Heteronotia binoei*
	Beaded Gecko	*Lucasium damaeum*
	Smooth Knob-tailed Gecko	*Nephurus levis levis*
		Nephurus laevissimus
		Nephurus vertebralis
	Beaked Gecko	*Rhynchoedura ornata*
	Northern Spiny-tailed Gecko	*Strophorus ciliaris aberrans*
	Jewelled Gecko	*Strophorus elderi*
	Western Spiny-tailed Gecko	*Strophorus strophurus*
Pygopodidae (Legless Lizards)		*Delma nasuta*
		Delma pax
	Western Hooded Scaly-foot	*Pygopus nigriceps*
Scincidae	Fence Skink	*Cryptoblepharus plagiocephalus*

Family	Common name	Species
(Skinks)	Lively Ctenotus	*Ctenotus alacer*
		Ctenotus ariadnae
		Ctenotus brooksi brooksi
	Narrow-lined Ctenotus	*Ctenotus dux*
		Ctenotus helenae
		Ctenotus leonhardii
	Leopard Ctenotus	*Ctenotus pantherinus ocellifer*
		Ctenotus quattuordecimlineatus
		Ctenotus schomburgkii
		Ctenotus septenarius
	Spinifex Slender Blue-tongue	*Cyclodomorphus melanops elongatus*
	Spinifex Slender Blue-tongue	*Cyclodomorphus melanops melanops*
	Pygmy Spiny-tailed Skink	*Egernia depressa*
	Desert Skink	*Egernia inornata*
	Great Desert Skink	*Egernia kintorei*
	Night Skink	*Egernia striata*
	Broad-banded Sand-swimmer	*Eremiascincus richardsonii*
		Lerista bipes
		Lerista desertorum
		Lerista ips
		Lerista labialis
		Lerista muelleri
	Grey's Skink	*Menetia greyii*
		Morethia boulengeri
		Proablepharus reginae
	Centralian Blue-tongue	*Tiliqua multifasciata*
Typhlopidae (Blind Snakes)		*Ramphotyplopsendoterus*
		Ramphotyplops waitii
Varanidae (Monitors)	Spiny-tailed Monitor	*Varanus acanthurus*
	Pygmy Desert Monitor	*Varanus eremius*
	Perentie	*Varanus giganteus*
	Pygmy Mulga Monitor	*Varanus gilleni*
	Sand Monitor	*Varanus gouldii*
	Black-headed Monitor	*Varanus tristus tristus*
Typhlopidae (Blind Snakes)		*Ramphotyplops endoterus*
		Ramphotyplops waitii
Boidae (Python)	Stimpson's Python	*Antaresia stimsoni stimsoni*
Elapidae	Desert Death Adder	*Acanthophis pyrrhus*

Family	Common name	Species
(Elapid Snakes)	Narrow-banded Shovel-nosed Snake	*Brachyurophis fasciolata fasciolata*
	Southern Shovel-nosed Snake	*Brachyurophis semifasciata*
	Yellow-faced Whip Snake	*Demansia psammophis psammophis*
	Moon Snake	*Furina ornata*
	Monk Snake	*Parasuta monachus*
	King Brown Snake	*Pseudechis australis*
	Ringed Brown Snake	*Pseudonaja modesta*
	Gwardar	*Pseudonaja nuchalis*
	Desert Banded Snake	*Simoselaps anomalus*
	Rosen's Snake	*Suta fasciata*

5.4.4 Amphibians

Four frog species have the potential to be found in the Project Area (**Table 8**). Most of the species are burrowing ground frogs that are restricted to the plains which contain substrates that are easy to penetrate and/or minor drainage lines occurring over the Project Area. All species breed in ephemeral or temporary water bodies.

Table 8. Amphibian species potentially occurring over the Project Area.

Family	Common name	Species
Hylidae (Tree Frogs)	Water-holding Frog	*Cyclorana playcephala*
Myobatrachidae (Ground Frogs)	Trilling Frog	*Neobatrachus centralis*
	Shoemaker Frog	*Neobatrachus sutor*
	Orange-crowned Toadlet	*Pseudophryne occidentalis*

5.4.5 Introduced Species

Introduced species occurring in the bioregion include cattle, camels, rabbits, foxes and cats (**Table 9**) (NLWRA,2008).

Table 9. Introduced exotic species potentially occurring over the Project Area

Group	Common Name	Scientific Name
Mammals	House Mouse	*Mus musculus*
	Cat	*Felix catus*
	European Rabbit	*Oryctolagus cuniculus*
	One humped Camel	*Camelus dromedarius*
	European Cattle	*Bos taurus*
	Red Fox	*Vulpes vulpes*

5.5 Fauna Species of Conservation Significance

5.5.1 Framework for Conservation Significance

Fauna species that have been formally recognised as rare, threatened with extinction or as having high conservation value are protected by law under Commonwealth and State legislation. At the national level, fauna are protected under the *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act). Within Western Australia, fauna can be listed under various Schedules under the *Western Australian Wildlife Conservation Act, 1950*. Definitions of conservation significance are presented in **Appendix K**.

The International Union for the Conservation of Nature (IUCN) reviews conservation status and lists fauna under various categories (the IUCN Red List). Categories for fauna and their conservation status used under the EPBC Act are those recommended by the IUCN. The *Western Australian Conservation Act, 1950* uses a set of 'Schedules', but the DEC also classifies species using IUCN categories.

International agreements that Australia has entered into include the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA) that cover migratory species of avifauna, particularly trans-equatorial waders, and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals).

The EPBC Act has lists of migratory species that are recognised under these international treaties. Particular species listed in JAMBA are also protected under Schedule 3 of the Western Australian Wildlife Conservation Act.

The Department of Environment and Conservation (DEC) also recognises species not listed under the Western Australian Wildlife Conservation Act, but for which there is some concern, and has produced a supplementary list of 'Priority' fauna. These species as well as those listed in various Government-endorsed Action Plans (eg. Duncan, *et al*. 1999; Garnett and Crowley, 2000) are also of recognised significance. Other species of conservation significance include endemics, those with restricted or fragmented ranges, or those that are at the extreme limits of their distribution. Short-range endemic fauna are those with naturally restricted distributional ranges.

The conservation significance of terrestrial vertebrate fauna potentially occurring over the Project area can be assessed at four spatial scales:

- International and National - Species listed under the EPBC Act, IUCN, and International Treaties
- State - Species listed under the Western Australian Wildlife Conservation Act, 1950
- Regional - DEC-listed Priority Species and species listed in Action Plans
- Local - Species not listed under any Acts or relevant publications, but considered of conservation significance due to patterns of distribution.

5.5.2 Vertebrate Species of Conservation Significance

Searches of the DEC Threatened and Priority Fauna Database, WAM Faunabase, Birds Australia database and EPBC Protected Matters Report identified a number of vertebrate species recorded from the region that are of conservation significance (**Table 10**).

Information from the DEC Threatened and Priority Fauna Database was augmented with additional information relating to species' likelihood of occurrence based upon other database searches and texts, as well as personal experience and general patterns of distribution and known habitat preferences. The likelihood of occurrence of each of these species within the Project Area is discussed below.

Species considered regionally extinct, outside their range, or restricted to habitats not present at the Project site, have been excluded from **Table 10.** These include the Western Quoll, Central Hare-wallaby, Lesser Stick-nest Rat, Lesser Bilby, Numbat, Long-tailed Hopping-mouse and Crescent Nail-tail Wallaby.

Table 10. Species of international, national, state or regional conservation significance potentially occurring over the Project Area

Group	Name		National	State	Regional	Likelihood of occurrence
Mammals	Mulgara	*Dasycercus cristicauda*	VU	S1		P
	Greater Bilby	*Macrotis lagotis*	VU	S1		U
	Southern Marsupial Mole	*Notoryctes typhlops*	EN	S1		U
	Northern Marsupial Mole	*Notoryctes caurinus*	EN	S1		U
	Black-footed Rock-wallaby (MacDonnell Ranges)	*Petrogale lateralis spp*	VU	S1		P
Birds	Malleefowl	*Leipoa ocellata*	VU	S1		P
	Princess Parrot	*Polytelis alexandrae*	VU		P4	P
	Major Mitchell's Cockatoo	*Cacatua leadbeateri*		SP		P
	Slender-billed Thornbill	*Acanthiza iredalei iredalei*	VU			P
	Australian Bustard	*Ardeotis australis*			P4	L
	Peregrine Falcon	*Falco peregrinus*		S4		U
	Grey Falcon	*Falco hypoleucos*			P4	U
	Bush Stonecurlew	*Burhinus grallarius*			P4	P
	Rainbow Bee-eater	*Merops ornatus*	Mig(JAMBA)			L
	Great Egret	*Ardea alba*	Mig(CAMBA/ JAMBA)			U
	Oriental Plover	*Charadrius veredus*	Mig(CAMBA)			U

Group	Name		National	State	Regional	Likelihood of occurrence
	Oriental Pratincole	*Glareola maldivarum*	Mig(CAMBA)			U
Reptiles	Great Desert Skink	*Egernia kintorei*	VU	S1		P
	Woma	*Aspidites ramsayi*		SP	P4	P

Key	Conservation Status	Key	Conservation Status
EN	Endangered	SP	Specially Protected
VU	Vulnerable	Mig	Migratory Species
S1	Schedule 1	P#	Priority Fauna
Mig	Migratory Species	P	Possible
S4	Schedule 4	R	Recorded
L	Likely	U	Unlikely

Mammals of Conservation Significance

Mammals of conservation significance known from the bioregion, with the potential to occur over the Project Area are discussed below.

The **Black-footed Rock-wallaby** (MacDonnell Ranges subspecies) once occurred over the region surrounding the Project Area and a Threatened and Priority Fauna database search has revealed one record. Its distribution extends from west of the Project Area to Central Australia and inhabits rocky escarpments with crevices and caves (Pearson, 1992, Robinson *et al*. 2003). A review of available aerial imagery for the Project Area indicates that the preferred habitat for this species is limited or does not occur within the Project Area. Subsequently, it is unlikely this species occurs in the Project Area

There are records of **Mulgara** within the Mann-Musgrave Block Subregion (Graham and Cowan, 2001) but not within 100km of the Project Area. It is possible that this species could occur within the Project Area due to the availability of suitable habitat e.g. hummock grasslands (Graham and Cowan, 2001).).

The **Southern** and **Northern Marsupial Moles** were identified by NLWRA (2008) as occurring in the Central Ranges region and WA Museum has records for south and east of Warburton (Faunabase, 2008). These species occupy arid areas immediately east and north of the Project Area, living underground in sand dunes, inter-dunal flats and sandy soils along river flats. It is possible that the Southern and Northern Marsupial Moles occur over the Project Area due to the availability of suitable habitat.

The **Greater Bilby** once occurred over the subregion, however in Western Australia it is now confined to sparse desert populations in the Gibson and Great Sandy Deserts south of Warburton, the Pilbara and Dampierland Bioregions, as well as the Kimberley (Faunabase, 2008; Strahan,

2000). It is unlikely that the Greater Bilby still survives over the Project Area due to habitat disturbance by frequent fires.

Birds of Conservation Significance

Birds of conservation significance known from the bioregion with the potential to occur over the Project Area are discussed below.

There has been one record of the **Peregrine Falcon** occurring within 50km of the Project Area. This species was recorded at Wurupura in 1974 (**Appendix E**). This species requires cliffs, large rocky outcrops, or large tree hollows as nesting sites. The **Grey Falcon** has a very broad but scattered distribution across Australia and prefers larger creeklines supporting River Red Gums and often nests in eucalypts along watercourses; habitat that does not occur over the Project Area (Faunabase, 2008). It is therefore unlikely that these species will occur over the Project Area.

A **Bush Stonecurlew** was recorded in 2001 within the Giles region (**Appendix E**). This species inhabits open to lightly timbered woodlands of mallee and mulga that has an understorey of small sparse shrubs, grass or litter (Johnstone & Storr, 1998). It is possible that this species may occur within the Project Area.

The **Princess Parrot** is an inhabitant of lightly-wooded country of desert areas to the north-west and north-east of the Project Area; from the Great Sandy Desert, through the Gibson Desert and into the Great Victoria Desert (Blakers *et al.*, 1984). It is possible for this species to occur over the Project Area.

The **Major Mitchell Cockatoo's** distribution is both patchy and disjunct. The Project area lies outside the species distribution as identified by Johnstone and Storr (1998) and WA Museum. It is possible that this species occurs from time-to-time as its preferred habitat of very open woodland occurs over the Project Area.

The **Australian Bustard** has a wide distribution across Australia and there is a Western Australian Museum record of the birds presence south-west of the Project Area (FaunaBase, 2008). The presence of suitable habitat within the Project Area (open to lightly timbered woodlands, grasslands) suggests that this species may be likely to occur.

The **Malleefowl's** distribution incorporates areas west of the Project Area near Warburton and north-east in the Northern Territory (FaunaBase, 2008). The Malleefowl is a ground-dwelling bird that inhabits scrubs and thickets of mallee, boree and bowgada and other dense litter shrublands (Johnstone & Storr,1998). It is therefore possible that this species could still occur in the habitats present, particularly Mulga communities.

The **Rainbow Bee-eater** occupies numerous habitats including open woodlands, semi-arid scrub and grasslands (Morcombe, 2000). The Rainbow Bee-eater is a Federally-listed migratory species likely to occur over the Project Area.

The **Slender-billed Thornbill's** *(Acanthiza iredalei iredalei)* preferred habitat is saltbush communities and samphire flats associated with lake systems. From the available information these habitats are present over the Project Area and therefore it is possible that it occurs.

There are no known records of migratory waders and/or waterbirds directly using the Project Area. The EPBC Protected Matters database search identified the Oriental Plover, Oriental Pratincole and Great Egret which are listed migratory and/or marine species under the EPBC Act, to potentially occur over the Project Area. These migratory wading birds and marine waterbirds listed under Commonwealth legislation (JAMBA and CAMBA) are known from the bioregion, however as there are no waterbodies within the Project Area, it is unlikely they will occur.

Reptiles of Conservation Significance

The **Great Desert Skink** occurs on red sandplains and sand ridges supporting spinifex *(Triodia* spp.*)* predominantly to the north-east and north-west of the Project Area (Pearson *et al*. 2001). Nationally, current strongholds for the Great Desert Skink appear to be the Tanami Desert, Uluru and an area of the Gibson Desert north of Warburton. Although the precise distribution of this species is likely to remain vague, three main populations appear to occur in Western Australia; at Patjarr (240km north-west of Warburton); in the vicinity of Lake MacKay; and the Rudall River National Park. The Project Area is outside of the species current core distribution, however, based on available habitat it is possible that the Great Desert Skink occurs over the Project Area.

The **Woma** occurs throughout arid zones of Australia with a disjunct south-west population in Western Australia that is now very rare (and may be taxonomically differentiated from the desert 'form'). In the more arid zones the Woma favours open myrtaceous heath on sandplains, and dunefields dominated by spinifex. In the south-west it also appears to favour sandplain habitats (Storr *et al.* 2002), though few records exist. The WA Museum recorded a specimen 8km from Wingellina. It is possible that this species would be found in the Project Area.

A new species of Taipan ***Oxyuranus temporalis*** (Doughty *et al*, 2007) was discovered in the Central Ranges Bioregion during a combined Western Australian Museum, South Australian Museum Department of Environment and Conservation (WA) survey conducted in 2006. As only one specimen was catalogued, it is not possible to determine the likelihood of this species occurring over the Project Area.

5.6 Short Range Endemics

Short-range endemism refers to taxa with naturally-restricted distributional ranges, suggested by Harvey (2002) as less than 10,000km^2. These taxa are also characterised by poor dispersal, reliance on discontinuous habitats, low growth rates, often seasonally-active in cooler, wetter months and often exhibit low fecundity (Harvey, 2002). Short-range endemic (SRE) fauna in Australia are dominated by invertebrate species, a group which has to date received little investigation due to its diverse nature. Recently, more reliable, up-to-date taxonomic evaluation of these taxa has begun, resulting in some data and literature on SRE species. Taxonomic groups known to display short-range endemism include mygalomorph spiders, land snails, millipedes, centipedes, scorpions, pseudoscorpions, and isopods; and these groups are often targeted during SRE surveys.

The EPA (2004) acknowledges that short-range endemism is a characteristic that should be considered in impact assessments. Species associated with short-range endemism are often invertebrates correlated with mesic refugia and belong to taxa such as the mygalomorph spiders, millipedes and land snails. Isolated rocky ridges can be significant for range-restricted invertebrates. Although little information is available on the invertebrates that are likely to occur over the Project Area, there is increasing awareness of species with restricted distributions in the region, particularly associated with habitat parameters associated with rock outcrops.

Fire refuges and mesic areas are also important for short-range endemic (SRE) invertebrates. Several common habitat factors are favoured by SRE invertebrates; primarily more mesic areas that offer protection from heat, desiccation and predators, and provide a source of moisture.

Examples of such areas include:

- rocky crevices, particularly those in gorges;
- south or south-east facing ridges and breakaways are most likely to contain SREs due to the shade they receive ;
- in deep litter deposits that have accumulated under vegetation;
- under bark; and
- near water supplies.

The Central Ranges - Mann-Musgrave Block subregion has been found to contain invertebrate fauna (camaenid land-snails) that appear to be endemic to this subregion (**Appendix H**). There is evidence to suggest that these snails have been found on rocky ranges throughout the Mann-Musgrave Block subregion and could potentially occur in rocky habitats (if present) within the Project Area. A list of these species that have been identified in the subregion is provided in **Appendix H**.

It is understood Metals X do not propose to conduct any exploration activity within the vicinity of rocky ridgelines, rocky outcrops or gorges.

6.0 REVIEW OF EXISTING LITERATURE

Beard, J. (1974). *Great Victoria Desert. Explanatory Notes to Sheet 3, 1:1 000 000 Series. Vegetation Survey of Western Australia.*

This broad-scale vegetation mapping provides a generalised overview of the vegetation associations of the Great Victoria Desert and the Eremaean Botanical Province as defined by Beard (1974). Descriptions of the vegetation associations are the result of interpretation of aerial photographs and ground-truthing.

Tenement E69/2453 is located in the Giles Botanical District (sometimes referred to as the Warburton Region) (Beard, 1974). The Giles Botanical District is approximately equivalent to the Central Ranges 1 (Mann-Musgrave Block Subregion) IBRA region. Beard (1974) broadly describes the vegetation of the region in relation to the underlying topography as being very varied, from low rounded quartzite ranges, sandy plains, confused dune systems, to salt lakes and kopi dunes.

Three of the vegetation communities described by Beard (1974) occur within tenement E69/2453:

- *Acacia aneura* Low Woodland occurring mostly over sandhills, however some patches on flat plains (a_1Li).
- *Acacia aneura* Scrub occurring on stony hills (a_1Si).
- *Allocasuarina decaisneana, Melaleuca* spp. steppe over *Triodia basedowii, T. melvillei* grass steppe ($c_1mp_2t_2$Hi).

Beard (1974) noted that the sandhills of the Giles Botanical District are often vegetated by *Grevillea stenobotrya, Acacia* spp., *Gyrostemon ramulosus, Crotalaria cunninghamii* and *Triodia melvillei.* Interdunal vegetation is typically a shrub steppe including *Hakea lorea* subsp. *suberea, Acacia pruinocarpa, A. aneura, A. cuthbertsonii, A. coriacea, Eucalyptus gamophylla, E. oxymitra, Eremophila forrestii* and *Triodia basedowii.* Groves of *Allocasuarina decaisneana* were also observed with no apparent pattern in their distribution or density. It is highly likely that many of the broad vegetation associations described by Beard (1974) for the region are likely to occur in tenement E69/2453.

HGM Maunsell (2002). *Wingellina Baseline Biological Survey*.

This report includes an inventory of all the flora and fauna recorded during a Level 1 survey of the surrounds of the Wingellina Aboriginal Community in April 2002 (an area of approx. 100km2). The area surveyed by HGM Maunsell in 2002 is approximately 80km to the south-east of tenement E69/2453 and lies within the Central Ranges IBRA Bioregion.

A total of 188 plants were recorded during this survey, 75 of which had not been previously recorded for the area. No Declared Rare or Priority flora were identified from this survey. Six introduced taxa were recorded, five of which were new records for the Central Ranges Bioregion.

HGM Maunsell concluded that a high level of human activity in the vicinity of the Wingellina Community had exacerbated the spread of weed species.

Seven vegetation communities were identified during the survey, none of which were restricted to the survey area. None of the communities recorded in the survey are nationally listed as threatened ecological communities under the EPBC Act. However, three communities were considered to be regionally significant;

- Grassland of Poaceae spp. with occasional *Senna glutinosa* subsp. *glutinosa* and *Sida fibulifera* in patches of cracking clay.
- Low Scrub over *Triodia* spp. in sand over sand dunes.
- Low Open Woodland of *Eucalyptus gamophylla* and *Eucalyptus socialis* subsp. *eucentrica* over *Acacia validinervia* over mixed shrubs over *Triodia scariosa* in clay loam on upper slopes of mafic ridges.

These vegetation communities were considered to be regionally significant due to their isolation and underlying geomorphology. It is possible that similar vegetation associations could be found in the area surrounding the Project Area within tenement E69/2453.

HGM Maunsell recorded four species of mammals during the survey. Of these, three were native species and one introduced. Fifty-four species of birds were recorded. Nine species of reptile were recorded, including two geckos, six dragons (two anecdotal), two legless lizards, two monitors and three skinks.

A. C. Robinson, P. B. Copley, P. D. Canty, L. M. Baker and B. J. Nesbitt (Eds) (2003). *A Biological Survey of the Anangu Pitjantjatjara Lands, South Australia*.

This report includes an inventory of all the flora and fauna recorded during a survey of the Anangu-Pitjantjatjara (AP) lands in the north-western region of South Australia. It forms part of a comprehensive biological survey of South Australia spanning 10 years. A total of 14 132 plants were recorded in the Anangu-Pitjantjatjara lands with only 38% of those records previously represented as a vouchered specimens in the South Australian State herbarium, attesting to the paucity of botanical knowledge in the area. A number of species recorded in this survey are also known from collections within Western Australia. It is possible that the distribution of some of the species recorded in the South Australian survey may include to the area of tenement E69/2453.

In terms of comparable vegetation associations, the relevance of the South Australian survey to tenement E69/2453 is likely to be limited, as areas in closest proximity to tenement E69/2453, were highly restricted due to cultural sensitivities and restricted access. Sites that were visited in close proximity to tenement E69/2453 were limited to the tops of ranges and midslope areas. Opportunistic records from the nearby Mann Range, Tomkinson and Musgrave Ranges suggest

that vegetation associations in this region are largely the product of underlying geology and topography.

This report recorded 41 species of mammals during the survey. Of these, 30 were native species and eleven introduced. One hundred and twenty-nine species of birds were recorded. Ninety-two species of reptile and three amphibians were recorded.

Pearson D., Miller J., Butler M., Butler M., Brennan K., Thompson W. (2006). Learning about country. Landscope Vol. 23 No.2 Summer 2007-08 Naturebase, Department of Environment and Conservation

In 2006, a survey of the Ngaanyatjarra lands was performed by the Western Australia Museum (WAM), Department of Environment and Conservation (DEC), South Australian Museum, Department of Environment and Heritage (DEH) (South Australia) and the Ngaanyatjarra people. The survey investigated flora, vertebrate fauna, invertebrates and subterranean fauna. Seven hundred and twenty plant specimens were recorded, including thirty seven species that were either new records or significant range extensions. A new species of Taipan was recorded, (*Oxyuranus temporalis*), and range extensions of several gecko species were documented. One hundred species of spiders identified within this survey are thought to be undescribed.

7.0 DISCUSSION AND RECOMMENDATIONS

7.1 Future Survey Work

Results from this desktop study indicate a number of terrestrial vertebrate fauna and flora species of conservation significance may occur over the Project Area. A site fauna and flora survey would be required to refine assessments made in this document relating to the likelihood of these species occurring.

It is understood that the disturbance footprint of the proposed groundwater exploration program will be limited to an area within close proximity of the existing access road. If results of the exploration program conclude the targeted aquifer could provide a viable water source for the proposed Wingellina Nickel Project, and subsequently the development of a borefield is proposed, it is recommended a site survey of the Project Area be undertaken prior to disturbance beyond that proposed in the current exploration program.

Guidance for conducting fauna and flora surveys for an environmental impact assessment in Western Australia is available through Position Statement No 3. “Terrestrial Biological Surveys as an Element of Biodiversity Protection” (EPA, 2002), and Guidance Statement No 56 “Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia” (EPA, 2004). The Level of survey required would be dependent on the scale and nature of impact of the proposed disturbance in the Project Area and the sensitivity of the surrounding environment.

7.1 General Management Guidelines

The general management guidelines below are suggested to minimise potential impacts of the exploration program to vegetation, habitat and fauna of the Project Area:

- Reduce vegetation clearance to an absolute minimum.
- Progressively rehabilitate exploration disturbance to an appropriate standard.
- Where practicable avoid clearance or disturbance to spinifex sandplains and dune systems. These form the primary habitat for the Mulgara, Greater Bilby and Great Desert Skink.
- Avoid disturbance to rock ridges and outcrops. These features may be important habitat for short –range endemic invertebrate species and other fauna of conservational significance that may occur in the area.
- Minimise impacts to surface hydrology by avoiding drainage features wherever possible.
- Discourage the establishment of any semi-permanent artificial structures that may hold water supplies (drill sumps etc).
- Implement standard dust suppression methods when drilling in the Project Area, to reduce impacts to surrounding vegetation.

- Prevent the establishment of new weed species, and the further spread of existing weed species by ensuring machinery hygiene prior to entering Project Area.
- Develop strategies to reduce the likelihood of increased populations of feral animals, such as appropriate refuse management, for example, ensure food scraps are disposed of appropriately during the exploration program.
- Implement environmental management strategies that have been applied and are currently in place at the Wingellina Nickel Project.

A number of the above environmental management guidelines have been successfully incorporated within the Wingellina Nickel Project exploration program. It is recommended that key Metals X site personnel ensure that these guidelines are continued to be implemented within the pending groundwater exploration program. This will involve implementing an operating procedure ensuring contract personnel are educated in the importance of the above guidelines in reducing environmental impact and secondly overseeing the ground operations to ensure these guidelines are adhered to.

8.0 REFERENCES

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Appendix A

Biodiversity Assessment of the Central Ranges

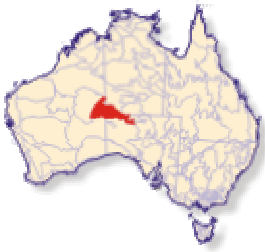
Australian Natural Resource Atlas

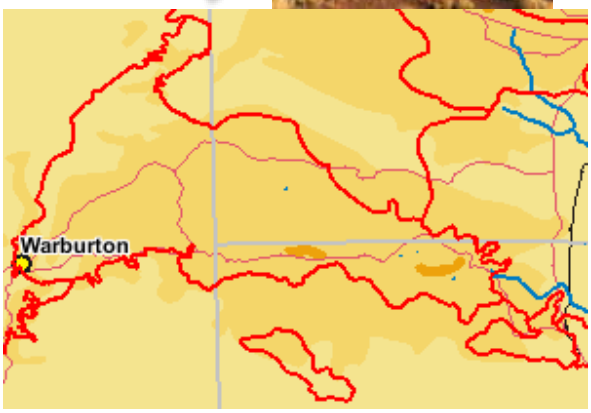
Biodiversity Assessment - Central Ranges

Specify a region: -- select region --

On this page

Central Ranges





Introduction

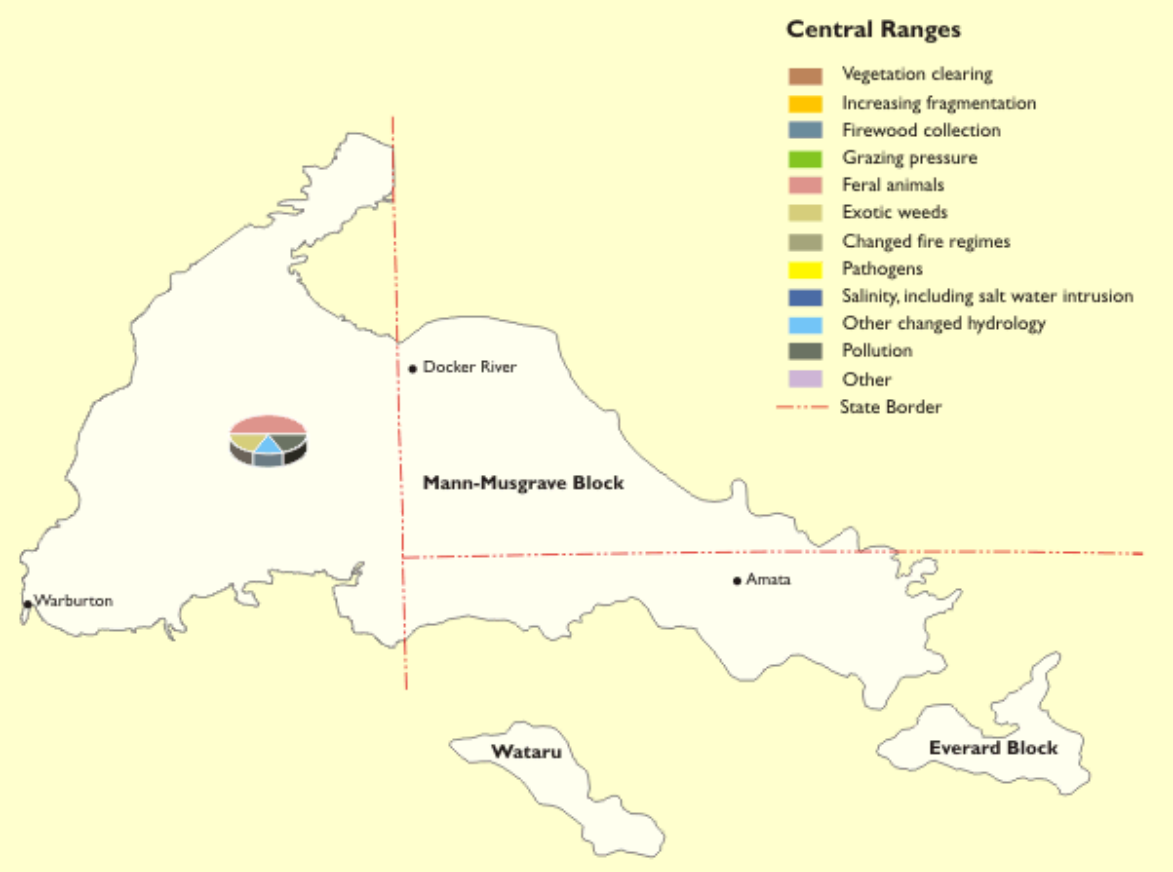
Natural values

Click here to link to a table of natural values within each subregion

Wetlands

Nationally important wetlands

Map: IBRA map showing DIWA locations, towns, subregions, major roads and reserves and most common threatening processes.



Click here to link to a table of Australia's Important Wetlands (Directory of Important Wetlands of Australia): their type, condition, trend and threatening processes within each subregion.

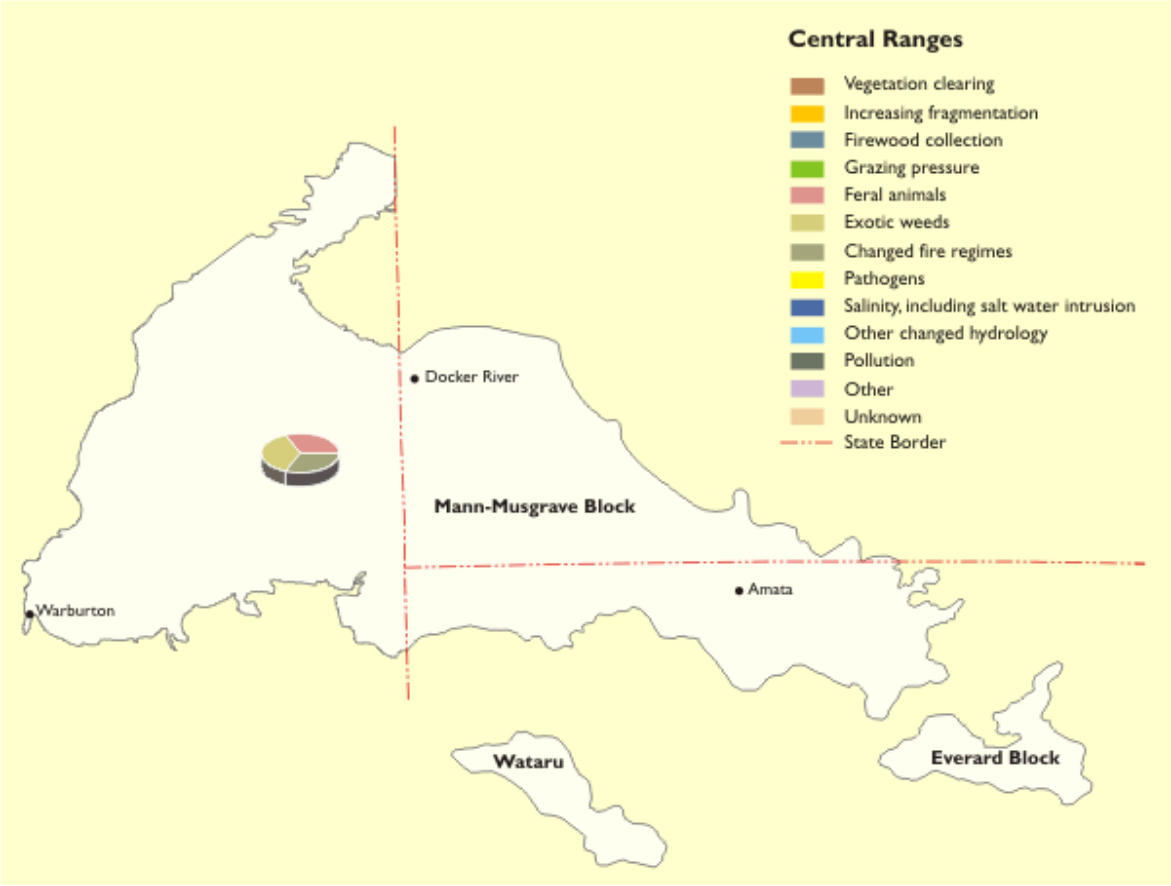
Regionally important wetlands

Click here to link to a table of provisional identification of wetlands of regional significance: their type and special values within each subregion. The reliability of the overall subregional assessment is indicated.

Click here to link to a table of provisional identification of wetlands of regional significance: their condition, trend and threatening processes within each subregion.

Riparian Zones

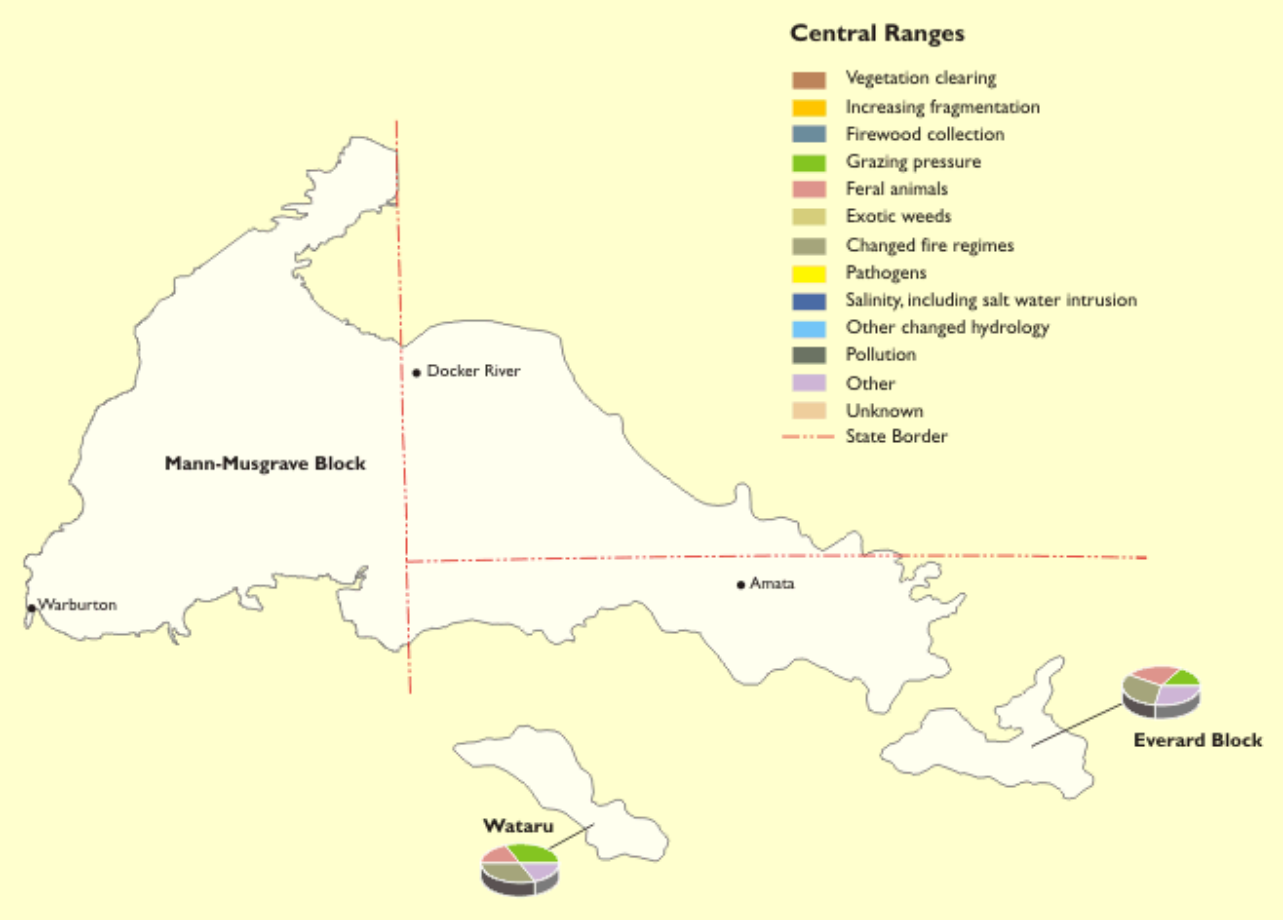
Map: Riparian threatening processes.



Click here to link to a table of riparian zones: their average condition, trend and threatening processes for each subregion. The reliability of this overall assessment is indicated.

Ecosystems at risk

Map: IBRA map showing frequency of threatening processes for ecosystems.



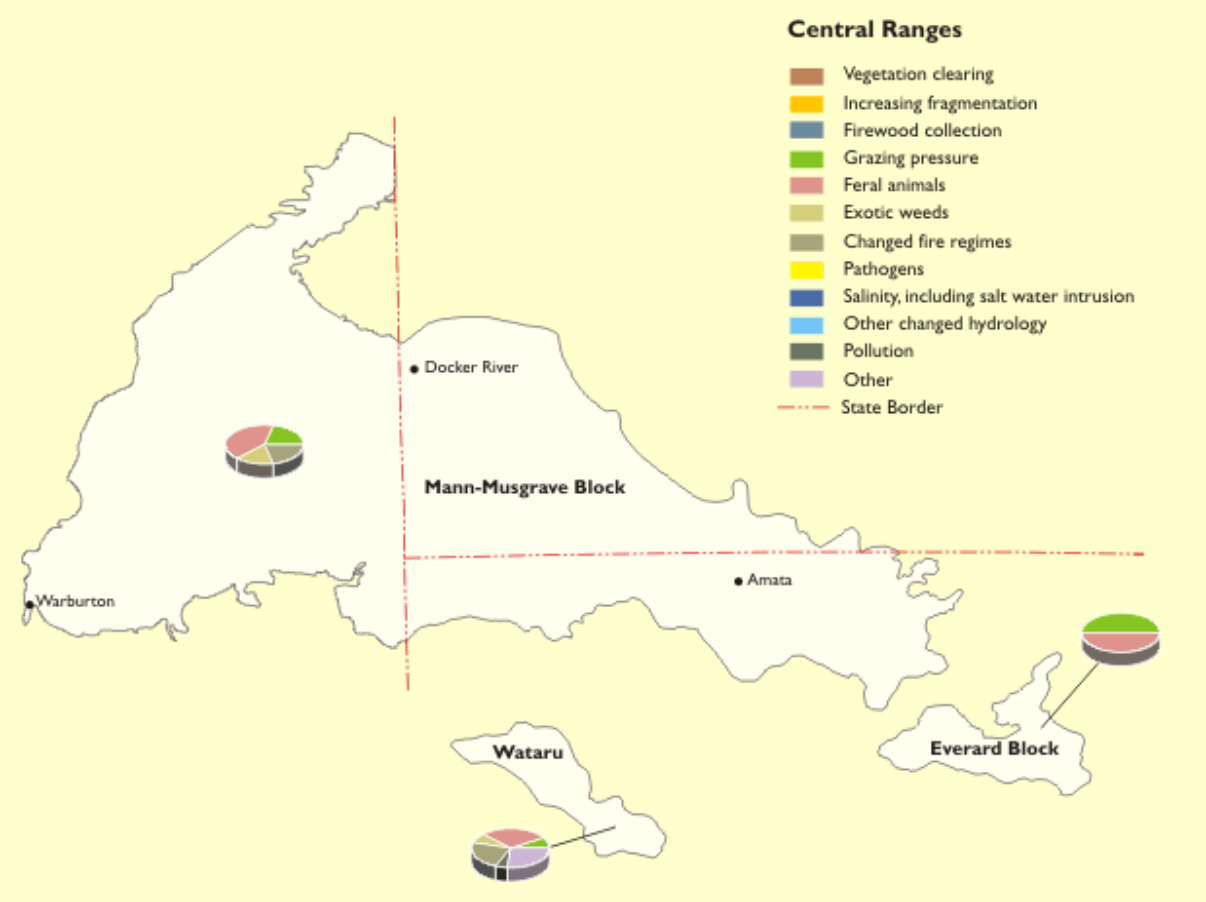
Click here to link to a table of provisional list of threatened ecosystems in Australia: their broad vegetation type (National Vegetation Information System - Major Vegetation Subgroup), recommended status, current legislative protection as a threatened ecosystem, trend and bioregional distribution. These ecosystems are arranged in the bioregion of their principal occurrence. The reliability of the recommended status is indicated.

Click here to link to a table of provisional list of threatened ecosystems in each subregion: their threatening processes.

Click here to link to a table of provisional list of threatened ecosystems in each subregion: their recommended recovery actions

Species at risk

Map: IBRA map showing frequency of threatening processes for species.



Click here to link to a table of species at risk in each subregion: their status, trend and subregional distribution. The reliability of the assessment of trend is indicated and whether recovery plans have been prepared.

Click here to link to a table of species at risk in each subregion: their threatening processes.

Click here to link to a table of species at risk in each subregion: their status recommended recovery actions.

Birds

The birds of the Central Ranges were not well surveyed in either Atlas period, but the composition of the avifauna appears to resemble that of other semi-arid bioregions. One limited range taxon, the Princess Parrot, was seen in the bioregion during the first Atlas period. The only other feature that sets the bioregion apart is the absence of any exotic species. The apparent decline in ground-nesting birds and of ground-feeding insectivores should be investigated at a larger scale.

Status: Typical semi-arid avifauna.

Rare and threatened: No major populations.

Increasers: None indicative of landscape health.

Indicators: Emu, Australian Bustard, Banded Lapwing, White-browed Treecreeper, Jacky Winter.

Trend: Possible decline in ground-nesting species.

Scenario: Probably little change.

Actions: Ensure representative areas have an appropriate fire regime to maintain diversity.

Click hereto download a summary report including the physical characteristics of the bioregion, a species list, and summary statistics [Excel file]. The file may open on your screen. To save it to your system 'Save as' under the File menu.

Mammals

Number of species and status

There are 41 mammal species within this bioregion. (The maximum number of species recorded in a bioregion is 86 and the minimum is 25).

Click here to link to a table of number of species in each status class for this bioregion.

Click here to link to a list of mammal species and their status for this bioregion.

Critical weight range

The critical weight range (35 - 5500 g) of mammals is the size range of Australian mammals that have been most affected by environmental changes following European settlement. In this bioregion, the proportion of mammal fauna within the critical weight range is .585. (The maximum proportion of fauna within the critical weight range recorded in a bioregion is 0.632 and the minimum is 0.222).

Faunal Attrition Index

Faunal attrition is a measure of contraction or loss of species richness with a region. A high index value means many species have declined or are extinct in the bioregion. The index can be used to compare the status of mammal fauna to regional attributes such as changes since European settlement and average annual rainfall. The Faunal Attrition Index for mammals in this bioregion is .45. (The maximum faunal attrition index value recorded in a bioregion is 0.66 and the minimum is 0).

Click here to link to a table of Faunal Attrition Index for groups of mammals shows the contributions of each group to overall patterns of faunal decline.

Faunal Contraction Index

A range contraction index is a measure of the extent to which the range inhabited by a particular species has contracted. A high index value means that many of the species comprising the region's original mammal fauna have contracted from a high proportion of the regions they originally occurred in. The faunal contraction index for the mammal fauna in this bioregion is .44. (The maximum faunal contraction index value recorded in a bioregion is 0.51 and the minimum is 0.07).

Faunal Endemism Index

Endemic species are those restricted to certain regions. Regions containing endemic species are considered to have high biodiversity conservation values because opportunities to conserve those species do not exist elsewhere. A high index value means that the species comprising the original mammal fauna typically occurred in few bioregions. The faunal endemism index value for the mammal fauna in this bioregion is .64. (The maximum faunal endemism index value recorded in a bioregion is 0.79 and the minimum is 0.52).

New Endemism Index

Extant (still surviving) species that have undergone major range contractions can be considered 'new endemics'. Bioregions that contain new endemic species are often important refugia for threatened species. The new endemism index for the mammal fauna in this bioregion is .66. (The maximum new endemism index value recorded in a bioregion is 0.93 and the minimum is 0.5).

Table: Translocated Species

There is no data available for this table within the bioregion.

Exotic Mammals

The number of introduced exotic mammal species that occur within this bioregion is 7. (The maximum number of introduced exotic mammal species in a bioregion is 16 and the minimum is 5).

Click here to link to a list of introduced exotic mammal species for this bioregion.

Extinct mammal species

The number of extinct mammal species that previously occurred within this bioregion is 17. (The maximum number of extinct mammal species in a bioregion is 29 and the minimum is 0).

Click here to link to a list of extinct mammal species for this bioregion.

Management responses

Reserve consolidation

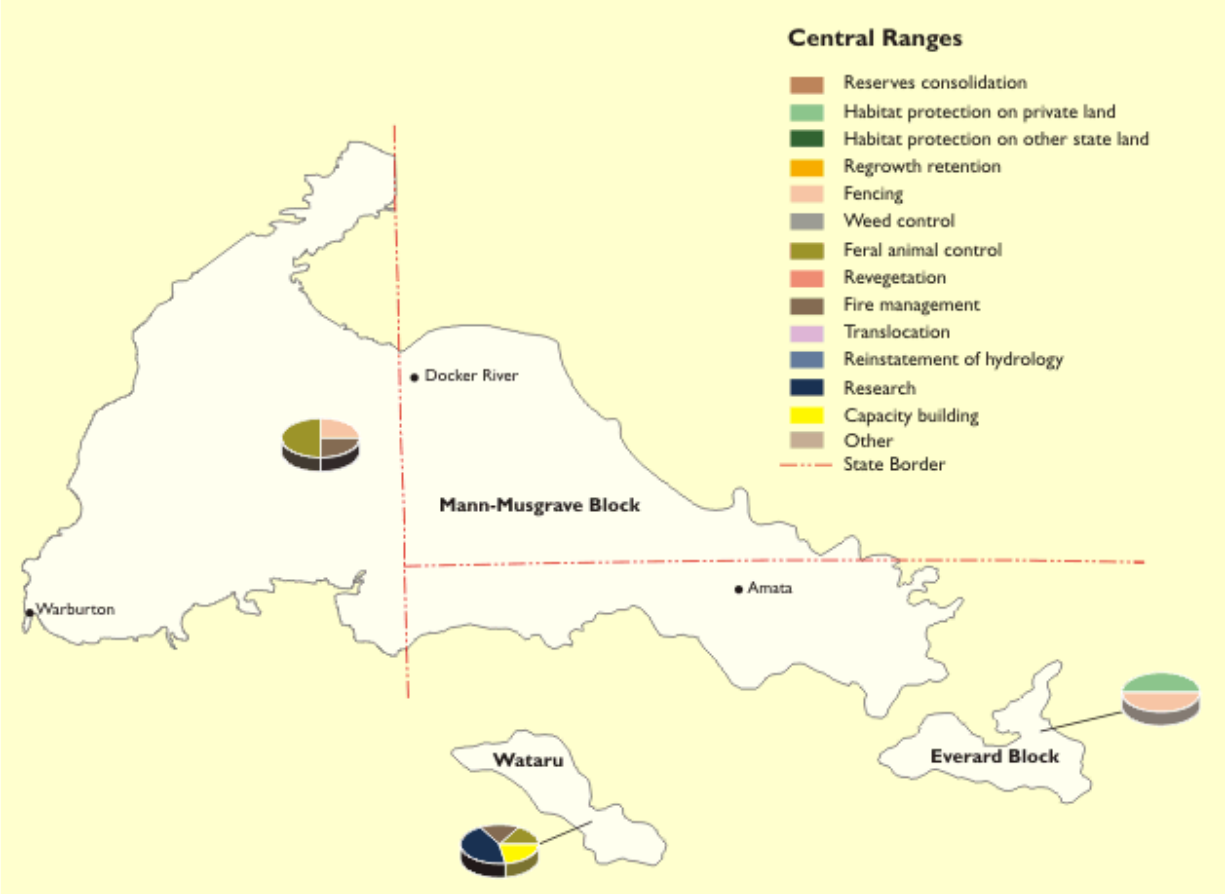
Click here to link to a table of comprehensiveness, adequacy and representativeness (CAR) of the National Reserve System in terms of ecosystems and area sampled and a ranking of reserve management. The bioregional priority for consolidating the National Reserve System is based on this CAR analysis and threat.

Click here to link to a table of bioregional and subregional priorities and ecosystem priorities to consolidate the National Reserve System and associated ecosystem constraints.

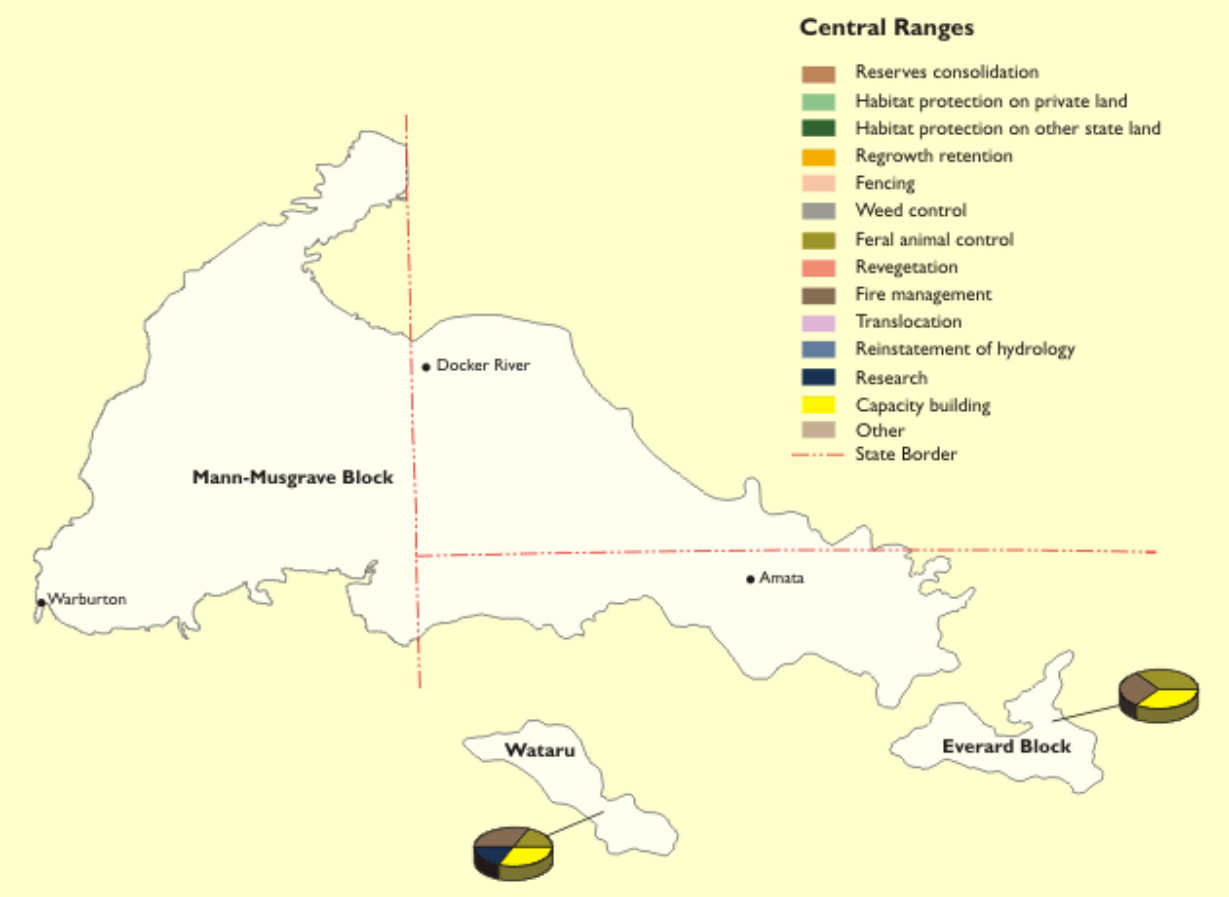
Off-park conservation for species and ecosystem recovery

Integrated NRM

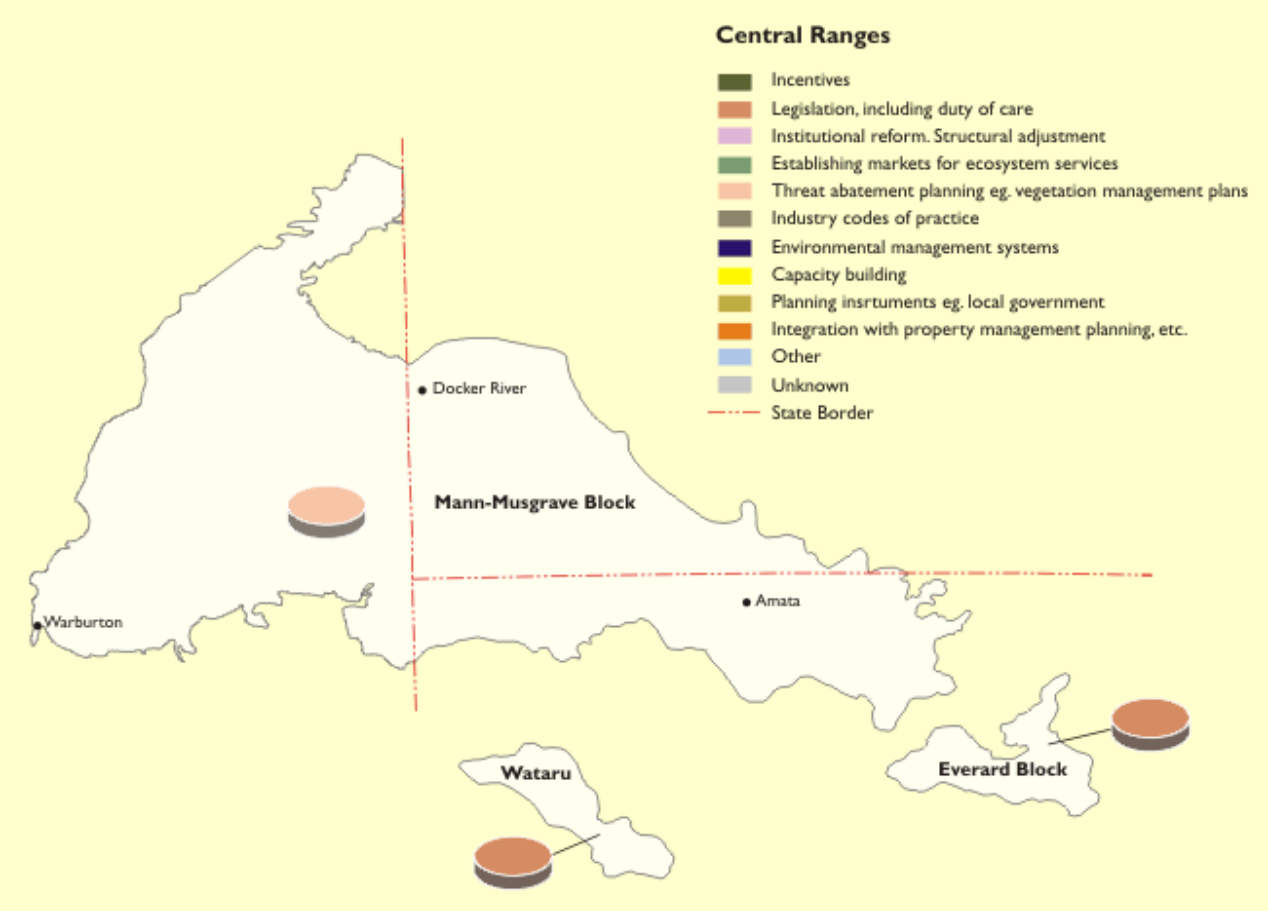
Map: IBRA map showing frequency of recovery actions (species).



Map: IBRA map showing frequency of recovery actions (ecosystems).



Map: IBRA map showing existing projects part of NRM.



Click here to link to a table of contribution of integrated Natural Resource Management to the protection of biodiversity in each subregion: existing measures and effectiveness.

Click here to link to a table of contribution of integrated Natural Resource Management to the protection of biodiversity in each subregion: feasible opportunities and comments.

Further Information & Gaps

Click here to link to a table of some major data gaps in each subregion in terms of protecting biodiversity.

Before you download

Most publications are downloadable as PDF files. Adobe Acrobat Reader is required to view PDF files.

If you are unable to access a publication, please contact us to organise a suitable alternative format.

Key

Links to an another web site
Opens a pop-up window

Australian Natural Resources Atlas
Department of the Environment and Water Resources
GPO Box 787
Canberra ACT 2601 Australia
+61 (0)2 6274 2051 ABN

NLWRA
Australian Government
Environment Portal

Biodiversity Assessment - Central Ranges

Species at risk

Table: Species at risk in each subregion: their status, trend and subregional distribution. The reliability of the assessment of trend is indicated and whether recovery plans have been prepared.

Species Group	Species name	EPBC listing	State listing	Trend	Recommended rank	Existing recovery plans (yes/no)	Subregional occurrence
				CR1			
Birds	Acanthiza iredalei iredalei (Slender-billed Thornbill (western))	Vulnerable	NT (E); SA (V)	Unknown	No data	No	AW1; AW2; COO1; COO2; COO3; CR1; EYB2; EYB3; EYB5; FLB4; FLB5; GAS2; GAS3;

							GAW1; GAW2; GAW4; GAW5; GD1; GS1; GS2; GVD2; GVD5; GVD6; HAM; KAN2; LSD2; MAL1; MAL2; MUR1; MUR2; NCP1; NCP3; NCP4; NUL1; NUL2; NUL3; YAL
Birds	Amytornis textilis modestus (Thick-billed Grasswren (eastern))	Vulnerable	No data	Unknown	No data	No	CAR2; CR1; FIN3; FIN4; FLB4; FLB5; MAC1; MAC2; SSD7; STP1; STP2; STP3; STP4; STP5
Birds	Leipoa ocellata (Malleefowl)	Vulnerable	NSW (E); NT (E); SA (V); VIC (E); WA (V)	Unknown	No data	No	AW1; AW2; BBS23; BBS24; BBS25; CAR2; COO1; COO2; COO3; CP2; CP3; CP4; CP5; CR1;

Birds	Polytelis alexandrae (Princess Parrot, Alexandra's Parrot)	Vulnerable	NT (V)	Unknown	No data	No	DRP10; DRP5; DRP9; ESP1; ESP2; EYB1; EYB3; EYB4; EYB5; GD1; GS1; GS2; GS3; GVD1; GVD2; GVD4; GVD6; HAM; MAL1; MAL2; MDD1; MDD2; MDD3; MDD4; MDD5; MDD6; MUR1; MUR2; NCP1; NCP2; CHC3; CR1; FIN1; FIN2; FIN3; GAS2; GAS3; GD1; GD2; GSD1; GSD2; GSD4; GVD1; GVD3; LSD2; MAC1; MAC2; MAC3; MUR1; NUL1; NUL2;

Mammals	Dasycercus cristicauda (Mulgara)	Vulnerable	NSW (X); NT (V); SA (E); WA (V)	Unknown	No data	No	MII3; PIL1; SEQ1; TAN1 BRT1; BRT2; BRT3; CAR1; CAR2; CHC1; CHC2; COO3; CR1; DMR1; DMR3; GAS2; GAS3; GD1; GD2; GSD1; GSD2; GVD1; GVD2; HAM; LSD1; LSD2; MAC1; MAC3; MUR1; MUR2; NUL1; NUL2; PIL1; SSD1; SSD2; TAN1
Mammals	Dasyurus geoffroii (Chuditch, Western Quoll)	Vulnerable	NT (X); VIC (X); WA (V)	Extinction	No data	No	AW1; AW2; BBS25; CAR2; COO2; COO3; CR1; ESP1; ESP2; GSD2; JF1; JF2; MAL1; MAL2; NUL2; SWA1; SWA2;

							WAR; YAL
Mammals	Lagorchestes asomatus (Central Hare-wallaby)	Extinct	NT (X); WA (X)	Extinction	No data	No	CR1
Mammals	Leporillus apicalis (Lesser Stick-nest Rat)	Extinct	NT (X); VIC (X); WA (X)	Extinction	No data	No	AW1; CAR2; CR1; GAS3; GD1; GS1; GVD1; GVD2; HAM; LSD2; MAL1; MDD2; MUR1; NUL2; PIL3; YAL
Mammals	Macrotis lagotis (Greater Bilby)	Vulnerable	NT (V); QLD (E); SA (E); WA (V)	Unknown	No data	No	AW1; AW2; BBS22; BBS24; BHC1; CAR2; CHC2; CHC3; CHC4; COO2; COO3; CP2; CP3; CR1; DL2; DMR3; DRP8; GAS1; GAS3; GD1; GD2; GSD1; GSD2; JF1; JF2; LSD1; LSD2; MAL2; MDD1; MDD6; MGD4; MGD7; MUR1;

							MUR2; NSS1; NSS2; NUL2; OVP1; OVP2; OVP4; PIL1; PIL2; PIL4; SSD6;
Mammals	Macrotis leucura (Lesser Bilby)	Extinct	NT (X); WA (X)	Extinction	No data	No	CR1; GD1; GSD2
Mammals	Myrmecobius fasciatus (Numbat)	Vulnerable	WA (V)	Extinction	No data	No	AW2; CR1; DRP10; ESP1; JF1; JF2; MAL2; SWA2
Mammals	Notomys longicaudatus (Long-tailed Hopping-mouse)	Extinct	NT (X); WA (X)	Extinction	No data	No	AW2; BHC1; BHC2; CR1; GD1; MUR1; YAL
Mammals	Notoryctes typhlops (Yitjarritjarri, Southern Marsupial Mole)	Endangered	NT (V); SA (E); WA (E)	Unknown	No data	No	COO3; CR1; CR2; FIN1; FIN2; FIN3; GAW2; GD1; GSD2; GSD5; GVD1; GVD2; GVD3; GVD4; LSD2; MAC2; MUR1; NUL1; NUL2; TAN1; TAN2
Mammals	Onychogalea lunata	Extinct	NT (X);	Extinction	No data	No	AW1; COO3;

	(Crescent Nail-tail Wallaby)		WA (X)				CR1; GD1; MAL2; MUR1; NUL2
Mammals	Petrogale lateralis MacDonnell Ranges race (Warru, Black-footed Rock-wallaby (MacDonnell Ranges race))	Vulnerable	SA (E); WA (V)	Unknown	No data	No	BRT1; BRT2; BRT3; BRT4; CHC1; CR1; CR2; DMR2; FIN1; GSD2; GVD2; GVD4; MAC1; MAC2; MAC3; SSD1; STP4
Mammals	Petrogale lateralis lateralis (Black-flanked Rock-wallaby)	Vulnerable	WA (V)	Unknown	No data	No	AW1; AW2; CAR1; CR1; ESP2; GD1; GD2; GS2; LSD2; PIL4
Mammals	Trichosurus vulpecula (Common Brushtail Possum)	No data	NT (E); NT (X)	Rapidly declining	Qualitative	No	BRT2; BRT3; CR1; GSD2; MAC1; MAC3
Reptiles	Egernia kintorei (Great Desert Skink)	Vulnerable	NT (V); SA (E); WA (V)	Unknown	No data	No	BRT1; CR1; DMR1; FIN2; GAS2; GD1; GSD1; GSD2; GSD4; LSD1; MAC1; MAC2; MUR1; TAN1
Vascular	Basedowia	Vulnerable	No	Unknown	No data	No	CR1; CR3

plants Vascular plants	tenerrima Prostanthera nudula	Vulnerable	data SA (V)	Unknown **CR2**	No data	No	CR1; CR3
Birds	Amytornis striatus (Striated Grasswren)	No data	NSW (V); SA (V)	Unknown	No data	No	CP2; CP3; CR2; EYB5; FLB4; FLB5; GAW1; GVD4; GVD6; MDD1; MDD6; NCP4; RIV1; STP5
Birds	Ardeotis australis (Australian bustard)	No data	NSW (E); SA (V); VIC (E)	Unknown	No data	No	BBS22; BBS24; BBS25; BHC1; BHC2; BHC4; CHC10; CHC2; CHC6; CHC9; CP2; CP5; CR2; DRP1; DRP2; DRP4; DRP5; DRP6; DRP7; DRP8; EYB5; FIN3; FIN4; FLB4; GVD4; GVD5; GVD6; MDD1; MDD2; MDD4; MDD5; MUL14; MUL16;

plants	tenerrima		data				
Vascular plants	Prostanthera nudula	Vulnerable	SA (V)	Unknown	No data	No	CR1; CR3

Biodiversity Assessment - Central Ranges

Species at risk and the Threatening Process

Table: Species at risk in each subregion: their threatening processes.

Species name	Threatening processes	Threatening processes notes
	CR1	
Trichosurus vulpecula (Common Brushtail Possum)	Changed fire regimes	habitat change through increased incidence of hot extensive fires
Trichosurus vulpecula (Common Brushtail Possum)	Exotic weeds	habitat change through broad-scale weed invasion
Trichosurus vulpecula (Common Brushtail Possum)	Feral animals	habitat change through grazing by camels, donkeys, etc. predation by foxes, cats
Trichosurus vulpecula (Common Brushtail Possum)	Grazing pressure	habitat change through cattle grazing
	CR2	
Amytornis striatus (Striated Grasswren)	Changed fire regimes	Fire, particularly extensive fires that destroy mature hummock grassland over large areas, and excessive frequent fires. (Garnett, 1992)
Amytornis striatus (Striated Grasswren)	Feral animals	Predation by feral cats and foxes.
Amytornis striatus (Striated Grasswren)	Grazing pressure	Grazing by stock in mallee areas. (Garnett, 1992)
Ardeotis australis (Australian bustard)	Exotic weeds	Invasion of pastoral land by woody weeds.
Ardeotis australis (Australian bustard)	Feral animals	Predation of chicks and eggs by foxes.
Ardeotis australis (Australian bustard)	Other - describe	Agriculture - bustards regularly desert nests in response to disturbance by humans, sheep or cattle.
Ardeotis australis (Australian bustard)	Pollution	Traditional and illegal hunting. Pesticides either directly or indirectly ingested are held responsible for local extinctions.

Notoryctes typhlops (Yitjarritjarri, Southern Marsupial Mole)	Changed fire regimes	Changed fire regimes in the spinifex dominated sandy deserts.
Notoryctes typhlops (Yitjarritjarri, Southern Marsupial Mole)	Feral animals	Predation by foxes and cats.
Notoryctes typhlops (Yitjarritjarri, Southern Marsupial Mole)	Other - describe	Overall lack of knowledge on biology of species and threats
		Predation by dingoes
Petrogale lateralis MacDonnell Ranges race (Warru, Black-footed Rock-wallaby (MacDonnell Ranges race))	Changed fire regimes	Detrimental to preferred habitat.
Petrogale lateralis MacDonnell Ranges race (Warru, Black-footed Rock-wallaby (MacDonnell Ranges race))	Feral animals	Habitat modification by, and competition for food with rabbits
		Predation by foxes and feral cats
	CR3	
Basedowia tenerrima	Grazing pressure	Grazing by stock affects the plant both directly and by habitat degradation resulting in increased run-off
Prostanthera nudula	Grazing pressure	Grazing by stock affects the plant both directly and by habitat degradation resulting in increased run-off

Appendix B

Search Results of the Department of Environment and Conservation Threatened and Priority Flora Databases

Department of Environment and Conservation

Your reference:
Our reference: 2008/001163-1
Enquiries: Bridgitte Long

Phone: 9334 0123
Fax: 9334 0278
Email: bridgitte.long@dec.wa.gov.au

Outback Ecology
1/71 Troy Terrace
Jolimont WA 6014

Attention: Trinity File

Dear Ms File

REQUEST FOR RARE FLORA INFORMATION

I refer to your request of 18th April 2008 for information on rare flora in the Lehmann Hills and Lupton Hills areas. The search co-ordinates used were 24^0 55' - 25^0 47' S and 128^0 02' - 129^0 10' E, and 26^0 15' - 27^0 05' S and 127^0 41' - 128^0 48' E (GDA94), respectively.

A search was undertaken for this area of **(1)** the Department's *Threatened (Declared Rare) Flora* database (for results, *if any*, see "Threatened Flora Data" – coordinates are GDA94), **(2)** the *Western Australian Herbarium Specimen* database for priority species opportunistically collected in the area of interest (for results, *if any*, see "WAHERB"- coordinates are GDA94 – see condition number 9 in the attached 'Conditions in Respect of Supply' and **(3)**, the Department's *Declared Rare and Priority Flora List* [this list is searched using 'place names'. This list which may also be used as a species target list, contains species that are declared rare (Conservation Code R or X for those presumed to be extinct), poorly known (Conservation Codes 1, 2 or 3), or require monitoring (Conservation Code 4) – for results, *if any*, see "Declared Rare and Priority Flora List"]. The results are attached electronically to this email.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the seventh point, which refers to the requirement to undertake field investigations for the accurate determination of rare flora occurrence at a site. *The information supplied should be regarded as an indication only of the rare flora that may be present and may be used as a target list in any surveys undertaken.*

The information provided does not preclude you from obtaining and complying with, where necessary, land clearing approvals from other agencies.

An invoice for $250 (plus GST) to supply this information will be forwarded.

It would be appreciated if any populations of rare flora encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss rare flora management, please contact Dr Ken Atkins, Manager, Species and Communities Branch, on (08) 9334 0455.

Yours faithfully

BA Long
.....
for Keiran McNamara
DIRECTOR GENERAL
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

21st April, 2008

<u>Please note:</u> Co-ordinates supplied for all data search requests must be provided in latitude/longitude format, 'eastings and northings' are no longer suitable. Thank you.

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

RARE FLORA INFORMATION

CONDITIONS IN RESPECT OF SUPPLY OF INFORMATION

1. All requests for data to be made in writing to the Director General, Department of Environment and Conservation, Attention: Threatened Flora Database Officer, Species and Communities Branch.

2. The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided, without the prior written consent of the Director General, Department of Environment and Conservation.

3. Specific locality information for Declared Rare Flora is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for DRF may not be used in public reports without the written permission of the Director General, Department of Environment and Conservation. Publicly available reports may only show generalised locations or, where necessary, show specific locations without identifying species. The Department is to be contacted for guidance on the presentation of rare flora information.

4. Note that the Department of Environment and Conservation respects the privacy of private landowners who may have rare flora on their property. Rare flora locations identified in the data as being on private property should be treated in confidence, and contact with property owners made through the Department of Environment and Conservation.

5. Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data provided, they may be present. The Department of Environment and Conservation accepts no responsibility for this.

6. Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.

7. **It should be noted that the supplied data do not necessarily represent a comprehensive listing of the rare flora of the area in question. Its comprehensiveness is dependant on the amount of survey carried out within the specified area. The receiving organisation should employ a botanist, if required, to undertake a survey of the area under consideration.**

8. Acknowledgment of the Department of Environment and Conservation as source of the data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Environment and Conservation, Attention: The Manager, Species and Communities Branch.

9. The development of the PERTH Herbarium database was not originally intended for electronic mapping (eg. GIS ArcView). The latitude and longitude coordinates for each entry are not verified prior to being databased. It is only in recent times that collections have been submitted to PERTH with GPS recorded in latitude and longitude coordinates. Therefore, be aware when using this data in ArcView that some records may not plot to the locality description given with each collection.

THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

DECLARED RARE AND PRIORITY FLORA LIST

for Western Australia

CONSERVATION CODES

R: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

X: Declared Rare Flora - Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., 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.

2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Note, the need for further survey of poorly known taxa is prioritised into the three categories depending on the perceived urgency for determining the conservation status of those taxa, as indicated by the apparent degree of threat to the taxa based on the current information.

ABBREVIATIONS USED IN THREATENED FLORA DATABASE PRINTOUTS

VESTING

AGR	Chief Exec Dept of Agriculture
ALT	Aboriginal Land Trust
BAP	Baptist Union of WA Inc
BSA	Boy Scouts Association
CC	Conservation Commission – NPNCA - LFC
CGT	Crown Grant in Trust
COM	Commonwealth of Australia
CRO	Crown Freehold-Govt Ownership
DOL	Dept of Land Administration
DPU	Ministry for Planning
EXD	Exec Direc CALM
FRE	Freehold
HOW	Homeswest
ILD	Industrial Lands Develop. Auth
JOI	Joint Vesting-NPNCA & Shire
LAC	LandCorp
LFC	Lands and Forests Commission
MAG	Minister for Agriculture
MED	Ministry of Education
MHE	Minister for Health
MIN	Minister for Mines
MPL	Ministry for Planning
MPR	Minister for Prisons
MRD	Main Roads WA
MTR	Minister for Transport
MWA	Minister for Water Resources
MWO	Minister for Works
NAT	Natural Trust of Australia WA
NON	Not Vested
NPN	NPNCA
OTH	Other
PRI	Private
RAI	Westrail
SEC	Western Power
SHI	Shire
SPC	State Planning Commission
SWA	State of Western Australia
TEL	Telstra
TGR	Timber Govt Requirement
TOW	TOWN
UNK	Unknown
WAT	Water Corporation
WEL	Minister Community Welfare
WRC	Water & Rivers Commission
XPL	Ex-Pastoral Lease

PURPOSES

ABR	Aboriginal Reserve
AER	Aerodrome
AIR	Airport
CAM	Camping
CAR	Caravan park
CEM	Cemetery
CFA	Conservation of Fauna
CFF	Conservation Of Flora & Fauna
CFL	Conservation of Flora
CHU	Church
CPK	Car Park
COM	Common
CON	Conservation Park
DEF	Defence
DRA	Drain
EDE	Educational Endowment
EDU	Educational purposes UWA
ENE	Enjoyment of Natural Environ.
EXC	Excepted from sale
EXL	Exploration Lease
EXP	Experimental Farm
FIR	Firing Range
FOR	State Forest
GHA	Grain Handling
GOL	Golf
GRA	Gravel Pit
GRE	Green Belt
GVT	Government Requirements
HAR	Harbour Purposes
HEP	Heritage Purposes
HER	Heritage trail
HOS	Hospital
KEN	Kennels
MIN	Mining lease
MUN	Municipal Purposes
NPK	National Park
NRE	Nature Reserve
OTH	Other
PAC	Public access
PAR	Parkland (& Recreation)
PAS	Pastoral lease
PFF	Protection of Flora & Fauna
PFL	Protection of Flora
PIC	Picnic ground
PLA	Plantation
POS	Public Open Space
PPA	Public parkland
PRS	Prison site
PUT	Public Utility
QUA	Quarry
RAD	Radio Station
RAC	Racecourse
REC	Recreation
REH	Rehabilitation
RNP	Re-establish Native Plants
RRE	Railway Reserve
RUB	Rubbish
SAN	Sand
SCH	School-site
SET	Settlers requirements
SHI	Shire Requirements
SHO	Showgrounds
SNN	Sanitary
SOI	Soil Conservation
STO	Stopping place
TIM	Timber
TOU	Tourism
TOW	Town-site
TRA	Training Ground
TRI	Trig station
TVT	Television transmitting
UCL	Unallocated Crown Land
UNK	Unknown
UTI	Utilities
VCL	Vacant Crown Land
VER	Road Verge
VPF	Vermin Proof Fence
WAT	Water
WCO	Water & Conservation of F & F
WOO	Firewood

* Please note that LFC now comes under the Conservation Commission.

WAHERB SPECIMEN DATABASE GENERAL ENQUIRY

Acacia auricoma
Maslin (Mimosaceae)
CONSERVATION STATUS:P3
Coll.: T.S. Henshall 3306 Date: 12 12 1980 (PERTH 855456)
LOCALITY Petermann Ranges, Mannana Range, 14 km E of Docker River NT
LAT 24 Deg 58 Min Sec S LONG 129 Deg 10 Min Sec E
Small tree to 5 m tall. Rocky creek with sand traps at base of hills.
Previous det.: Acacia auricoma

Calotis latiuscula
F.Muell. & Tate (Asteraceae)
CONSERVATION STATUS:P3
Coll.: A.S. George 4849 Date: 08 07 1963 (PERTH 00421960)
LOCALITY Mount Fanny, NE of Blackstone Range WA
LAT 25 Deg 47 Min 0.000 Sec S LONG 128 Deg 34 Min 7.000 Sec E
Herb to 50 cm. Flowers yellow. On rocky hillside.
Previous det.: Calotis latiuscula F.Muell.& Tate

Calotis latiuscula
F.Muell. & Tate (Asteraceae)
CONSERVATION STATUS:P3
Coll.: A.S. George 12058 Date: 21 07 1974 (PERTH 585092)
LOCALITY 36km N along Docker River road from Giles Mulga Park road WA
LAT 24 Deg 56 Min Sec S LONG 128 Deg 45 Min Sec E
loamy on loamy flat
Previous det.: Calotis

Calotis latiuscula
F.Muell. & Tate (Asteraceae)
CONSERVATION STATUS:P3
Coll.: A.S. George 12119 Date: 24 07 1974 (PERTH 421987)
LOCALITY Rawlinson Range Pass of the Abencerrage WA
LAT 24 Deg 58 Min Sec S LONG 128 Deg 17 Min Sec E
rocky river bed
Previous det.: Calotis latiuscula

Calotis latiuscula
F.Muell. & Tate (Asteraceae)
CONSERVATION STATUS:P3
Coll.: G. Chippendale s.n. Date: 20 06 1958 (PERTH 00421995)
LOCALITY Giles WA
LAT 25 Deg 2 Min 6.000 Sec S LONG 128 Deg 18 Min 18.000 Sec E
on stony ridge
Previous det.: Calotis latiuscula F.Muell.& Tate

Comesperma viscidulum
F.Muell. (Polygalaceae)
CONSERVATION STATUS:P4
Coll.: J.B. Cleland s.n. Date: 20 06 1958 (PERTH 04069382)
LOCALITY Road S of Giles, Rawlinson Range WA
LAT 24 Deg 58 Min 30.000 Sec S LONG 128 Deg 15 Min 5.000 Sec E
Previous det.: Pityrodia lepidota (F.Muell.)E.Pritz.

Eucalyptus sparsa
Boomsma (Myrtaceae)
CONSERVATION STATUS:P3
Coll.: P.K. Latz 8045 Date: 11 09 1981 (PERTH 01073206)
LOCALITY S Docker River Settlement NT
LAT 25 Deg 7 Min Sec S LONG 129 Deg 7 Min Sec E
Mallee to 5 m smooth bark regrowth after fire. Sandy loam, valley between granitic outcrops. (HAD)
Frequency:rare.

Eucalyptus sparsa
Boomsma (Myrtaceae)
CONSERVATION STATUS:P3
Coll.: A.C. Kalotas 1555 Date: 04 06 1983 (PERTH 01465775)
LOCALITY On road to Wangkari, c. 15 km S of Docker River NT
LAT 25 Deg 2 Min Sec S LONG 129 Deg 9 Min Sec E
Large spreading mallee to 7 m high. Gravelly soil by creekline. Pitjantjatjara name = pilanpa given by Tommy Wilpinytja of Docker River
Previous det.: Eucalyptus sparsa Boomsma

Fuirena nudiflora
S.T.Blake (Cyperaceae)
CONSERVATION STATUS:P1
Coll.: A.S. George 8801 Date: 20 07 1967 (PERTH 1741063)
LOCALITY Glen Helen, Rawlinson Range WA
LAT 24 Deg 58 Min Sec S LONG 128 Deg 8 Min Sec E
Rocky creek bed in valley.
Previous det.: Fuirena nudiflora S.T. Blake

Goodenia gibbosa
Carolin (Goodeniaceae)
CONSERVATION STATUS:P1
Coll.: A.S. George 8780 Date: 20 07 1967 (PERTH 02605082)
LOCALITY Near Pass of the Abencerrages, Rawlinson Range WA
LAT 24 Deg 57 Min 29.000 Sec S LONG 128 Deg 17 Min 11.000 Sec E
Prostrate with bright yellow flowers. In rocky, sandy loam. With spinifex.

Isotropis winneckei
F.Muell. (Papilionaceae)
CONSERVATION STATUS:P1

Coll.: A.S. George 8783 Date: 20 07 1967 (PERTH 2870428)
LOCALITY Near Glen Helen, Rawlinson Range WA
LAT 24 Deg 59 Min 42.000 Sec S LONG 128 Deg 8 Min 36.000 Sec E
Perennial herb; flowers deep pink. Rocky rise. Among spinifex with scattered Acacia.
Previous det.: Isotropis sp.

Isotropis winneckei
F.Muell. (Papilionaceae)
CONSERVATION STATUS:P1
Coll.: A.C. Beauglehole & E.G. Errey ACB 60682 Date: 22 09 1978 (PERTH 06152309)
LOCALITY S side of Petermann Range; W of WA - NT Border WA
LAT 25 Deg 2 Min Sec S LONG 128 Deg 54 Min Sec E

Lythrum paradoxum
Koehne (Lythraceae)
CONSERVATION STATUS:P3
Coll.: B. Lay 865 Date: 29 08 1973 (PERTH 04903242)
LOCALITY Fanny's Peak [Mount Fanny], ca 85 km S of Giles Meteorological Station, on road to Warburton Mission WA
LAT 25 Deg 47 Min 0.000 Sec S LONG 128 Deg 34 Min 42.000 Sec E
Perennial. Shrub 1 m high x 2 m in diameter. Rocky gully.
Previous det.: Lythrum paradoxum Koehne
Frequency:common.

Prostanthera centralis
B.J.Conn (Lamiaceae)
CONSERVATION STATUS:P3
Coll.: S. Carlquist 5173 Date: 24 07 1974 (PERTH 03728358)
LOCALITY Abencengares Pass [Pass of the Abencerrage] WA
LAT 24 Deg 57 Min 29.000 Sec S LONG 128 Deg 17 Min 11.000 Sec E
With Eremophila, Acacia and Marsilea.
Previous det.: Prostanthera sp.

Prostanthera centralis
B.J.Conn (Lamiaceae)
CONSERVATION STATUS:P3
Coll.: Morcombe s.n. Date: 24 08 1973 (PERTH 04959019)
LOCALITY Glen Cumming WA
LAT 24 Deg 59 Min 35.000 Sec S LONG 128 Deg 23 Min 11.000 Sec E
Previous det.: Prostanthera sp.

Prostanthera centralis
B.J.Conn (Lamiaceae)
CONSERVATION STATUS:P3
Coll.: A.S. George 8293 Date: 03 10 1966 (PERTH 03507211)
LOCALITY Pass of the Abencerrages, Rawlinson Range WA
LAT 24 Deg 58 Min Sec S LONG 128 Deg 17 Min Sec E
Shrub 40 cm, flowers with purple calyx and mauve corolla. On higher slopes.
Frequency:rare.

Prostanthera centralis
B.J.Conn (Lamiaceae)
CONSERVATION STATUS:P3
Coll.: D.J. Pearson DJP 4039 Date: 01 05 1994 (PERTH 04626753)
LOCALITY Glen Gerald, Rawlinson Range, WA
LAT 24 Deg 59 Min 23.000 Sec S LONG 128 Deg 22 Min 43.000 Sec E
Erect dwarf shrub 50 cm high, mauve flowers. Rocky hill, red clayey sand over quartzite. Hummock grassland, Triodia sp., Eucalyptus sp. Abundance: occasional.
Previous det.: Prostanthera suborbicularis

Prostanthera centralis
B.J.Conn (Lamiaceae)
CONSERVATION STATUS:P3
Coll.: A.S. George 8812 Date: 20 07 1967 (PERTH 03507246)
LOCALITY Glen Helen, Rawlinson Range WA
LAT 24 Deg 58 Min Sec S LONG 128 Deg 8 Min Sec E
Small shrub to 50 cm, flowers pale purple. Higher slopes.
Previous det.: Prostanthera sp.
Frequency:occasional.

Prostanthera centralis
B.J.Conn (Lamiaceae)
CONSERVATION STATUS:P3
Coll.: A.S. George 8277 Date: 03 10 1966 (PERTH 03507203)
LOCALITY Rawlinson Range, c. 32 miles W of Giles WA
LAT 24 Deg 58 Min 30.000 Sec S LONG 128 Deg 15 Min 5.000 Sec E
Shrub to 50 cm, calyx purple, corolla mauve. On rocky slopes near foot of range.

Schoenus centralis
Latz (Cyperaceae)
CONSERVATION STATUS:P1
Coll.: A.S. George 8796 Date: 20 07 1967 (PERTH 1119311)
LOCALITY Glen Helen, Rawlinson Range WA
LAT 24 Deg 58 Min Sec S LONG 128 Deg 8 Min Sec E
Ephemeral sedge. In rocky creek bed in valley.
Previous det.: Schoenus centralis P. Latz

Total No. of Records = 1

Species Name	Cons. Code	Status	Pop ID	No. Plants	Latitude	Longitude	Purpose	Vest
Isotropis winneckei	1		1		24^59'36.9"	128^08'40.8"	Aboriginal Reserve	ALT

Appendix C

Search Results for the Department of Environment and Conservation Threatened Ecological Communities Database

Trinity File

From: Podesta, Mia [Mia.Podesta@dec.wa.gov.au]
Sent: Friday, 18 April 2008 3:05 PM
To: Trinity File
Subject: Results of TEC/PEC Search - Wingellina (OE)

Hi Trinity,

I refer to your request on the 18th of April 2008 for information on threatened and priority ecological communities occurring within 50km radius of the search areas co-ordinates: Search 1: -25.4082598 and Search 2: -26.6832718, 128.2500009.

A search was undertaken on the Department's Threatened Ecological Communities database. Please note that there are no known occurrences of threatened or priority ecological communities recorded within these boundaries.

Attached are the conditions under which this information has been supplied. The information supplied should be regarded as an indication only of the threatened and priority ecological communities that may be present.

It would be appreciated if any occurrences of threatened and priority ecological communities encountered by you in the area could be reported to this Department to ensure their ongoing management.

An invoice for $165 (including GST) for the supply of this information will be forwarded. Please note that all TEC/PEC searches where records are found are now provided as shapefiles, and will be a standard price of $220 due to changes in the way we produce information for searches.

Regards

Mia

Mia Podesta (nee Morley)
Ecologist - Threatened Ecological Community Database
Department of Environment and Conservation, Kensington
Ph: 9334 0116
Fax: 9334 0300
Email: Mia.Podesta@dec.wa.gov.au

From: Trinity File [mailto:trinity.file@outbackecology.com]
Sent: Friday, 18 April 2008 2:12 PM
To: Podesta, Mia
Subject: Ecological Community Database Search Request

Hi Mia,

Can you please provide me with 2 separate Threatened Ecological Communities database searches, with an area of 50km radius around the following central coordinates:

Search 1. Central Coordinate: Eastings 460442 Northings 7189777 MGA Zone 52

Search 2. Central Coordinate: Eastings 425380 Northings 7048415 MGA Zone 52

The search is being conducted on behalf of Metals X Limited for their Wingellina Nickel Project on the corner of the WA, SA and NT borders. The information is being sought as part of a desktop study which is to be used for supporting information in a Clearing Permit Application (CPA). The two CPAs are for areas in which Metals X plans to explore for water.

The preferred delivery format of the search results is electronic.

An invoice (~$250 + GST) can be raised to Outback Ecology at 1/71 Troy terrace, Jolimont 6014.

I can be reached on 9388 8799 or via return email if you require any further information.

Thank you for your assistance.

Kind regards

Trinity

Trinity File

Eastern Australia Business Manager
Outback Ecology

1/71 Troy Terrace
JOLIMONT WA 6014
Ph: +61 8 9388 8799
Fax: +61 8 9388 8633
www.outbackecology.com

Appendix D

Search Results of the Federal Government Environment Protection and Biodiversity Conservation Act Protected Matters Database

Wingellina - E69/2453

EPBC Act Protected Matters Report

19 May 2008 14:58

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

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Search Type: Point

Buffer: 100 km

Coordinates: -25.408341,128.6066

Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	7
Migratory Species:	6

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Places on the RNE:	1
Listed Marine Species:	4
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Leipoa ocellata * Malleefowl	Vulnerable	Species or species habitat likely to occur within area
Polytelis alexandrae * Princess Parrot, Alexandra's Parrot	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasycercus cristicauda * Mulgara	Vulnerable	Species or species habitat likely to occur within area
Notoryctes caurinus *	Endangered	Species or species habitat likely

Karkarratul, Northern Marsupial Mole		to occur within area
Notoryctes typhlops * Yitjarritjarri, Southern Marsupial Mole	Endangered	Species or species habitat likely to occur within area
*Petrogale lateralis MacDonnell Ranges race** Warru, Black-footed Rock-wallaby (MacDonnell Ranges race)	Vulnerable	Species or species habitat may occur within area
Reptiles		
Egernia kintorei * Great Desert Skink, Tjakura, Warrarna, Mulyamiji	Vulnerable	Species or species habitat may occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Leipoa ocellata * Malleefowl	Migratory	Species or species habitat likely to occur within area
Merops ornatus * Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Migratory	Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Charadrius veredus	Listed -	Species or species habitat may

Oriental Plover, Oriental Dotterel	overfly marine area	occur within area
Glareola maldivarum Oriental Pratincole	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus * Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Defence

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Ranges of the Western Desert WA

Extra Information

State and Territory Reserves [Dataset Information]

Ngaanyatjarra Lands Indigenous Protected Area, WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria

- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Appendix E
Search Results of the Department of Environment and Conservation Threatened and Priority Fauna Database

24.837 °S 128.09 °E / 25.868 °S 129.032 °E Search area 1 (plus~50km buffer)

*	Date	Certainty	Seen	Location Name	Method

Schedule 1 - Fauna that is rare or is likely to become extinct

Petrogale lateralis ssp. (ANWC CM15314) **Black-footed Rock-wallaby, Warru (Mc** *1 records*

This species thrives in steep, complex rocky habitats providing tunnels, caves and crevices for shelter and protection from predators.

	1	1	Ngaanyatjarra-Giles	

Schedule 4 - Other specially protected fauna

Falco peregrinus **Peregrine Falcon** *1 records*

This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land.

1974	1	1	Warrupura	Day sighting

Priority Four: Taxa in need of monitoring

Burhinus grallarius **Bush Stonecurlew** *1 records*

A well camouflaged, ground nesting bird which prefers to 'freeze' rather than fly when disturbed. It inhabits lightly timbered open woodlands.

2001	1		NGAANYATJARRA-GILES

***** Information relating to any records provided for listed species:-
Date: date of recorded observation
Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.
Seen: Number of individuals observed.
Location Name: Name of reserve or nearest locality where observation was made
Method: Method or type of observation

Appendix F

Search Results of Western Australian Museum's (WAM) Faunabase Database

WA Museum FaunaBase Search Results for Vertebrate Terrestrial Fauna

Reptiles collected between -24.5612, 125.65 and -27.0071, 128.9754

Agamidae
Caimanops amphiboluroides
Ctenophorus caudicinctus graafi
Ctenophorus clayi
Ctenophorus fordi
Ctenophorus isolepis gularis
Ctenophorus nuchalis
Ctenophorus reticulatus
Ctenophorus rufescens
Ctenophorus scutulatus
Diporiphora winneckei
Lophognathus longirostris
Moloch horridus
Pogona minor minor
Tympanocryptis lineata centralis

Boidae
Antaresia stimsoni stimsoni

Elapidae
Acanthophis pyrrhus
Brachyurophis fasciolata fasciata
Brachyurophis semifasciata
Demansia psammophis psammophis
Furina ornata
Parasuta monachus
Pseudechis australis
Pseudonaja modesta
Pseudonaja nuchalis
Simoselaps anomalus
Suta fasciata

Gekkonidae
Diplodactylus conspicillatus
Diplodactylus damaeus
Diplodactylus pulcher
Diplodactylus stenodactylus
Gehyra montium
Gehyra purpurascens
Gehyra variegata
Heteronotia binoei
Nephrurus laevissimus
Nephrurus levis levis
Nephrurus vertebralis
Rhynchoedura ornata
Strophurus ciliaris aberrans
Strophurus elderi
Strophurus strophurus

Pygopodidae
Delma nasuta
Delma pax
Pygopus nigriceps

Scincidae
Cryptoblepharus plagiocephalus
Ctenotus alacer
Ctenotus ariadnae
Ctenotus brooksi brooksi
Ctenotus dux
Ctenotus helenae
Ctenotus leonhardii
Ctenotus pantherinus ocellifer
Ctenotus quattuordecimlineatus
Ctenotus schomburgkii
Ctenotus septenarius
Cyclodomorphus melanops elongatus
Cyclodomorphus melanops melanops
Egernia depressa
Egernia inornata
Egernia kintorei
Egernia striata
Eremiascincus richardsonii
Lerista bipes
Lerista desertorum
Lerista ips
Lerista labialis
Lerista muelleri
Menetia greyii
Morethia boulengeri
Proablepharus reginae
Tiliqua multifasciata

Typhlopidae
Ramphotyphlops endoterus
Ramphotyphlops waitii

Varanidae
Varanus acanthurus
Varanus eremius
Varanus giganteus
Varanus gilleni
Varanus gouldii
Varanus tristis tristis

Mammals collected between -24.9071, 126.2412 and -27.0318, 128.9507

Canidae
Canis lupus dingo

Dasyuridae
Antechinomys laniger
Dasycercus cristicauda
Ningaui ridei
Pseudantechinus macdonnellensis
Sminthopsis crassicaudata
Sminthopsis hirtipes
Sminthopsis longicaudata
Sminthopsis ooldea

Macropodidae
Lagorchestes hirsutus
Macropus robustus erubescens
Petrogale lateralis lateralis

Molossidae
Tadarida australis

Muridae
Mus musculus
Notomys alexis
Pseudomys desertor
Pseudomys hermannsburgensis

Myrmecobiidae
Myrmecobius fasciatus

Notoryctidae
Notoryctes caurinus
Notoryctes typhlops

Peramelidae
Isoodon auratus auratus

Thylacomyidae
Macrotis lagotis

Vespertilionidae
Chalinolobus gouldii
Nyctophilus geoffroyi
Vespadelus finlaysoni

Birds collected between -24.5612, 126.1673 and -27.0318, 128.9261

Acanthizidae
Acanthiza apicalis
Aphelocephala leucopsis
Aphelocephala nigricincta
Pyrrholaemus brunneus

Cinclosomatidae
Cinclosoma castaneothorax marginatum
Cinclosoma castanotus

Climacteridae
Climacteris rufa

Columbidae
Geophaps plumifera
Geophaps plumifera ferruginea
Ocyphaps lophotes

Corvidae
Corvus orru
Corvus orru cecilae

Cracticidae
Cracticus tibicen tibicen

Cuculidae
Chrysococcyx osculans

Dicruridae
Rhipidura fuliginosa

Maluridae
Amytornis purnelli purnelli
Amytornis striatus striatus
Malurus lamberti assimilis
Malurus splendens musgravi
Stipiturus ruficeps ruficeps

Megapodiidae
Leipoa ocellata

Meliphagidae
Certhionyx variegatus
Lichenostomus keartlandi
Lichenostomus penicillatus
Manorina flavigula

Otididae
Ardeotis australis

Pachycephalidae
Colluricincla harmonica rufiventris

Petroicidae
Microeca fascinans assimilis

Podargidae
Podargus strigoides brachypterus

Pomatostomidae
Pomatostomus superciliosus

Psittacidae
Cacatua roseicapilla
Platycercus zonarius zonarius
Polytelis alexandrae

Amphibia collected between -24.7588, 126.3151 and -27.0812, 128.9507

Hylidae
Cyclorana platycephala

Myobatrachidae
Neobatrachus centralis
Neobatrachus sutor
Pseudophryne occidentalis

Appendix G

Search Results of the Birds Australia Atlas Database and Regional Summaries (Central Ranges Bioregion)

Birds Australia Atlas – Database Search Results

IBRA Region:	**Central Ranges**		**CR**	
Physical characteristics	*Area*	Total area of region:	10,120,033	ha
	Rainfall Index	Comparison with average rainfall:		
		Atlas period 1:	0.21	
		Atlas period 2:	0.62	
		Difference in rainfall index between Atlas periods:	No change	
	Use Index	Use zone:	Extensive	
		Percent cleared:	0.0	
		Continental stress:	Very low	
Number of surveys	*Atlas 1*	10 min surveys:	163	
		60 min surveys:	55	
		10 min surveys used for analysis:	102	
	Atlas 2	2-ha searches:	102	
		500 m area searches:	125	
		5 km area searches:	27	
		Area searches used for analysis:	75	
		Incidental records:	32	

Comments

The birds of the Central Ranges were not well surveyed in either Atlas period, but the composition of the avifauna appears to resemble that of other semi-arid bioregions. One limited range taxon, the Princess Parrot, was seen in the bioregion during the first Atlas period. The only other feature that sets the bioregion apart is the absence of any exotic species. The apparent decline in ground-nesting birds and of ground-feeding insectivores should be investigated at a larger scale.

Status:	Typical semi-arid avifauna.
Rare and threatened:	No major populations.
Increasers:	None indicative of landscape health.
Indicators:	Emu, Australian Bustard, Banded Lapwing, White-browed Treecreeper, Jacky Winter.
Trend:	Possible decline in ground-nesting species.
Scenario:	Probably little change.
Actions	Ensure representative areas have an appropriate fire regime to maintain diversity.

Central Ranges

CR

Area (ha)	10,120,033	26	th largest bioregion	

Class	Value	Rank (1 high-85 low)	IBRA average	IBRA total	Units
All species					
Atlas period 1	141	76	232	698	
Atlas period 2	125	82	226	731	
Both periods	151	81	254	743	
Australian resident species					
No. species	146	75	215	555	
No. genera	105	76	139	248	
Species/genus	1.39	80	1.53	2.24	
Species:area ratio	0.31	81	0.33	0.41	ln(no. species)/ln(bioregion area)
Australian endemic species					
No. endemic species	101	67	124	355	
Endemic/total resident species	0.69	4	0.58	0.64	
Range limitation					
Index of range limitation (frequency)	9.2	82	20.4	100	Sum(100/ no. bioregions)
Index of range limitation (reporting rate)	9.9	78	22.7	100	Sum(100xreporting rate/ no. bioregions)
No. species recorded in 10 or fewer bioregions	1	76	8	154	
Index of importance of bioregion to species recorded in 10 or fewer bioregions	0.1	72	1.2	100	Sum(100/ no. bioregions)
Threatened taxa					
No. Critically Endangered taxa	0		-	15	
No. Endangered taxa	0		-	24	
No. Vulnerable taxa	0		-	35	
Total	0	85	4.0	74	
Introduced species					
Exotic species					
No. species	0	85	6.3	30	
Representation in bioregion	0.0	85	2.6	5.4	No. ESx100/ no. spp. in bioregion
Relative abundance in bioregion	0.0	85	2.6	100	Rep. rate ESx100/ Rep rate spp. in bioregion
Percentage of Australian total	0.0	85	20.9	100	No. ES in regionx100/ no. ES in Australia
Australian translocated species					
No. species	0	85	0.9	16	
Representation in bioregion	0.0	85	0.4	3	No. ATSx100/ no. spp. in bioregion
Relative abundance in bioregion	0.0	85	0.3	100	Rep. rate ATSx100/ Rep rate spp. in bioregion
Percentage of Australian total	0.0	85	5.5	100	No. ATS in regionx100/ no. ATS in Australia

Total introduced species					
No. species	0	85	7.2	36	
Representation in bioregion	0.0	85	2.9	6	No. TISx100/ no. spp. in bioregion
Relative abundance in bioregion	0.0	85	3.0	100	Rep. rate TISx100/ Rep rate spp. in bioregion
Percentage of Australian total	0.0	85	15.5	100	No. TIS in regionx100/ no. TIS in Australia

Central Ranges

Order	Atlas species no	Common name	Scientific name	Proportion of sightings in bioregion
1	1	**Emu**	*Dromaius novaehollandiae*	Medium
2	9	**Stubble Quail**	*Coturnix pectoralis*	Low
3	11	**Brown Quail**	*Coturnix ypsilophora*	Low
4	205	**Plumed Whistling-Duck**	*Dendrocygna eytoni*	Low
5	214	**Freckled Duck**	*Stictonetta naevosa*	Low
6	202	**Australian Wood Duck**	*Chenonetta jubata*	Low
7	208	**Pacific Black Duck**	*Anas superciliosa*	Medium
8	211	**Grey Teal**	*Anas gracilis*	Medium
9	213	**Pink-eared Duck**	*Malacorhynchus membranaceus*	Medium
10	215	**Hardhead**	*Aythya australis*	Low
11	61	**Australasian Grebe**	*Tachybaptus novaehollandiae*	Low
12	62	**Hoary-headed Grebe**	*Poliocephalus poliocephalus*	Low
13	97	**Little Black Cormorant**	*Phalacrocorax sulcirostris*	Low
14	96	**Great Cormorant**	*Phalacrocorax carbo*	Low
15	106	**Australian Pelican**	*Pelecanus conspicillatus*	Low
16	188	**White-faced Heron**	*Egretta novaehollandiae*	Medium
17	189	**White-necked Heron**	*Ardea pacifica*	Low
18	180	**Straw-necked Ibis**	*Threskiornis spinicollis*	Low
19	232	**Black-shouldered Kite**	*Elanus axillaris*	Medium
20	231	**Black-breasted Buzzard**	*Hamirostra melanosternon*	Medium
21	229	**Black Kite**	*Milvus migrans*	Medium
22	228	**Whistling Kite**	*Haliastur sphenurus*	Medium
23	218	**Spotted Harrier**	*Circus assimilis*	Medium
24	221	**Brown Goshawk**	*Accipiter fasciatus*	Medium
25	222	**Collared Sparrowhawk**	*Accipiter cirrhocephalus*	Medium
26	224	**Wedge-tailed Eagle**	*Aquila audax*	**High**
27	225	**Little Eagle**	*Hieraaetus morphnoides*	Medium
28	239	**Brown Falcon**	*Falco berigora*	**High**
29	235	**Australian Hobby**	*Falco longipennis*	Medium
30	236	**Grey Falcon**	*Falco hypoleucos*	Medium
31	238	**Black Falcon**	*Falco subniger*	Medium
32	237	**Peregrine Falcon**	*Falco peregrinus*	Medium
33	240	**Nankeen Kestrel**	*Falco cenchroides*	**High**
34	58	**Purple Swamphen**	*Porphyrio porphyrio*	Low
35	59	**Eurasian Coot**	*Fulica atra*	Low
36	176	**Australian Bustard**	*Ardeotis australis*	Medium
37	18	**Little Button-quail**	*Turnix velox*	Medium
38	158	**Common Greenshank**	*Tringa nebularia*	Low
39	154	**Wood Sandpiper**	*Tringa glareola*	Low
40	167	**Broad-billed Sandpiper**	*Limicola falcinellus*	Low
41	174	**Bush Stone-curlew**	*Burhinus grallarius*	Low
42	148	**Red-necked Avocet**	*Recurvirostra novaehollandiae*	Low

43	143	**Red-capped Plover**	*Charadrius ruficapillus*	Low
44	142	**Oriental Plover**	*Charadrius veredus*	Low
45	145	**Inland Dotterel**	*Peltohyas australis*	Low
46	144	**Black-fronted Dotterel**	*Elseyornis melanops*	Medium
47	132	**Red-kneed Dotterel**	*Erythogonys cinctus*	Low
48	135	**Banded Lapwing**	*Vanellus tricolor*	Low
49	133	**Masked Lapwing**	*Vanellus miles*	Low
50	173	**Australian Pratincole**	*Stiltia isabella*	Low
51	111	**Gull-billed Tern**	*Sterna nilotica*	Low
52	34	**Common Bronzewing**	*Phaps chalcoptera*	Medium
53	43	**Crested Pigeon**	*Ocyphaps lophotes*	**High**
54	42	**Spinifex Pigeon**	*Geophaps plumifera*	Medium
55	31	**Diamond Dove**	*Geopelia cuneata*	Medium
56	264	**Red-tailed Black-Cockatoo**	*Calyptorhynchus banksii*	Low
57	273	**Galah**	*Eolophus roseicapillus*	**High**
58	271	**Little Corella**	*Cacatua sanguinea*	Medium
59	270	**Major Mitchell's Cockatoo**	*Cacatua leadbeateri*	Medium
60	274	**Cockatiel**	*Nymphicus hollandicus*	Medium
61	279	**Princess Parrot**	*Polytelis alexandrae*	Low
62	294	**Australian Ringneck**	*Barnardius zonarius*	**High**
63	296	**Mulga Parrot**	*Psephotus varius*	**High**
64	310	**Budgerigar**	*Melopsittacus undulatus*	**High**
65	304	**Bourke's Parrot**	*Neopsephotus bourkii*	Medium
66	303	**Scarlet-chested Parrot**	*Neophema splendida*	Low
67	337	**Pallid Cuckoo**	*Cuculus pallidus*	Medium
68	341	**Black-eared Cuckoo**	*Chrysococcyx osculans*	Medium
69	342	**Horsfield's Bronze-Cuckoo**	*Chrysococcyx basalis*	Medium
70	242	**Southern Boobook**	*Ninox novaeseelandiae*	Medium
71	249	**Barn Owl**	*Tyto alba*	Medium
72	313	**Tawny Frogmouth**	*Podargus strigoides*	Medium
73	331	**Spotted Nightjar**	*Eurostopodus argus*	Medium
74	317	**Australian Owlet-nightjar**	*Aegotheles cristatus*	Medium
75	325	**Red-backed Kingfisher**	*Todiramphus pyrrhopygia*	Medium
76	326	**Sacred Kingfisher**	*Todiramphus sanctus*	Low
77	329	**Rainbow Bee-eater**	*Merops ornatus*	Medium
78	561	**White-browed Treecreeper**	*Climacteris affinis*	Medium
79	532	**Splendid Fairy-wren**	*Malurus splendens*	Medium
80	536	**Variegated Fairy-wren**	*Malurus lamberti*	**High**
81	535	**White-winged Fairy-wren**	*Malurus leucopterus*	Medium
82	528	**Rufous-crowned Emu-wren**	*Stipiturus ruficeps*	Low
83	513	**Striated Grasswren**	*Amytornis striatus*	Low
84	511	**Dusky Grasswren**	*Amytornis purnelli*	Medium
85	570	**Red-browed Pardalote**	*Pardalotus rubricatus*	Medium
86	976	**Striated Pardalote**	*Pardalotus striatus*	Medium
87	497	**Redthroat**	*Pyrrholaemus brunneus*	Medium
88	465	**Weebill**	*Smicrornis brevirostris*	Medium
89	463	**Western Gerygone**	*Gerygone fusca*	Medium
90	476	**Inland Thornbill**	*Acanthiza apicalis*	Medium
91	481	**Chestnut-rumped Thornbill**	*Acanthiza uropygialis*	Medium
92	480	**Slaty-backed Thornbill**	*Acanthiza robustirostris*	Medium
93	486	**Yellow-rumped Thornbill**	*Acanthiza chrysorrhoa*	**High**
94	466	**Southern Whiteface**	*Aphelocephala leucopsis*	**High**
95	469	**Banded Whiteface**	*Aphelocephala nigricincta*	Medium
96	640	**Spiny-cheeked Honeyeater**	*Acanthagenys rufogularis*	**High**
97	635	**Yellow-throated Miner**	*Manorina flavigula*	**High**
98	608	**Singing Honeyeater**	*Lichenostomus virescens*	**High**
99	621	**Grey-headed Honeyeater**	*Lichenostomus keartlandi*	Medium

100	623	**Grey-fronted Honeyeater**	*Lichenostomus plumulus*	Medium
101	625	**White-plumed Honeyeater**	*Lichenostomus penicillatus*	**High**
102	597	**Brown Honeyeater**	*Lichmera indistincta*	Medium
103	594	**White-fronted Honeyeater**	*Phylidonyris albifrons*	Medium
104	599	**Grey Honeyeater**	*Conopophila whitei*	Low
105	589	**Black Honeyeater**	*Certhionyx niger*	Low
106	602	**Pied Honeyeater**	*Certhionyx variegatus*	Medium
107	449	**Crimson Chat**	*Epthianura tricolor*	**High**
108	450	**Orange Chat**	*Epthianura aurifrons*	Medium
109	448	**White-fronted Chat**	*Epthianura albifrons*	Low
110	377	**Jacky Winter**	*Microeca fascinans*	Medium
111	381	**Red-capped Robin**	*Petroica goodenovii*	**High**
112	385	**Hooded Robin**	*Melanodryas cucullata*	**High**
113	443	**Grey-crowned Babbler**	*Pomatostomus temporalis*	Low
114	445	**White-browed Babbler**	*Pomatostomus superciliosus*	**High**
115	865	**Chiming Wedgebill**	*Psophodes occidentalis*	Medium
116	437	**Chestnut Quail-thrush**	*Cinclosoma castanotus*	Low
117	438	**Chestnut-breasted Quail-thrush**	*Cinclosoma castaneothorax*	Medium
118	549	**Varied Sittella**	*Daphoenositta chrysoptera*	Medium
119	419	**Crested Bellbird**	*Oreoica gutturalis*	**High**
120	401	**Rufous Whistler**	*Pachycephala rufiventris*	**High**
121	408	**Grey Shrike-thrush**	*Colluricincla harmonica*	**High**
122	728	**Restless Flycatcher**	*Myiagra inquieta*	Low
123	415	**Magpie-lark**	*Grallina cyanoleuca*	**High**
124	361	**Grey Fantail**	*Rhipidura fuliginosa*	Low
125	364	**Willie Wagtail**	*Rhipidura leucophrys*	**High**
126	424	**Black-faced Cuckoo-shrike**	*Coracina novaehollandiae*	**High**
127	423	**Ground Cuckoo-shrike**	*Coracina maxima*	Medium
128	430	**White-winged Triller**	*Lalage sueurii*	Medium
129	543	**White-breasted Woodswallow**	*Artamus leucorhynchus*	Medium
130	544	**Masked Woodswallow**	*Artamus personatus*	Medium
131	545	**White-browed Woodswallow**	*Artamus superciliosus*	Low
132	546	**Black-faced Woodswallow**	*Artamus cinereus*	**High**
133	548	**Little Woodswallow**	*Artamus minor*	Medium
134	702	**Grey Butcherbird**	*Cracticus torquatus*	Medium
135	700	**Pied Butcherbird**	*Cracticus nigrogularis*	**High**
136	705	**Australian Magpie**	*Gymnorhina tibicen*	**High**
137	930	**Australian Raven**	*Corvus coronoides*	Low
138	691	**Little Crow**	*Corvus bennetti*	**High**
139	692	**Torresian Crow**	*Corvus orru*	**High**
140	681	**Western Bowerbird**	*Chlamydera guttata*	Medium
141	647	**Australian Pipit**	*Anthus novaeseelandiae*	**High**
142	653	**Zebra Finch**	*Taeniopygia guttata*	**High**
143	654	**Painted Finch**	*Emblema pictum*	Medium
144	564	**Mistletoebird**	*Dicaeum hirundinaceum*	Medium
145	358	**White-backed Swallow**	*Cheramoeca leucosternus*	Medium
146	357	**Welcome Swallow**	*Hirundo neoxena*	Medium
147	359	**Tree Martin**	*Hirundo nigricans*	Medium
148	360	**Fairy Martin**	*Hirundo ariel*	Medium
149	507	**Spinifexbird**	*Eremiornis carteri*	Low
150	509	**Rufous Songlark**	*Cinclorhamphus mathewsi*	Medium
151	508	**Brown Songlark**	*Cinclorhamphus cruralis*	**High**

Appendix H

Refugia for Biological Diversity in Arid and Semi-arid Australia

Refugia for Biological Diversity in Arid and Semi-arid Australia

Biodiversity Series, Paper No. 4
Biodiversity Unit

S.R. Morton, J. Short and R.D. Barker
with an Appendix by G.F. Griffin and G. Pearce

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6.8. Central Ranges

Area

99,258 km2.

Primary land-use

Aboriginal use, cattle grazing

National Parks and Nature Reserves

None.

Management problems

Rabbit and fox control (Copley *et al*. 1989; Pearson 1992).

ANZECC-listed species

Mammals: The black-footed rock-wallaby *Petrogale lateralis* (V) is known from the Region but continues to decline (Copley *et al*. 1989; Eldridge *et al*. 1992; Pearson 1992).

Plants: *Ricinocarpos gloria-medii* (V) (Leigh *et al*. 1984, p. 199).

Species that are regionally endemic

The agamid lizard *Ctenophorus rufescens* and the skink *Lerista speciosa* (Cogger 1992).

Solem (1993) noted the presence of an extensive radiation of camaenid land-snails on the rocky ranges throughout the Region. The following species appear endemic: *Pleuroxia everardensis* (on the Everard Ranges), *P. carmeena* (Everard Ranges), *P. radiata* (Mann Ranges), *Sinumelon hullanum* (only from Lasseter's Cave, Petermann Ranges), *S. musgravei* (Musgrave Ranges), *S. amatensis* (Musgrave Ranges), *S. pumilio* (Everard Ranges), *Basedowena cognata* (Petermann Ranges and Schwerin Mural Crescent), *B. cottoni* (Mann Ranges), *B. gigantea* (Mann Ranges), *B. vulgata* (Tomkinson Ranges), *B. katjawarana* (Mann Ranges), *B. papulankutjana* (Blackstone Range), *Minimelon colmani* (widespread), *Tatemelon musgum* (Musgrave Ranges), *T. herberti* (Musgrave Ranges), *T. inexpectatum* (Musgrave Ranges), *T. everardensis* (Everard Ranges), *Eximiorhagada asperrima* (Mann Ranges), *Montanomelon angatjana* (Mann Ranges), *Semotrachia minuta* (Everard Ranges), *S. illbilleeana* (Everard Ranges), *S. basedowi* (Musgrave Ranges), *S. mannennsis* (Mann Ranges), *S. discoidea* (Musgrave Ranges), *S. plana* (Musgrave Ranges), *Dirutrachia mersa* (Musgrave Ranges), and *D. ponderi* (Everard Ranges).

Relict populations

One population of brushtail possums *Trichosurus vulpecula* is known from Irving Creek in the Petermann Ranges (Kerle *et al*. 1992).

Other significant populations

Many birds use the gullies of the ranges, but none of the species appears confined to the Region (Shurcliff 1980).

Wetland sites

No information.

Refugia

Although there is evidence that land-snails have speciated to a considerable extent on the isolated outcrops of the Central Ranges, the lack of clear evidence from other taxa (especially plants) causes us not to list any refugia pending further investigation.

Last updated: Sunday, 20-Jun-2004 05:16:21 EST

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Appendix I

Search Results of the Australian Wetlands Database

A Directory of Important Wetlands in Australia

To save this report to your computer, use File/Save as, and use a .TXT file extension.

Rock Pools of the Walter James Range - WA014

Level of importance: National - Directory

Location: 24 degrees 40' S, 128 degrees 46' E; 62 km north-east of Giles Meteorological Station, 40 km north-west of Docker River (Northern Territory).

Biogeographic region: Central Ranges

Shire: Ngaanyatjarraku.

Area: Each pool is c. 9 m diameter.

Elevation: c. 500 m ASL.

Other listed wetlands in same aggregation: None.

Wetland type: B17

Criteria for inclusion: 1, 3, 6,

Site description: Identified by various names on maps (Bungabiddy Rockhole, Bangalburi Rockhole), the Aboriginal name for the two large rock pools on the eastern side of the Walter James Range is Pungkilpirri. Nearby wetlands: Lake Gruszka (WA039) lies 295 km west south-west.

Physical features: Landform: Two permanent rock pools, c. 9 m in diameter and c. 4 m deep, each at the base of a waterfall. The rock pools lie along a temporary creek which drains the range after rain and they are formed by corrasion of the sandstone at the base of the waterfalls. The lower pool is backed by a 6 m cliff which must be climbed to reach the upper pool. A narrow 50 m stretch of gorge inclines gently to the upper pool which is c. 15 m above the lower. There is a small amount of gravel in the pools which are very turbulent ('tumble pools') when the creek is flowing. Geological setting: Set in the Amadeus Basin, the Walter James Range is a small range of stratified quartzite sandstone surrounded by alluvial and aeolian sandplain broken by other isolated ranges. The steep scree slopes and small cliffs of the gorge rise 200 m above the pools. Climate: Median and mean annual rainfall at nearby Giles Meteorological Station are 245 mm and 259 mm respectively, mostly falling in December-March; average annual evaporation is c. 3400 mm (Forman 1965; P.J. Fuller pers. comm.; D. Pearson pers. comm.).

Hydrological features: Water supply: Surface inflow along a temporary creek. Inundation: Permanent; the high walls of the narrow gorge shade the pools and water loss by evaporation is minimal. Water depth: Maximum, over 5 m deep. Water salinity: Fresh. Water colour: None.

Ecological features: Ecological role: A permanent breeding site for Cyclorana maini; permanent water supply for birds. Plant structural formations: No emergent vegetation; surrounding area open shrubland, creek fringed by trees and sedges.

Significance: A good example of the few permanent rock pools in the Central Ranges bioregion; one of few sources of permanent water.

Notable flora: Threatened species: None. Composition: The rocky pools are bare. Figs Ficus platypoda overhang the lower pool. The creek flowing from the pools has a rocky bed lined with River Red Gums Eucalyptus camaldulensis, sedges and mixed shrubs, and flood-out flats of bloodwood Eucalyptus sp. and mulga Acacia aneura. The steep rocky scree slopes of the gorge support spinifex Triodia (sp.) and a sparse wattle scrub of A. cyperophylla. Callitris columellaris occurs in patches on steeper slopes and in gullies (Beard 1974).

Notable fauna: No information; the narrow gorge and rocky unvegetated surrounds make it unlikely that the pools have any value to waterbirds.

Other Fauna: Threatened species: Black-footed Rock Wallaby Petrogale lateralis (MacDonnell Ranges race) (Nv, Sr) occur in the area, but are not dependent on water from the pools. Composition: Euros Macropus robustus and terrestrial birds, including pigeons, cockatoos, parrots and finches utilise the permanent water supply. Peregrine Falcon Falco peregrinus hunt near the pools. Dusky Grasswren Amytornis purnelli occur on nearby spinifex slopes and Spotted Bowerbird Chlamydera maculata build bowers under nearby fig trees. There are numerous tadpoles of Cyclorana maini in the pools (A. Chapman pers. comm.; P.J. Fuller pers. comm.; D. Pearson pers. comm.).

Social and Cultural values: Cultural: The rockholes are well-known to the Pitjantjatjara, Ngaatjatjarra and Ngaanyatjarra Aboriginal people of the Western Desert as part of an important songline which extends from Broome WA, through Kings Canyon NT, to Pukara WA and beyond. This songline is a route along which a mythical ancestral being, Pukara a Rainbow Serpent is believed to have travelled. According to Tjukurpa (Aboriginal Law) special events occurred at places along the route and the significance of these sites is preserved in Aboriginal oral tradition. Pungkilpiri is a place of traditional ceremonial importance and was a very important water source, particularly during drought. The lower pool is now used as a swimming hole by people from the Tjukurla community; the upper pool is reserved for drinking water (P.J. Fuller pers. comm.; D. Pearson pers. comm.; L.R. Rive pers. comm.).

Land tenure: Central Australia Aboriginal Reserve for Use and Benefit of Aboriginal Inhabitants (17614). Surrounding area: Central Australia Aboriginal Reserve for Use and Benefit of Aboriginal Inhabitants(17614).

Current land use: Aboriginal usage. Surrounding area: Aboriginal usage and sparse

human population.

Disturbance or threat: Past/present: None known.

Potential: Possibly considered as a weekend ""swimming hole"" by Docker River residents and travellers.

Conservation measures taken: Access to Aboriginal land is restricted and permission to enter must be obtained from the Aboriginal Lands Trust.

Management authority and jurisdiction: Managed by the Aboriginal Lands Trust.

References: See Western Australia Reference List

Compiler & date: Romeny J. Lynch, c/- Department of Conservation and Land Management, Busselton. July- October 1995.

Drainage:

Appendix J

Search Results of the Environment Reporting Tool of the Australian Government Department of Environment, Water, Heritage and Arts (DEWHA)

Database Report

27 May 2008 11:06

This report includes places of national environmental significance that are registered in the Department of the Environment and Water Resources' databases, for the selected area. The information presented here has been provided by a range of groups across Australia, and the accuracy and resolution varies.

Search Type: Point

Buffer: 100 km

Coordinates: -25.40833,128.25

Report Contents: Summary >> Details >> Caveat >> Acknowledgment

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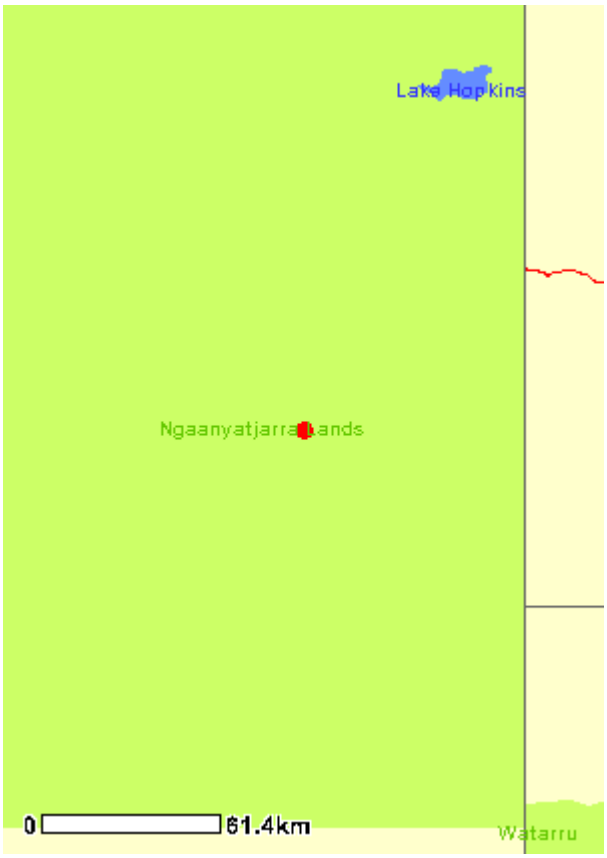

Biodiversity

Threatened Species: 8

Migratory Species:	4
Listed Marine Species:	3
Invasive Species:	4
Whales and Other Cetaceans:	None
Threatened Ecological Communities:	None
Heritage	
World Heritage Properties:	None
Australian Heritage Sites:	1
Wetlands	
Ramsar sites: (Internationally important)	None
Nationally Important Wetlands:	None
National Pollutant Inventory	
Reporting Facilities:	None
Airsheds:	None
Catchments:	None
Protected Areas	
Reserves and Conservation Areas:	1
Regional Forest Agreements:	None

Biodiversity

Threatened Species [Dataset Information]	Status	Comments
Birds		
Leipoa ocellata Malleefowl	Vulnerable	Species or species habitat likely to occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasycercus cristicauda Mulgara	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby	Vulnerable	Species or species habitat may occur within area
Notoryctes caurinus	Endangered	Species or species habitat likely

Karkarratul, Northern Marsupial Mole		to occur within area
Notoryctes typhlops Yitjarritjarri, Southern Marsupial Mole	Endangered	Species or species habitat likely to occur within area
Petrogale lateralis MacDonnell Ranges race Warru, Black-footed Rock-wallaby (MacDonnell Ranges race)	Vulnerable	Species or species habitat may occur within area
Reptiles		
Egernia kintorei Great Desert Skink, Tjakura, Warrarna, Mulyamiji	Vulnerable	Species or species habitat may occur within area
Migratory Species [Dataset Information]	Status	Comments
Migratory Terrestrial Species		
Birds		
Leipoa ocellata Malleefowl	Migratory	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Charadrius veredus Oriental Plover, Oriental Dotterel	Migratory	Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole	Migratory	Species or species habitat may occur within area
Listed Marine Species [Dataset Information]	Status	Comments
Birds		
Charadrius veredus Oriental Plover, Oriental Dotterel	Listed - overfly marine area	Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Invasive Species [Dataset Information]	Status	Comments

Selected Invasive Species: Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Mammals

Felis catus Cat, House Cat, Domestic Cat	Feral	Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit	Feral	Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox	Feral	Species or species habitat likely to occur within area

Plants

Cenchrus ciliaris Buffel-grass, Black Buffel-grass	Invasive	Species or species habitat may occur within area

Heritage

Australian Heritage Sites [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Ranges of the Western Desert WA

Other

Reserves and Conservation Areas [Dataset Information]

Ngaanyatjarra Lands Indigenous Protected Area, WA

Caveat

The information presented here has been drawn from a range of sources, compiled for a variety of purposes. Details of the coverage of each dataset are included in the metadata [Dataset Information] links above.

Acknowledgment

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Appendix K

Summary Tables Describing Conservation Status

IUCN categories also used under the Commonwealth EPBC Act and by DEC

Status	Code	Description
Extinct	(EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died.
Extinct in the Wild	(EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range.
Critically Endangered	(CR)	A taxon is Critically Endangered when the best available evidence indicates that it is considered to be facing an extremely high risk of extinction in the wild.
Endangered	(EN)	A taxon is Endangered when the best available evidence indicates that it is considered to be facing a very high risk of extinction in the wild.
Vulnerable	(VU)	A taxon is Vulnerable when the best available evidence indicates that it is considered to be facing a high risk of extinction in the wild.
Lower Risk	(LR)	A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories: o Conservation Dependent (cd). Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation program targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years. o Near Threatened (nt). Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable. o Least Concern (lc). Taxa which do not qualify for Conservation Dependent or Near Threatened.
Data Deficient	(DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.
Not Evaluated	(NE)	A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

Schedules of the Western Australian Wildlife Conservation Act 1950: Wildlife Conservation (Specially Protected Fauna) Notice.

Status	Code	Description
Schedule 1	(S1)	Fauna that is rare or likely to become extinct, are declared to be fauna that is in need of special protection
Schedule 2	(S2)	Fauna that is presumed to be extinct, are declared to be fauna that is in need of special protection
Schedule 3	(S3)	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 faunathat is in need of special protection
Schedule 4	(S4)	Fauna that is in need of special protection, otherwise than for the reasons mentioned above

Priority Fauna Codes used by the Western Australian DEC

Status	Code	Description
Priority One Taxa with few, poorly known populations on threatened lands.	(P1)	Taxa which are 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 Two Taxa with few, poorly known populations on conservation lands.	(P2)	Taxa which are 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 Three Taxa with several, poorly known populations, some on conservation lands.	(P3)	Taxa which are 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 Four Taxa in need of monitoring.	(P4)	Taxa which are 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 Five Taxa in need of monitoring.	(P5)	Taxa which are not considered threatened but are subject to a specific conservatin program, the cessation of which would result in the species becoming threatened within five years.