Pilbara 2 *(PIL2 – Fortescue Plains subregion)*

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Subregional description and biodiversity values

Description and area

Alluvial plains and river frontage. Extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east. Deeply incised gorge systems in the western (lower) part of the drainage. River gum woodlands fringe the drainage lines. Northern limit of Mulga (*Acacia aneura*). An extensive calcrete aquifer (originating within a palaeo-drainage valley) feeds numerous permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of river gum and cadjeput *Melaleuca* woodlands. Climatic conditions are semi desert tropical, with average rainfall of 300 mm, falling mainly in summer cyclonic events. Drainage occurs to the north-west. Subregional area is 2,041,914ha.

Dominant land use

(see Appendix B, key b)

Grazing (ix) native pastures, (xi) UCL and Crown reserves, (xiii) Conservation, (x) Aboriginal land (lease).

Continental Stress Class

The Continental Stress Class for PIL2 is 4.

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

Rare features:
All are features associated with the Fortescue River.

- Millstream wetlands: Extensive permanent spring-fed streams, pools and river flow that extend for up to 40 kilometres or more below the springs. Large areas of wetland community, including large, deep (up to 2 km long and 15+m deep) riverine pools, springs, riffle streams, marshes and swamps. Extensive areas of cadjeput and river gum forest. A very diverse aquatic invertebrate community, particularly Odonata (dragon and damsel flies), and a relatively large fresh water fish fauna. Supports large stands of *Livistona alfredii*, a species restricted mainly to the Fortescue valley around Millstream.

- Millstream aquifer: An extensive calcrete aquifer, lying between the Hamersley and Chichester Ranges, and formed through *in situ* deposition within an ancient river drainage basin. The present aquifer is approximately 400 square kilometres in area (and about 50 km long), with a thickness of calcrete greater than 30 metres. The aquifer is highly transmissive. The Fortescue River flows over part of the aquifer, and recharge is primarily during floods. Numerous springs discharge along the northern lip of the aquifer, where either the Fortescue River or associated streams have eroded into the water-carrying calcrete. The aquifer is known to contain a stygofauna. Little is known of this fauna, due to lack of survey.

- Fortescue Marsh: An extensive, episodically inundated samphire marsh, approximately 100 km long and 10 km wide. Constricted at the western (downstream) end by the Goodiadarrie Hills, it is possible that the upper Fortescue is prevented from flowing through into the lower Fortescue drainage except in extreme rainfall events. These hills effectively separate the Fortescue into two separate drainages. The Fortescue Marsh represents the terminus for the upper Fortescue. Episodically supports immense water-bird breeding.

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

Rare Vertebrates
Includes: Bilby (*Macrotis lagotis*) and Orange Leaf-nosed Bat (*Rhinonicteris aurantius*).

Rare Flora
Includes: *Eremophila pilosa* ms, *E. spongiocarpa* ms, *Goodenia pallida, Swainsona* sp. Millstream (AA Mitchell PRP 798), *Euphorbia drummondii* subsp. Pilbara (BG Thomson 3503), *Gonocarpus ephemerus* and *Ischaemum albovillosum*.

Centres of Endemism:

- Millstream aquifer: Almost certain to contain an endemic crustacean, and possibly other groups of stygofauna. Preliminary sampling strongly indicates this. There may also be a terrestrial troglofauna in the upper parts of the calcrete.

- Other calcrete deposits in the eastern pasts of PIL2. Note that survey of troglofaunas in these localities is so far preliminary.

Refugia:
Note that Morton *et al.* (1995) do not list any refugia within PIL2. In my opinion, not listing the Millstream wetlands was an oversight on their part.

- Millstream wetlands: Large, permanent wetlands, including deep riverine pools, streams and springs provide season refuge for vertebrate species during dry periods, and climatic refuge for many invertebrates.
- Gorges of the Fortescue River, within the Chichester ranges. Deeply incised gorge features provide refuge from fire for plant species (*Terminalia, Erythrina, Ficus*).

High Species and Ecosystem Diversity:

- Odonata species at Millstream.

- Stygofaunal crustacean within calcrete environments, at Millstream and in the upper Fortescue.

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

In 1975 the Conservation Through Reserves Committee (CTRC) made recommendations for reserves within the Pilbara (System 8) (Environmental Protection Authority 1975), in the 'Red Book' reports of 1976 – 1984. These recommendations were reviewed in 1993 (Environmental Protection Authority 1993). Reserve recommendations for PIL2 were that the Millstream area be reserved, and vested in the national Parks Authority. This was implemented, and the resulting national Park was amalgamated with the Chichester Range National Park. No other subregional or bioregional planning for biodiversity conservation has been attempted.

Wetlands

Wetlands of National significance (DIWA listings)

Name and Code	Description[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Fortescue Marshes, PIL002WA	B4, B6	ii	iii - iv	iii	iv (grazing & trampling by cattle), v (cattle, pigs, donkey, camel and horses), x (changed hydrology, possibly from Ophthalmia Dam)
Millstream Pools, PIL005WA	B1, B9, B17	ii	iv - v	iii	iv (historically heavy grazing), vi (date palms, cotton palms, buffel grass, parkinsonia, water fern and water lilies), xii (human impact through recreation along river; water abstraction via West Pilbara water supply)

[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	Location	Description[1]	Special Values[2]	Condition[3]	Trend[4]	Reliability[5]	Threatening Processes[6]
Broad flood-out valleys on the middle Fortescue	Between Millstream and the Goodiadarrie Hills	2, B4, B6	ii (high-productivity seasonally inundated eucalypt grasslands, ephemeral pools and flood channels)	ii	iv	ii	iv, v (cattle), vi (buffel grass)
Gregory and Dogger Gorge, Fortescue River	Gorge of Fortescue, below Millstream	B2, B17	ii (deep gorge, with permanent pools and large stands of cajuput woodland)	ii	iii	ii	v (cattle), vi (date palms, parkinsonia and buffel grass), iv
Mulga Downs Fresh-water Lake	5 km S of Mulga Downs homestead	B6	ii (seasonal lake with emergent *Acacia coriacea*)	iii	iv	ii	v (cattle), iv

[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]
Fortescue River	ii	iv	ii	iv (cattle, horse), v (donkey), vi (buffel grass, parkinsonia, mesquite, date palm, cotton palm, water fern and water lilies)

[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)

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Ethel Gorge aquifer stygobiont community		N/A	iii	iii	ii	xii (groundwater drawdown)

[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

Other ecosystems at risk

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]

Permanent wetland communities, Millstream.	-	15	iii	v	iii	vi
Fortescue Marsh saltbush community	-	39	iii	iv	iii	iv, x (Ophthalmia dam)
Perennial grassland communities in the Fortescue Valley	-	37	iii	vi	iii	iv, v (stock), xii (soil erosion)
Grove-intergrove mulga communities at Southern end of Northern apron of Hamersley Range	-	20	ii	vi	iii	iv, v (stock), vii

[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)					
Macrotis lagotis	V	i	iii - iv	i	v (fox, cat, herbivores)
Rhinonicteris aurantius	V	unknown	vi	ii	Unknown threatening processes
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 3 (REPTILES)					
Liasis olivaceus barroni	V	iv	iv	iii	Not threatened, or likely to be. Shouldn't be on list, common, widespread, and not declining
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA. DIVISION 2 (BIRDS)					
Falco peregrinus	SP	iii	iv	ii	Unknown threatening processes
OTHER SPECIES AT RISK WITHIN THE SUBREGION					
Ctenotus affin. *uber johnstonei*	P2	Unknown	Unknown	Unknown	Unknown threatening processes
Nososticta pilbara	P2	iii	iv	ii	vi (Ceratopteris?)
Ardeotis australis	P4	iii	iv	ii	v (feral predators)
Burhinus grallarius	P4	iii	iv	ii	v (feral predators)
Falco hypoleucos	P4	iii	vi	ii	Unknown threatening processes
Leiopotherapon ahenius	P4	iii	iv	ii	Unknown threatening processes
Macroderma gigas	P4	iii	vi	ii	xii (human disturbance; barbed wire)
Neochima ruficauda subclarescens	P4	iii	iv	ii	v (feral predators)

[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 Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
PRIORITY 1					
Eremophila pilosa ms	1	Unknown	vi	i-ii	iv
Eremophila spongiocarpa ms	1	Unknown	vi	i-ii	No known threatening processes
Goodenia pallida	1	Unknown	vi	i-ii	No known threatening processes
Swainsona sp. Millstream (AA Mitchell PRP 798)	1	Unknown	vi	i-ii	No known threatening processes
PRIORITY 2					
Euphorbia drummondii subsp. Pilbara (BG Thomson 3503)	2	Unknown	vi	i-ii	No known threatening processes
Ischaemum albovillosum	2	Unknown	vi	i-ii	No known threatening processes

[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 Ha	CALM-Purchased Lease	Priority
11	Medium woodland; coolibah (*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	2,649.6	0.0	0.0	L
82	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*	0.1	0.0	0.0	M
93	Hummock grasslands, shrub steppe; kanji over soft spinifex	0.0	0.0	0.0	M
111	Hummock grasslands, shrub steppe; *Eucalyptus gamophylla* over hard spinifex	8,264.2	4682.4	0.0	L
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
151	Sedgeland; sedges with open low trees; coolibah over various sedges	0.0	0.0	0.0	H
157	Hummock grasslands, grass steppe; hard spinifex *Triodia wiseana*	0.0	0.0	0.0	M
173	Hummock grasslands, shrub steppe; kanji over soft spinifex & *T. wiseana* on basalt	0.0	0.0	0.0	M
175	Short bunch grassland - savannah/grass plain (Pilbara)	0.0	0.0	0.0	H
178	Hummock grasslands, grass steppe; hard spinifex *Triodia basedowii*	0.0	0.0	0.0	M
192	Hummock grasslands, shrub steppe; kanji over *Triodia pulchella* & *T. brizoides* on basalt	0.0	0.0	0.0	M
196	Hummock grasslands, shrub steppe; kanji over *Triodia wiseana* on hills of dolerite and shale	0.0	0.0	0.0	M
197	Sedgeland; sedges with scattered medium trees; coolibah 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	M
199	Hummock grasslands, shrub steppe; mulga over soft spinifex *Triodia* on rises	0.0	0.0	0.0	M
216	Low woodland; mulga (?with spinifex) on rises	0.0	0.0	0.0	M
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
Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve Ha	CALM-Purchased Lease	Priority
607	Hummock grasslands, low tree steppe; snappy gum & bloodwood over soft spinifex & *T. wiseana*	0.0	0.0	0.0	M
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	M
629	Mosaic: Short bunch grassland - savannah/grass plain (Pilbara)/Hummock grasslands, grass steppe; hard spinifex *Triodia wiseana*	0.0	0.0	0.0	H
641	Medium woodland; coolibah & river gum	0.2	0.0	0.0	H
644	Hummock grasslands, open low tree steppe; mulga & snakewood over soft spinifex & *T. basedowii*	0.0	0.0	0.0	H
645	Hummock grasslands, shrub steppe; kanji & snakewood over soft spinifex	0.0	0.0	0.0	M

	& T. wiseana				
646	Hummock grasslands, shrub steppe; snakewood over *Triodia basedowii*	661.1	0.0	0.0	M
676	Succulent steppe; samphire	0.0	0.0	0.0	H

Subregional constraints in order of priority

(see Appendix B, key g)

Economic Constraints: In terms of the cost of land acquisition as well as constraints in terms of implementing management. Most land is pastoral lease, and relatively productive.

Competing Land Uses: In particular prospective mining interests and pastoral values.

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% or its area reserved, PIL2 has 0.79%, PIL3 has 14.10%, and PIL4 has 9.56%. However, there is considerable bias at the subregional level. A higher priority for reservation is appropriate to include riverine systems and wetlands in the reserve system in PIL2.

Reserve management standard

PIL2 contains small portions of two national parks, Millstream–Chichester National Park and Karijini National Park. The two parks have seven resident CALM staff, in addition to 10 Ministry of Justice workers at Millstream-Chichester National Park and two to four Visitor Centre staff at Karijini National Park. There are no other areas of conservation estate.

National Parks: Reserve Management Standard Rank is good (iii) (see Appendix C, rank 5). Karijini National Park has a management plan, and ongoing weed control. Eradication of cattle, donkeys and horses is underway, as is fire management. Only small portions of the northern margins of Karijini National Park are within PIL2. Millstream-Chichester National Park has a draft management plan, has high level of ecological monitoring, extensive weed control and rehabilitation operations, fire management. However, both have weed issues (buffel, ruby dock) that will be impossible to solve. The Millstream wetlands of the park fall within PIL2.

Class	Purpose	Name	Category	Reserve Management[1]
A	Conservation of fauna and flora & Recreation	Karijini National Park	National Park	iii
A	Conservation of fauna and flora & Recreation	Millstream-Chichester National Park	National Park	iii

[1]Appendix C, rank 5

Off reserve conservation

Priority species or groups and existing recovery plans

Species	Threats/Info	Species Recovery Plan	General Recovery Plan
Macrotis lagotis	One recent record from Mulga Downs Station; a freshly dead animal found in mulga stands of the Fortescue valley by station staff doing a mill run. Possible that a viable population still lives in the Fortescue valley mulgas.	Yes – RP, National Threatened Species Recovery team	Action Plan for Australian Marsupials and Monotremes
Species	Threats/Info	Species Recovery Plan	General Recovery Plan
Rhinonicteris aurantius	One record, from a road-killed animal collected from the North West Coastal Highway, close to the crossing on the Fortescue River. Probably resident in the Fortescue Gorge, upstream from the crossing. No other data, except that recent searches for the species did not find any at this locality (pers. comm., Kyle Armstrong, 2001)	No	Action Plan for Australian Bats
Liasis olivaceus barroni	Known mainly from rocky areas, particularly along water courses. It is not threatened, and should not be listed as such.	No	The Action Plan for Australian Reptiles
Falco peregrinus	Uncommon resident. Very little data apart from occasional sightings. No information on local population.	No	Action Plan for Australian Birds
Petrogale rothschildi	Local/regional recovery actions include predator control and population monitoring on Dampier Archipelago.	No	Action Plan for Australian Marsupials and Monotremes
Bothriembryon sp.	Scattered populations of an undescribed *Bothriembryon* species are found along the Fortescue, from Deep Reach to Gregory Gorge. An isolated outlier of a predominantly south western genus (nearest congeneric are in the gorges of the Hamersley Range), closely associated with the calcrete of the Millstream aquifer. Specimens also collected from calcretes at Weeli Wolli Springs. No conservation problems.	No	No
Livistona alfredii	Confined mainly to the Fortescue River valley, mostly	No	No

	near the Millstream aquifer. Also found in Duck Creek (Ashburton drainage), and at Tanberry (Sherlock drainage). Large population present at Millstream (hundreds of thousands of individuals), but are potentially threatened by weeds (date palms).		
Priority 1 and 2 species including: *Eremophila pilosa* ms, *Eremophila spongiocarpa* ms, *Euphorbia drummondii* subsp. Pilbara (BG Thomson 3503), *Gonocarpus ephemerus, Goodenia pallida*, *Ischaemum albovillosum* and *Swainsona* sp. Millstream (AA Mitchell PRP 798).	No data	No	No

Appropriate species recovery actions

Species	Recovery Actions[1]	Recovery Descriptions
Macrotis lagotis	i, vi, xii	Status of Mulga Downs population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.
Rhinonicteris aurantius	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.
Liasis olivaceus barroni	None needed	Not threatened and should not be on list.
Falco peregrinus	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.
Eremophila pilosa ms P1	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.

Species	Recovery Actions[1]	Recovery Descriptions
Eremophila spongiocarpa ms P1	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.
Euphorbia drummondii subsp. Pilbara (BG Thomson 3503) P2	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.
Gonocarpus ephemerus P2	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.
Goodenia pallida P1	xii	Habitat retention through reserves or on other State lands or on private lands.
Ischaemum albovillosum P2	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.
Swainsona sp. Millstream (AA Mitchell PRP 798) P1	xii	Status of population is uncertain. Needs to be examined for basic documentation of distribution and abundance, and threatening processes.

[1]Appendix B, key h

Ecosystems and existing recovery plans

Ecosystem	Location	Beard Veg Assoc	Specific Recovery Plan	General Recovery Plans
Permanent wetland communities, Millstream.	PIL2		No	No
Fortescue Marsh saltbush community	PIL2		No	No
Perennial grassland communities in the Fortescue Valley	PIL2		No	No
Grove-inter-grove mulga communities at Southern end of Northern apron of Hamersley Range	PIL2		No	No
Troglofaunas (stygo- and terrestrial) populations	PIL 1, PIL 2, PIL 3	No Beard Assoc numbers or NVIS numbers applicable to caves.	No	No
Various reptiles (new or restricted) *Ctenotus* aff. *uber johnstonei, Ramphotyphlops pilbarensis, Heteronotia planiceps, Ctenotus angusticeps, Lerista zietzi*	Mostly not monitored, and additional collections are needed	Many and varied vegetation associations	No	No

[1]Appendix B, key e

Appropriate ecosystem recovery actions

Ecosystem	Recovery Actions[1]	Recovery Actions
Permanent wetland communities, Millstream.	i, ii, iii, v, vi, vii, ix, xii	Habitat retention through reserves or on other State lands (including pastoral lease); Fencing stock away from riverine areas; Weed removal (particularly date palms, cotton palms, parkinsonia); Feral animal control (especially donkeys); Fire management, with specific fire program to encourage a mosaic fire/age distribution; Research into species distributions, requirements and threatening processes.
Fortescue Marsh saltbush community	i, ii, iii, v, vi, vii, ix; xii	Habitat retention through reserves or on other State lands (including pastoral lease); Fencing stock away from riverine areas; Feral animal control (especially donkeys); Fire management, with specific fire program to encourage a mosaic fire/age distribution; Research into species distributions, requirements and threatening processes.
Perennial grassland communities in the Fortescue Valley	i, ii, iii, v, vi, vii, ix, xii	Habitat retention through reserves or on other State lands (including pastoral lease); Fencing stock away from riverine areas; Feral animal control (especially donkeys); Fire management, with specific fire program to encourage a mosaic fire/age distribution; Research into species distributions, requirements and threatening processes.
Grove-inter-grove mulga communities at Southern end of Northern apron of Hamersley Range	i, ii, iii, vi, vii, ix, xii	Habitat retention through reserves or on other State lands(including pastoral lease); Feral animal control; Fire management, with specific fire program to encourage a mosaic fire/age distribution; Research into species distributions, requirements and threatening processes.

Ecosystem	Recovery Actions[1]	Recovery Actions
Troglofaunas (stygo- and terrestrial) populations	i, ii, iii, vii, xii	Habitat retention through reserves or on other State lands (including pastoral lease); Research into species distributions, requirements and threatening processes, particularly troglofaunas.
Various reptiles (new or restricted) *Ctenotus* aff, *uber johnstonei*, *Ramphotyphlops pilbarensis, Heteronotia planiceps, Ctenotus angusticeps, Lerista zietzi*	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands (including pastoral lease); Feral animals; Fire management, with specific fire program to encourage a mosaic fire/age distribution; Research into species distributions, requirements and threatening processes.

[1]Appendix B, key h

Subregion priority for off reserve conservation

The subregional priority for off park conservation is (ii) (see Appendix C, rank 6), indicating that there are a range of off park measures required.

Conservation actions as an integral part of NRM

Existing NRM actions

Threat Abatement Planning as Part of NRM: e.g. pest management.

Capacity Building: In place through Land Conservation District Committees, local land-holder liaison.

Feasible opportunities for NRM

Legislation: Including duty of care for leasehold and other lands, especially pastoral and aboriginal leases.

Institutional Reform: e.g. rural reconstruction, industry reconstruction, new tenure and management arrangements; includes resumption of high quality lands for reservation from existing pastoral leases.

Threat Abatement Planning as Part of NRM: e.g. pest management; particularly fox, and feral herbivore control on pastoral lands.

Capacity Building: Further capacity building in resource and pastoral industries, particularly possibility for joint or compatible management of pastoral leases owned by mining companies.

Other Planning Opportunities: Including local and State government planning for a CAR conservation reserve system.

Impediments or constraints to opportunities

Lack of funding to acquire lands on open market. Lack of funds to adequately manage our existing estate, let alone any further acquisitions. High value conservation areas are held under pastoral leases, and we can't afford to purchase them and therefore resumption is the only option. Impediments exist in operations of the Pastoral Lands Board (need to re-structure un-viable leases after reserve areas are removed). There is a need to increase awareness of conservation values through education of various industry (mining, pastoral) and the public in general. Limited financial resources are also a major constraint. Weed control is a major cost, but is limited to a few species, in a relatively small area (Millstream wetlands).

Subregions where specific NRM actions are a priority to pursue

PIL2 has an NRM priority of (i) (see Appendix C, rank 7), indicating that there are major constraints to implement effective NRM actions, especially in regards to the pastoral industry.

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. Only small areas have been examined in detail by botanists, usually for industrial development. Quadrat-based floristic data is available from only a few localities.

Ecological and Life History Data: There are few 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 (e.g. hummock grasses). There are little data to provide a regional context on population-trends for even ecologically significant species (e.g. native rodents, dasyurids, spinifex reptile communities, termites, ants, weeds such as buffel grass, kapok bush, ruby dock and water fern (*Ceratopteris thalictroides*).

Other Priority Data Gaps:

- 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 subregional troglofaunas, particularly stygofaunas associated with palaeo-drainage calcretes.

Sources

References cited

No.	Author	Date	Title	Publication Details	Pub. Type
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