Pilbara 1 *(PIL1 – Chichester subregion)*

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Subregional description and biodiversity values

Description and area

The Chichester subregion (PIL 1) comprises the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. The climate is Semi-desert-tropical and receives 300mm of rainfall annually. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule, Sherlock). Subregional area is 9,044,560ha.

Dominant land use

Grazing – native pastures (see Appendix B, key b), Aboriginal lands and Reserves, UCL & Crown Reserves, Conservation, and Mining leases.

Continental Stress Class

Continental Stress Class for PIL1 is 4.

Known special values in relation to landscape, ecosystem, species and genetic values

Rare features:
Rare features include the Ripon Hills sinkhole, Meentheena Carbonate stromatolite fossils (also stromatolite fossils at North Pole and elsewhere), geological complexity of the Marble Bar – Nullagine mineral province.

Short Range Endemics
Generally very little is known about short range endemic invertebrates in the Pilbara.

Rare Vertebrates:
Include Schedule 1 species Mulgara (*Dasycercus cristicauda*), Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*), Bilby (*Macrotis lagotis*), Orange Leaf-nosed Bat (*Rhinonicteris aurantius*), and Princess Parrot (*Polytelis alexandrae*). Species listed under Schedule 4 of the WA Wildlife Conservation Act include Major Mitchell's Cockatoo (*Cacatua leadbeateri*), Peregrine Falcon (*Falco peregrinus*) and Pilbara Olive Python (*Liasis olivaceus barroni*). *Trichosurus vulpecula arnhemensis* and other Critical Weight Range mammals, arid zone populations of Ghost Bat (*Macroderma gigas*), Northwestern Long-eared Bat (*Nyctophilus bifax daedalus*) and Little Northwestern Free-tailed Bat (*Mormopterus loriae cobourgensis*) are also significant in the subregion.

Rare Flora:
Species of subregional significance include *Livistona alfredii* populations in the Chichester escarpment (Sherlock River drainage).

Centres of endemism:
Bioregional endemics include *Ningaui timealeyi*, an undescribed *Planigale*, *Dasykaluta rosamondae*, *Pseudomys chapmani*, *Pseudantechinus roryi*, *Diplodactylus savagei*, *Diplodactylus wombeyi*, *Delma elegans*, *Delma pax*, *Ctenotus rubicundus*, *Ctenotus* affin. *robustus*, *Egernia pilbarensis*, *Lerista zietzi*, *Lerista flammicauda*, *Lerista neander*, two or three undescribed taxa within *Lerista muelleri*, *Notoscincus butleri*, *Varanus pilbarensis*, *Acanthophis wellsi*, *Demansia rufescens*, *Ramphotyphlops pilbarensis*, and *Ramphotyphlops ganei*.

Refugia:
There are no known true Refugia in PIL1, however it is possible that calcrete aquifers in the upper Oakover system (Davis River) contain stygofauna.

High Species and Ecosystem Diversity:
- Hummock grassland reptile and small mammal communities.
- Cracking clay communities of the Chichester Range and Mungaroona Range.

Existing subregional or bioregional plans and/or systematic reviews of biodiversity and threats

In 1974 the Conservation Through Reserves Committee (CTRC) made recommendations for reserves within the Pilbara (System 7) in the CTRC Green Book (Environmental Protection Authority 1974). Some but not all of these recommendations (with modification) were implemented over the following two years. A review of outstanding recommendations was initiated in 1988 and culminated in the production of a report (Henry-Hall *et al.* 1990). This report made recommendations on a nature conservation reserve system for Pilbara which incorporates PIL1. Management planning is underway for Millstream-Chichester National Park. Reserve requirements have not been addressed at a broad scale.

Wetlands

Wetlands of National significance (DIWA listings)

Name and Code	Description[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
De Grey, NK001WA	B1, B2, A6, A7, A8, B9	ii	iii	iv	iv (trampling by cattle & feral animals), v (cattle, pigs, donkey, camel and horses), vi (buffel grass and parkinsonia)

[1]Appendix B, key d; [2]Appendix C, rank 2; [3]Appendix C, rank 3; [4]Appendix C, rank 1; [5]Appendix B, key e

Wetlands of subregional significance (in addition to the DIWA listed wetlands)

Name and Code	Location	Description[1]	Special Values[2]	Condition[3]	Trend[4]	Reliability[5]	Threatening Processes[6]
Carawine Gorge (Oakover River)	121° 15' E 21° 30' S	B17	ii, iii (Large permanent pools, large fish fauna, waterbirds)	iii	iv	ii	iv, v (cattle, donkey, camel), x (increased flow due to dewatering operations upstream), xii (camping on banks of pools)
Running Waters and Skull Springs (Davis River)	121° 10' E; 21° 40' S	B17	ii, iii (Permanent springs, large permanent pools, large fish fauna, waterbirds, aquatic vegetation)	iii	iv	ii	iv, v (trampling by cattle, donkey, camel), xii (camping along pools)

[1]Appendix B, key d; [2]Appendix B, key c; [3]Appendix C, rank 2; [4]Appendix C, rank 3; [5]Appendix C, rank 1; [6]Appendix B, key e

Riparian zone vegetation

Name	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
All fringing vegetation of riparian zones	i	iii	ii	iv, v (cattle, donkey, camel, horse), vi (buffel grass, parkinsonia, mesquite, mexican poppy), xii (erosion).

[1]Appendix C, rank 2; [2]Appendix C, rank 3; [3]Appendix C, rank 1; [4]Appendix B, key e

Ecosystems at risk

Threatened ecological communities (TECs)

There are no Threatened Ecological Communities (TECs) in PIL1.

Other ecosystems at risk

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Heliotropium, Eragrostis community on seepages near Mt Montagu, Chichester Range (Trudgen and Casson 1998)	V	36	Unknown	vi	ii	iv, v (cattle, donkey)
Cracking clay communities of the Chichester Range and Mungaroona Range (Trudgen and Casson 1998; S. van Leeuwen and P. Kendrick pers. comm.; Andrew Mitchell's reports). Chichester tablelands cracking clays, grazed heavily at times in the past, still sometimes by feral and station cattle. Usually high in the landscape, sometimes perched on hill tops and on plateaus.	V	36	Unknown	iv	ii	iv, v (cattle, donkey), xii (mining infrastructure
Specific snakewood communities. Between Roy Hill and Marillana Stations (A. Mitchell pers. comm.) Will be in AgWA Pilbara rangelands report (in press).	V	23	Unknown	vi	ii-iii	iv, v (cattle)
Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Saltbush Shrublands (de Grey River west side) (A. Mitchell pers. comm.) Will be in AgWA Pilbara Rangelands report (in press).	V	39	Unknown	vi	ii-iii	iv, v (cattle)
Saltbush community of the duplex plains - Mosquito Creek series (Nullagine) (A. Mitchell pers. comm.) Will be in Pilbara Rangelands report (in press).	V	39	Unknown	vi	ii-iii	iv, v (cattle)
Invertebrate assemblages (Errawallana Spring type) Coolawanya Station. Geologically distinct. -213801, 1174625. Sherlock River system. Permanent spring-fed creek. Has atypical invertebrate community. (W. Kay, M. Smith, M. Scanlon, S. Halse). Priority 4 (b)	V	33	Unknown	iv	iii	iv, v (cattle)

Stygofauna of freshwater aquifers of the Pilbara region, Millstream type		N/A	iii	unknown	ii	xii (groundwater drawdown), ix

[1]Appendix B, key f; [2]Appendix C, rank 2; [3]Appendix C, rank 3; [4]Appendix C, rank 1; [5]Appendix B, key e

Species at risk

Fauna

Species	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 1 (MAMMALS)					
Dasycercus cristicauda	V	Unknown	iii - iv	iii	v (foxes, cats and herbivores), vii
Macrotis lagotis	V	Unknown	iv	ii	v (cattle?, foxes, cats and herbivores), vii
Rhinonicteris aurantius	V	Unknown	iii	iii	xii (human disturbance)
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 2 (BIRDS)					
Polytelis alexandrae	V	Unknown	iii	ii	v (foxes, cats and herbivores), vii
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 3 (REPTILES)					
Liasis olivaceus barroni	V	Unknown	iv	iii	Not threatened, or likely to be.
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA. DIVISION 2 (BIRDS)					
Falco peregrinus	SP	Unknown	iv	ii	Unknown threatening processes
OTHER SPECIES AT RISK WITHIN THE SUBREGION					
Ctenotus nigrilineatus	P1	Unknown	vi	ii	Unknown threatening processes
Burhinus grallarius	P4	Unknown	iv	ii	v (foxes, cats, herbivores), vii
Falco hypoleucos	P4	Unknown	iv	ii	Unknown threatening processes
Lagorchestes conspicillatus leichardti	P3	Unknown	Possibly ii	ii	v (foxes, cats, and herbivores), vii
Leggadina lakedownensis	P4	Unknown	vi	ii	Unknown threatening processes
Macroderma gigas	P4	Unknown	iv	iii	xii (human disturbance
Neochima ruficauda subclarescens	P4	Unknown	iv	ii	Unknown threatening processes
Pseudomys chapmani	P4	Unknown	iv	iii	Not threatened, or likely to be.

[1]Appendix C, rank 2; [2]Appendix C, rank 3; [3]Appendix C, rank 1; [4]Appendix B, key e

Declared rare and priority flora

Species	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
PRIORITY 1					
Acacia aphanoclada	1	Unknown	vi	Unknown	Unknown threatening processes
Acacia cyperophylla var. *omearana*	1	Unknown	vi	Unknown	xii (tourism); iv
Atriplex spinulosa	1	Unknown	vi	Unknown	iv
Fimbristylis sp. Shay Gap (K Newbey 10293)	1	Unknown	vi	Unknown	iv, xii (mining)
Goodenia omearana ms	1	Unknown	vi	Unknown	Unknown threatening processes
Lepidium amelum	1	Unknown	vi	Unknown	iv, xii (trampling)
PRIORITY 2					
Dampiera atriplicina	2	Unknown	vi	Unknown	Unknown threatening processes
Euphorbia clementii	2	Unknown	vi	Unknown	xii (mining)
Euphorbia drummondii subsp. Pilbara (BG Thomson 3503)	2	Unknown	vi	Unknown	Unknown threatening processes
Indigofera ixocarpa ms	2	Unknown	vi	Unknown	Unknown threatening processes
Ischaemum albovillosum	2	Unknown	vi	Unknown	Unknown threatening processes
Olearia fluvialis	2	Unknown	vi	Unknown	Unknown threatening processes
Olearia mucronata	2	Unknown	vi	Unknown	Unknown threatening processes
Paspalidium retiglume	2	Unknown	vi	Unknown	Unknown threatening processes
Ptilotus mollis	2	Unknown	vi	Unknown	xii (mining)

[1]Appendix C, rank 2; [2]Appendix C, rank 3; [3]Appendix C, rank 1; [4]Appendix B, key e

Analysis of appropriate management scenarios

Reservation priorities of ecosystems

Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
11	Medium woodland; coolabah (*E. microtheca*)	0.0	0.0	0.0	H
18	Low woodland; mulga (*Acacia aneura*)	0.0	0.0	0.0	H
28	Open low woodland; mulga	0.0	0.0	0.0	H
29	Sparse low woodland; mulga, discontinuous in scattered groups	0.0	0.0	0.0	H
39	Shrublands; mulga scrub	0.0	0.0	0.0	H
41	Shrublands; teatree scrub	0.0	0.0	0.0	H
43	Low forest; mangroves (Kimberley) or thicket; mangroves (Pilbara)	0.0	0.0	0.0	H
82	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*	0.0	0.0	30090.7	L
93	Hummock grasslands, shrub steppe; kanji over soft spinifex	14,165.7	0.0	56785.3	L
95	Hummock grasslands, shrub steppe; acacia & grevillea over *Triodia basedowii*	0.0	0.0	0.0	M
98	Hummock grasslands, shrub steppe; kanji over soft spinifex & *T. basedowii*	0.0	0.0	0.0	M
101	Hummock grasslands, shrub steppe; *Acacia pachycarpa* over soft spinifex	0.0	0.0	0.0	M
111	Hummock grasslands, shrub steppe; *Eucalyptus gamophylla* over hard spinifex	0.0	0.0	0.0	M
117	Hummock grasslands, grass steppe; soft spinifex	0.0	0.0	0.0	M
127	Bare areas; mudflats	0.0	0.0	0.0	H

Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
134	Mosaic: Hummock grasslands, open low tree steppe; desert bloodwood and feathertop spinifex (on) sandhills/Hummock grasslands, shrub steppe; mixed shrubs over spinifex between sandhills	0.0	0.0	0.0	H
136	Hummock grasslands, shrub steppe; mixed shrubs over spinifex between sandhills	0.0	0.0	0.0	H
152	Hummock grasslands, grass steppe; soft & hard spinifex soft spinifex	5,191.1	0.0	0.0	M
157	Hummock grasslands, grass steppe; hard spinifex *Triodia wiseana*	0.0	0.0	0.0	M/L
171	Hummock grasslands, low tree steppe; snappy gum over soft spinifex & *T. brizoides*	0.0	0.0	8913.9	M/L
173	Hummock grasslands, shrub steppe; kanji over soft spinifex & *T. wiseana* on basalt	140,162.7	0.0	115414.6	M/L
174	Hummock grasslands, shrub steppe; mixed shrubs over soft spinifex	0.0	0.0	0.0	M/L
175	Short bunch grassland - savannah/grass plain (Pilbara)	22,929.7	0.0	0.0	H
177	Hummock grasslands, sparse shrub steppe; *Acacia bivenosa* over hard spinifex *Triodia brizoides*	0.0	0.0	1610.8	M/L
178	Hummock grasslands, grass steppe; hard spinifex *Triodia basedowii*	0.0	0.0	0.0	M/L
179	Hummock grasslands, shrub steppe; *Acacia pachycarpa* & *A. victoriae* over soft spinifex & *T. wiseana*	0.0	0.0	0.0	M/L
188	Shrublands; mulga & *Acacia sclerosperma* scrub	0.0	0.0	0.0	H
190	Hummock grasslands, sparse shrub steppe; *Acacia bivenosa* & *A. trachycarpa* over hard spinifex *Triodia wiseana,* Very poor rocky country on gneiss	0.0	0.0	0.0	M
191	Hummock grasslands, low open tree & shrub steppe; sparse snappy gum, *Acacia pachycarpa* & *A. victoriae* over *T. pungens* & *T. brizoides*	0.0	0.0	0.0	L
192	Hummock grasslands, shrub steppe; kanji over *Triodia pulchella* & *T. brizoides* on basalt	0.0	0.0	27599.3	L
196	Hummock grasslands, shrub steppe; kanji over *Triodia wiseana* on hills of dolerite and shale	1,393.0	0.0	0.0	L
197	Sedgeland; sedges with scattered medium trees; coolabah over various sedges & forbes	0.0	0.0	0.0	H
198	Hummock grasslands, low open tree & shrub steppe; sparse snappy gum, *Acacia pachycarpa* & *A. victoriae* over *Triodia brizoides* on chert	0.0	0.0	0.0	L
562	Mosaic: Low woodland; mulga in valleys/Hummock grasslands, open low tree-steppe; snappy gum over *T. wiseana*	0.0	0.0	0.0	M
569	Hummock grasslands, low tree steppe; bloodwood over soft spinifex & *T. wiseana*	0.0	0.0	0.0	L
587	Mosaic: Hummock grasslands, open low tree-steppe; snappy gum over *Triodia wiseana*/Hummock grasslands, shrub-steppe; kanji over *T. pungens*	131,419.3	0.0	0.0	L
589	Mosaic: Short bunch grassland - savannah/grass plain (Pilbara)/Hummock grasslands, grass steppe; soft spinifex soft spinifex	0.0	0.0	0.0	H
601	Mosaic: Sedgeland; various sedges with very sparse snakewood/Hummock grasslands, shrub-steppe; kanji over soft spinifex	0.0	0.0	0.0	H
603	Hummock grasslands, sparse shrub steppe; *Acacia bivenosa* over hard spinifex	0.0	0.0	0.0	L
607	Hummock grasslands, low tree steppe; snappy gum & bloodwood over soft spinifex & *T. wiseana*	16,184.4	0.0	0.0	L
609	Mosaic: Hummock grasslands, open low tree steppe; bloodwood with sparse kanji shrubs over soft spinifex/Hummock grasslands, open low tree steppe; snappy gum over *Triodia wiseana* lateritic crust	0.0	0.0	0.0	L
Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
619	Medium woodland; river gum (*E. camaldulensis*)	264.2	0.0	0.0	H
626	Hummock grasslands, shrub-steppe; kanji over soft spinifex & *T. brizoides*	19,771.1	0.0	0.0	L
629	Mosaic: Short bunch grassland - savannah/grass plain (Pilbara)/Hummock grasslands, grass steppe; hard spinifex *Triodia wiseana*	771.5	0.0	0.0	H
640	Sedgeland; sedges with scattered medium trees; coolabah & river gum over various sedges	0.0	0.0	0.0	H

641	Medium woodland; coolabah & river gum	1,147.9	0.0	0.0	H
646	Hummock grasslands, shrub steppe; snakewood over *Triodia basedowii*	41.3	0.0	0.0	L
647	Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	0.0	0.0	0.0	M
649	Sedgeland; Various sedges with very sparse snakewood	0.0	0.0	0.0	H
699	Shrublands, pindan; *Acacia eriopoda* shrubland with scattered low bloodwood (*E. dichromophloia*) & *E. setosa* over soft & curly spinifex on sandplain	0.0	0.0	0.0	H

Subregional constraints in order of priority

(see Appendix B, key g)

Competing Land Uses: Most of PIL 1 is used for grazing. Most valuable grazing land is along major rivers, especially De Grey / Oakover Rivers.

Economic Constraints: Relate to competing land use issue, as acquisition of reserve lands is very expensive in these areas.

Other: Lack of detailed fine scale biodiversity mapping to identify priorities for acquisition.

Bioregional and subregional priority for reserve consolidation

PIL has 7.75% of its surface under some form of conservation tenure and therefore has a reservation class of 3 (see Appendix D, and Appendix C, rank 4). Within the bioregion, PIL1 has 6.56% of its area reserved, PIL2 has 0.79%, PIL3 has 14.10%, and PIL4 has 9.56%. The reservation class for PIL1 is appropriate.

Reserve management standard

PIL1 contains one national park, one conservation park and one large nature reserve. Millstream–Chichester National Park has seven resident CALM staff, in addition to 10 Ministry of Justice workers. Other areas have no resident staff. Mungaroona Nature Reserve has no road access to speak of.

National Parks: Reserve Management Rank is good (iii) (see Appendix C, rank 5). Millstream-Chichester National Park has a draft management plan, and has high level of ecological monitoring. Extensive weed control and rehabilitation operations, and fire management are underway. However, there are weed issues (buffel, ruby dock) that will be impossible to solve.

Conservation Parks: Reserve Management Rank is fair (ii). Meentheena has interim management guidelines, good feral herbivore control (Judas collar program for donkeys and regular aerial shooting), and some fire management, but no resident staff. Buffel grass is well established.

Terrestrial Nature Reserves: Reserve Management Rank is fair (ii). Mungaroona Nature Reserve is very difficult to access. No fire management, but occasional aerial shooting of feral herbivores. The area is rough country, so weed and grazing issues likely to be of minor importance.

Off reserve conservation

Priority species or groups

Species	Location	Beard Vegetation Association	Threatening Processes[1]
Lagorchestes conspicillatus leichardti	Middle Turner River (PIL 1)	95 – Hummock grasslands, shrub steppe: acacia & grevillea over *Triodia basedowii*; 190 – Hummock grasslands, sparse shrub steppe: *Acacia bivenosa* & *A. trachycarpa* over hard spinifex *Triodia wiseana*, very poor rocky country on gneiss; 569 – Hummock grasslands, low tree steppe: bloodwood over soft spinifex & *T. wiseana*; 607 – Hummock grasslands, low tree steppe: snappy gum & bloodwood over soft spinifex & *T. wiseana*.	v (fox), iv, vii
Dasycercus cristicauda	Sandy substrates with *Triodia* spp in PIL 1 and PIL 4. Possibly isolated pockets along Fortescue Valley (PIL 2)	93 – Hummock grasslands, shrub steppe: kanji over soft spinifex; 98 – Hummock grasslands, shrub steppe: kanji over soft spinifex & *T. basedowii*; 117 – Hummock grasslands, grass steppe: soft spinifex.	v (fox and cat), vii, iv
Macrotis lagotis	Northern and eastern margins of Bioregion (PIL 1), isolated areas in Fortescue valley (PIL 2)	18 – Low woodland: mulga (*Acacia aneura*); 93 – Hummock grasslands, shrub steppe: kanji over soft spinifex; 98 – Hummock grasslands, shrub steppe: kanji over soft spinifex & *T. basedowii*; 117 – Hummock grasslands, grass steppe: soft spinifex.	v (fox and cat), vii, iv
Petrogale rothschildi	Throughout Bioregion, in suitable habitat, PIL 1, PIL 2, PIL 3, PIL 4	11 – Medium woodlands: coolabahs (*E. microtheca*); 82 – Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*; 93 – Hummock grasslands, shrub steppe: kanji over soft spinifex; 98 – Hummock grasslands, shrub steppe: kanji over soft spinifex & *T. basedowii*; 111 – Hummock grasslands, shrub steppe; *Eucalyptus gamophylla* over hard spinifex; 117 - Hummock grasslands, grass steppe: soft spinifex; 152 – Hummock grasslands, grass steppe: soft and hard spinifex; 157 – Hummock grasslands, grass steppe: hard spinifex over *Triodia wiseana*; 173 – Hummock grasslands, shrub steppe: kanji over soft spinifex & T. wiseana on basalt; 174 – Hummock grasslands, shrub steppe: mixed shrubs over soft spinifex; 178 – Hummock grasslands, grass steppe: hard spinifex *Triodia basedowii*; 190 - Hummock grasslands, sparse shrub steppe: *Acacia bivenosa* & *A. trachycarpa* over hard spinifex *Triodia wiseana*, very poor rocky country on gneiss; 216 – Low woodland: mulga (? with spinifex) on rises; 583 – Hummock grasslands, sparse shrub steppe: kanji & *Acacia bivenosa* over hard spinifex *Triodia basedowii* & *T. wiseana*; 603 – Hummock grasslands, sparse shrub steppe: *Acacia bivenosa* over hard spinifex; 607 – Hummock grasslands, low tree steppe: snappy gum & bloodwood over soft spinifex and *T. wiseana*; 619 – Medium woodland: river gum (*E. camaldulensis*), 641 – Medium woodland: coolabah & river red gum; 1162 – Hummock grasslands, grass steppe: hard spinifex *Triodia wiseana* & *T. basedowii*; only where suitable rockpile or cliff habitat exists	v (fox), vii, iv (locally significant on granitic plains)

Species	Location	Beard Vegetation Associations	Threatening Processes[1]
Rhinonicteris aurantius	East Pilbara (Marble Bar/Nullagine area), lower Fortescue valley; PIL 1, PIL 2	82 - Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*; 98 – Hummock grasslands, shrub steppe: kanji over soft spinifex & *T. basedowii*; 152 – Hummock grasslands, grass steppe: soft and hard spinifex; 157 – Hummock grasslands, grass steppe: hard spinifex over *Triodia wiseana*; 171 – Hummock grasslands, low tree steppe: snappy gum over soft spinifex & *T. brizoides*; 569 - Hummock grasslands, low tree steppe: bloodwood over soft spinifex & *T. wiseana*; 587 – Mosaic: Hummock grasslands, open tree steppe, snappy gum over *Triodia wiseana*/Hummock grasslands, shrub steppe: kanji over *T. pungens*; 603 – Hummock grasslands, sparse shrub steppe: *Acacia bivenosa* over hard spinifex; 609 – Mosaic: Hummock grasslands, open tree steppe, bloodwood with sparse kanji shrubs over spinifex/Hummock grasslands, open tree steppe: snappy gum over *Triodia wiseana* lateritic crust; 619 – Medium woodland: river gum (*E. camaldulensis*); 641 – Medium woodland: coolabahs & river gum.	xii (human disturbance of disused mines)
Macroderma gigas	East Pilbara (Marble Bar/Nullagine area), lower Fortescue valley; PIL 1, PIL 3	82 - Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*; 98 – Hummock grasslands, shrub steppe: kanji over soft spinifex & *T. basedowii*; 152 – Hummock grasslands, grass steppe: soft and hard spinifex; 157 – Hummock grasslands, grass steppe: hard spinifex over *Triodia wiseana*; 171 - Hummock grasslands, low tree steppe: snappy gum over soft spinifex & *T. brizoides*; 569 - Hummock grasslands, low tree steppe: bloodwood over soft spinifex & *T. wiseana*; 587 Mosaic: Hummock grasslands, open tree steppe, snappy gum over *Triodia wiseana*/Hummock grasslands, shrub steppe: kanji over *T. pungens*; 603 - Hummock grasslands, sparse shrub steppe: *Acacia bivenosa* over hard spinifex; 609 - Mosaic: Hummock grasslands, open tree steppe, bloodwood with sparse kanji shrubs over spinifex/Hummock grasslands, open tree steppe: snappy gum over *Triodia wiseana* lateritic crust; 619 – Medium woodland: river gum (*E. camaldulensis*); 641- Medium woodland: coolabahs & river gum.	xii (human disturbance of disused mines; local barbed wire fencing)

[1]Appendix B, key e

Species recovery actions

Species	Recovery Actions[1]	Recovery Descriptions	Specific Recovery Plan	General Recovery Plan
Lagorchestes conspicillatus leichardti	i, iii, vii, ix, xii	Habitat retention and protection through reserves and on other state lands. Very few populations known, all on pastoral lease (Tabba Tabba). Require ongoing monitoring and some research, and possibly fire and feral (fox) management.	No. Occasional monitoring only	Recovery Plan for Australian Marsupials and Monotremes
Dasycercus cristicauda	ii?, iii, vii, ix, xii	Habitat protection on private property. Populations recently located by R. Teale. Feral predator control. Needs to be examined for basic documentation of distribution and abundance, and threatening processes. Possibly does not deserve its Schedule 1 status.	Yes – RP (draft), National Threatened Species Recovery team	Recovery Plan for Australian Marsupials and Monotremes
Macrotis lagotis	ii, vii, xii	Habitat protection on private property - status of Mulga Downs population is uncertain. Feral predator control. Needs to be examined for basic documentation of distribution and abundance, and threatening processes. Other populations appear to be secure	Yes – RP, National Threatened Species Recovery team	Recovery Plan for Australian Marsupials and Monotremes
Species	Recovery Actions[1]	Recovery Descriptions	Specific Recovery Plan	General Recovery Plan
Petrogale rothschildi	vii, xii	Local/regional recovery actions include predator control and population monitoring on Dampier Archipelago.	No	Recovery Plan for Australian Marsupials and Monotremes
Rhinonicteris aurantius	i, ii, xii, xiii	Habitat retention and protection through reserves and on private land. Status of population is uncertain. Apparent reliance upon disused mine workings in east Pilbara is of concern, given chances of re-mining. Mining industry needs to be involved in conservation.	No	Recovery Plan for Australian Bats
Macroderma gigas	i, iii, xii, xiii	Habitat retention and protection through reserves and on other state lands. Status of population is uncertain. Apparent reliance	No	Recovery Plan for Australian Bats

		upon disused mine workings in east Pilbara is of concern, given chances of re-mining. Mining industry needs to be involved in conservation.		
Liasis olivaceus barroni	None needed	Not threatened and should not be on list.	No	Recovery Plan for Australian Reptiles
Falco peregrinus	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.	No	Recovery Plan for Australian Birds
Various troglofaunas	i, iii, xii, xiii	Distribution and status largely unknown, but suspected to occur within sub-bioregion. Needs research, and protection on public and leased lands	No	No
Priority 1 and 2 species including: *Acacia aphanoclada*, *Acacia cyperophylla* var. *omearana*, *Atriplex spinulosa*, *Dampiera atriplicina*, *Euphorbia clementii*, *Euphorbia drummondii* subsp. Pilbara (BG Thomson 3503), *Fimbristylis* sp. Shay Gap (K Newby 10293), *Goodenia omearana* ms, *Indigofera ixocarpa* ms, *Ischaemum albovillosum*, *Lepidium amelum*, *Olearia fluvialis*, *Olearia mucronata*, *Paspalidium retiglume*, *Ptilotus mollis*	xii	Status of species is uncertain. Need to establish basic documentation of distribution, abundance, and threatening processes.	No	No

[1]Appendix B, key h

Ecosystems

Ecosystem	Location	Threatening Processes[1]
Heliotropium, Eragrostis community on seepages near Mt Montagu, Chichester Range	PIL1	iv, v (cattle, donkey)
Cracking clay communities of the Chichester Range and Mungaroona Range.	PIL1	iv, v (cattle, donkey)
Specific snakewood communities. Between Roy Hill and Marillana Stations.	PIL1	iv, v (cattle)
Saltbush Shrublands (De Grey River west side)	PIL1	iv, v (cattle)
Saltbush community of the duplex plains - Mosquito Creek series (Nullagine)	PIL1	iv, v (cattle)
Invertebrate assemblages (Errawallana Spring type) Coolawanya Station.	PIL1	iv, v (cattle)
Troglofaunas (stygo- and terrestrial) populations	PIL 1, PIL 2, PIL 3	xi (pollution of ground-water), x (removal of groundwater through mine dewatering), xii (waster abstraction - Millstream)
Ecosystem	Location	Threatening Processes[1]
Various reptiles (new or restricted) *Ramphotyphlops pilbarensis, Heteronotia planiceps, Ctenotus angusticeps, Ctenotus* affin. *robustus Lerista zietzi*	Mostly not monitored, and additional collections are needed	No indications that they are threatened
Wetlands of De Grey River (from confluence with Nullagine to sea)	PIL 1	iv, v (feral pigs. Pigs are present in the lower De Grey, and are spreading upstream. They are at high densities along the lower reaches, including mangrove areas)

[1]Appendix B, key e

Existing ecosystem recovery plans and appropriate recovery actions

Ecosystem	Recovery Actions[1]	Action Descriptions	Specific Recovery Plan	General Recovery Plans
Heliotropium, Eragrostis community on seepages near Mt Montagu, Chichester Range	i, ii, iii, xi, vi, vii, xii	Habitat retention through reserves, on private lands and on other state lands. Feral animal control – herbivores. Weed control. Fire management. Research.	No	No
Cracking clay communities of the Chichester Range and Mungaroona Range.	i, ii, iii, xi, vi, vii, xii	Habitat retention through reserves, on private lands and on other state lands. Feral animal control – herbivores. Weed control. Fire management. Research, especially possible effects of mining infrastructure.	No	No
Specific snakewood communities. Between Roy Hill and Marillana Stations.	i, ii, iii, xi, vi, vii, xii	Habitat retention through reserves, on private lands and on other state lands. Feral animal control – herbivores. Weed control. Fire management.	No	No
Saltbush Shrublands (De Grey River west side)	i, ii, iii, xi, vi, vii, xii	Habitat retention through reserves, on private lands and on other state lands. Feral animal control – herbivores. Weed control. Fire management.	No	No
Saltbush community of the	i, ii, iii, xi, vi, vii,	Habitat retention through reserves, on private lands and on	No	No

duplex plains - Mosquito Creek series (Nullagine)	xii	other state lands. Feral animal control – herbivores. Weed control. Fire management.		
Invertebrate assemblages (Errawallana Spring type) Coolawanya Station.	i, ii, iii, xi, vi, vii, xii	Habitat retention through reserves, on private lands and on other state lands. Feral animal control – herbivores. Weed control. Fire management.	No	No
Troglofaunas (stygo- and terrestrial) populations	i, ii, iii, xi, xii, xiii	Habitat retention through reserves, on private lands and on other state lands. Reinstatement of hydrology. Further troglofauna research; Capacity building with mining industry.	No	No
Various reptiles (new or restricted) *Ramphotyphlops pilbarensis, Heteronotia planiceps, Ctenotus angusticeps, Ctenotus* affin. *robustus, Lerista zietzi*	i, ii, iii, xii	Habitat retention through reserves, on private lands and on other state lands. Research.	No	Action Plan for Australian Reptiles
Wetlands of De Grey River (from confluence with Nullagine to sea)	i, ii, iii, xi, vi, ix, xii	Habitat retention through reserves, on private lands and on other state lands. Reinstatement of hydrology. Weed control. Fire management. Research.	No	No

[1]Appendix B, key h

Subregion priority for off reserve conservation

The subregional priority for off park conservation is (iv) (see Appendix C, rank 6), indicating that limited off park measures are required.

Conservation actions as an integral part of NRM

Existing NRM actions

Threat Abatement Planning as Part of NRM: Vegetation management plans, pest management.

Industry Codes of Practice: Particularly within the mining industry.

Environmental Management Systems and Ecologically Sustainable Product Marketing

Feasible opportunities for NRM

Legislation: Including duty of care for leasehold and other lands.

Institutional Reform: e.g. rural reconstruction, industry reconstruction, new tenure and management arrangements.

Other Planning Opportunities: Including local government planning and National Action Plan for Water Quality and Salinity.

Impediments or constraints to opportunities

A number of impediments exist including the Land Administration Act and operations of the Pastoral Land Board, Conservation Through Reserves is limited through mining leases and tenements. There is a need to increase awareness of conservation values through education of various industry (especially mining and pastoral) and the public in general. Limited financial resources are also a major constraint.

Subregions where specific NRM actions are a priority to pursue

The NRM priority for PIL1 is (ii) (see Appendix C, rank 7), indicating that there are significant constraints to integrate conservation as part of production / development systems.

Data gaps

Gaps in data needed for the identification of biodiversity values and management responses

Vegetation and Regional Ecosystem Mapping: No environmental geology / regolith mapping at better than 1:250 000. No broad-scale soil mapping is available at finer scale than 1:2 000 000 (Bettenay *et al.* 1967). Quantitative subregional survey of vegetation has not been undertaken.

Systematic Fauna Survey: Quantitative subregional survey of fauna has not been undertaken.

Floristic Data: Subregional flora is poorly known, with few intensive studies. Quadrat-based floristic data is available from only some localities. Quantitative subregional survey of flora has not been undertaken.

Ecological and Life History Data: There is little detailed data on ecological requirements and life histories of virtually all invertebrate species, plants, persisting CWR mammals, uncommon vertebrate and plant species, and ecologically dominant plant species (eg hummock grasses). There are little data to provide a regional context on population-trends for even ecologically significant species (eg, native rodents, dasyurids, spinifex reptile communities, termites, ants, weeds such as buffel grass and ruby dock).

Other Priority Data Gaps Include:

- No quantitative data on the impact of exotic herbivores on aquatic systems, or other communities, especially effects on invertebrate and non-vascular plant communities.
- No quantitative data on the impact of changes to fire regimes in hummock grasslands, particularly upon vertebrate communities, invertebrate communities, and non-vascular plants.
- No quantitative data on the impact of weed colonisation (especially buffel grass) on riverine and other grassland communities, particularly upon recruitment of perennial species, and consequent effects on invertebrate and vertebrate communities.
- Poor understanding of the long term impact of mining below water tables, particularly with respect to leaving flooded voids subject to salination.
- Poor understanding of subregional troglofaunas, particularly stygofaunas associated with palaeo-drainage calcretes.

Sources

References cited

No.	Author	Date	Title	Publication Details	Pub. Type
764	Baker, L.M. and Johnson, K.A.	(undated).	Draft Recovery Plan for the Mulgara (*Dasycercus cristicauda*)	Conservation Commission of the Northern Territory	O
717	Bellchambers, K. and Johnson, K.A.	(1991).	The Recovery Plan for the Greater Bilby *Macrotis lagotis*	Endangered Species Programme and the Conservation Commission of the Northern Territory, Alice Springs	R
091	Bettenay, E., Churchward, H.M., McArthur, W.M. and Northcote, K.H.	(1967).	Atlas of Australian Soils. Explanatory data for Sheet 6, Meekatharra - Hamersley Range area. Commonwealth Scientific and Industrial Research Organisation, and Melbourne University Press.	Cambridge University Press, London and New York.	O
181	Cogger, H., Cameron, E., Sadlier, R. and Eggler, P.	(1993).	The Action Plan for Australian Reptiles.	Australian Nature Conservation Agency, Canberra.	R
258	Duncan, A., Barry Baker, G. and Montgomery, N.	(1999).	The Action Plan for Australian Bats.	Environment Australia.	R
272	Environmental Protection Authority	(1974).	Conservation Reserves in Western Australia - Report of the Conservation through Reserves Committee to the Environmental Protection Authority.	Environmental Protection Authority, Perth	R
298	Garnett, S.T. and Crowley, G.M.	(2000).	The Action Plan for Australian Birds.	Environment Australia, Canberra.	R
354	Henry-Hall, N.J., Hopper, S.D., McKenzie, N.L. and Keighery, S.D.	(1990).	Nature Conservation Reserves in the Eastern Goldfields, Western Australia - Southern Two Thirds of CTRC System 11.	Report submitted to EPA Red Book Task Force.	R
483	Maxwell, S., Burbidge, A.A. and Morris, K. (eds).	(1996).	The 1996 Action Plan for Australian Marsupials and Monotremes. Wildlife Australia Endangered Species Program Project Number 50.	Environment Australia, Canberra.	R
856	Tudgen, M. and Casson	(1998).	Flora and vegetation of Ore Bodies A and B in West Angela Hill area, and area surrounding these ore bodies and of the rail route options considered to link them to existing Robe River Iron Associates rail line.	Unpublished report	R

R = Report; J = Journal article; O = Other.

Other relevant publications

See reference numbers 012, 021, 024, 025, 025, 094, 100, 118, 148, 173, 182, 245, 268, 281, 383, 387, 399, 407, 419, 493, 519, 625, 634, 635, 636, 637, 638, 647, 648 and 699 in Appendix A.