Carnarvon 2 *(CAR2 – Wooramel subregion)*

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Subregional description and biodiversity values

Description and area

The Carnarvon bioregion is composed of quaternary alluvial, aeolian and marine sediments overlying Cretaceous strata. A mosaic of saline alluvial plains with samphire and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains, Snakewood scrub on clay flats, and tree to shrub steppe over hummock grasslands on and between red sand dune fields. Limestone strata with *Acacia stuartii* or *A. bivenosa* shrubland outcrop in the north, where extensive tidal flats in sheltered embayments support mangal.

The Wooramel Subregion is the southern and central parts of the Carnarvon Basin. Alluvial plains associated with downstream sections and deltas of Gascoyne, Minilya and Wooramel Rivers. Includes Lake MacLeod and Kennedy Range. Tree to shrub steppe over hummock grasslands on and between aeolian red sand dunefields are extensive in the north and east as well as on top of Kennedy Range. Permian sediments are common in northern parts. Southern areas comprise limestone plateaux overlain by red sand plains. Acacia shrublands (Mulga, Bowgada and *A. coriacea*) over bunch grasses on red sandy ridges and plains. Mangroves confined to small areas around Lake MacLeod and near Carnarvon. Saline alluvial plains with samphire and saltbush low shrublands in near-coastal areas. A seasonal arid climate, tending towards bimodal rainfall. Includes the northern section of the Peron Peninsula. The subregional area is 6, 667, 540 ha.

Dominant land use

Mainly (ix) (see Appendix B, key b) grazing- native pastures, (90.37%) with lesser areas of (xi) UCL and Crown reserves (4.36%) and (xiii) Conservation (3.63%) although a significant proportion of conservation estate in the subregion falls outside the IUCN I-IV categories.

Continental Stress Class

The Continental Stress Class is 3.

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

Rare Vertebrates:
Including: Peregrine Falcon (*Falco peregrinus*), Malleefowl (*Leipoa ocellata*), Slender-billed Thornbill (*Acanthiza iredalei iredalei*), Mulgara (*Dasycercus cristicauda*), Kultarr (*Antechinomys laniger*), and *Ctenotus zastictus*.

Rare Flora:
The subregion has a number of rare flora.

Ecosystem Types That Have at Least 85% of Their Total Extent Confined to CAR2

Beard Veg Assoc	Description
200	Mosaic: Low woodland over scrub; mulga over bowgada scrub/Shrublands; bowgada & grevillea scrub on sandhills
205	Shrublands; *Acacia sclerosperma* & bowgada scrub
208	Mosaic: Shrublands; *Acacia sclerosperma* & bowgada scrub/Shrublands; bowgada & grevillea scrub
209	Shrublands; *Acacia sclerosperma* & minnieritchie scrub
224	Shrublands; waterwood & *Acacia victoriae* scrub
226	Mosaic: Shrublands; *Acacia sclerosperma* & bowgada scrub/Succulent steppe; samphire
229	Mosaic: Shrublands; bowgada and associated spp scrub/Shrublands; bowgada & grevillea scrub
242	Succulent steppe with scrub; snakewood over saltbush
244	Shrublands; *Acacia sclerosperma* & *A. victoriae scrub*
245	Mosaic: Shrublands; bowgada & minnieritchie scrub/Succulent steppe; saltbush & bluebush
246	Hummock grasslands, low tree steppe; *Eucalyptus dongarraensis* & *E. foecunda* over *Triodia plurinervata*
265	Low woodland; *Acacia sclerosperma* & *A. victoriae*
281	Shrublands; mulga & bowgada open scrub
282	Shrublands; *Acacia sclerosperma* & *A. victoriae* sparse scrub
283	Shrublands; *Acacia sclerosperma*, bowgada & *A. victoriae* scrub
Beard Veg Assoc	Description

284	Mosaic: Shrublands; *Acacia sclerosperma* & bowgada scrub/Shrublands; snakewood & *A. victoriae* scrub
301	Hummock grassland; shrub steppe; mixed scrub, hard spinifex (*Triodia basedowii*) with dwarf shrubs
303	Sparse succulent steppe; bluebush with very sparse snakewood shrubs
304	Sparse low woodland; *Acacia victoriae* & snakewood in scattered groups
307	Low woodland; bowgada & *Acacia subtessarogona*
308	Mosaic: Shrublands; *Acacia sclerosperma* sparse scrub/Succulent steppe; saltbush & bluebush
320	Shrublands; bowgada & *Acacia victoriae* scrub
321	Mosaic: Shrublands; *Acacia sclerosperma* & bowgada scrub/Succulent steppe; saltbush & bluebush
323	Shrublands; Acacia sclerosperma, bowgada & snakewood scrub
325	Succulent steppe; saltbush & samphire
328	Succulent steppe with scrub; waterwood & *Acacia sclerosperma* over saltbush & samphire
329	Shrublands; dwarf waterwood (*Acacia coriacea*) shrubs on recent dunes
342	Mosaic: Low woodland; waterwood /Shrublands; *Acacia sclerosperma* & bowgada scrub
344	Mosaic: Shrublands; bowgada scrub and associated sp/Shrublands; *Acacia sclerosperma*, bowgada & *A. victoriae* scrub
346	Mosaic: Shrublands; *Acacia sclerosperma*, *A. victoriae* & snakewood scrub/Shrublands; patches of low mixed scrub
347	Mosaic: Shrublands; *Acacia sclerosperma*, *A. victoriae* & snakewood scrub patches/Succulent steppe; bluebush
349	Mosaic: Shrublands; bowgada scrub with scattered mulga/Shrublands; bowgada & grevillea scrub
1101	Shrublands; *Acacia ligulata* x *rostellifera* thicket
1103	Shrublands; Acacia & lamarchea thicket
1105	Hummock grasslands, grass steppe; spinifex *Triodia plurinervata*
1325	Succulent steppe with very open low trees; coolibah over saltbush & samphire
3432	Mosaic: Low woodland; waterwood/Shrublands; *Acacia sclerosperma*, *A. victoriae* & *A. subtessarogona* scrub

Centres of endemism:
The Lerista group exhibits significant endemism in the subregion. The following species are endemic to the subregion:

- *Lerista gascoynensis*
- *Lerista kennedyensis*
- *Lerista lineata* (isolated population)
- *Lerista haroldi*

Refugia:
Lake MacLeod wetland is a major migration stopover and drought refuge for shorebirds

High Species and Ecosystem Diversity:
The Lerista group of lizards displays high species diversity, as listed above.

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 System 9 in the CTRC Green Book. Some but not all of these recommendations (with modification) were implemented over the following ten years.

In 2000 a report on the Biodiversity of the Southern Carnarvon Basin was published. This included a paper on reserve system gaps, McKenzie, Halse and Gibson (2000).

The State Government's policy statement (Managing the Rangelands) broadly outlines the need to implement a CAR reserve system although no specific areas are targeted for reservation.

An unpublished report by Department of Conservation and Land Management - "Gascoyne - Murchison Strategy, Establishment and Management of a Conservation Reserve System" outlines the broad techniques to implement a CAR reserve system but does not target any specific areas. An outline of this report is given in the article *Filling the Gaps* (McNamara *et al.* 2000).

Although no systematic assessment of biodiversity was undertaken recommendations on reserve status of the Shark Bay area are included in the Shark Bay Terrestrial Reserves management Plan (Department of Conservation and Land Management 2000).

Wetlands

Wetlands of National significance (DIWA listings)

Name and Code	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Lake MacLeod, WA009 (CAR004WA)	iii	iv	iii	xii (mining for salt and gypsum), iv
McNeill Claypan, WA010 (CAR005WA)	ii	ii	iii	iv, xii (urban and light commercial development; inappropriate use by adjacent speedway and off road vehicles), xi (rubbish tip, sewage disposal and oil waste disposal)
Hamelin Pool, WA008 (CAR003WA)	iii-iv	iv	iii	xii (inappropriate tourism)
East Shark Bay, WA011 (CAR006WA)	iii-iv	iv	iii	xii (fishing, boating), xi (Monkey Mia sewerage)

[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]
Wooramel River	25^{O} 45' S 114^{O} 30'E	B2	Principal drainage, regional alluvial process-control, biological refuge, riverine ecosystems	i	iii	iii	x (floods, massive bed-load), vi (buffel grass, Athel Pine), iv (cattle), v (foxes, cats, rabbits, goats)
Gascoyne River	24^{O} 50' S 114^{O} 30'E	B2	Principal drainage, regional alluvial process-control, biological refuge, riverine ecosystems	i	iii	iii	x (floods, massive bed-load), vi (buffel grass, Athel Pine), iv (cattle), v (foxes, cats, rabbits, goats)
Minilya River	23^{O} 45'S 114^{O} 30'E	B2	Principal drainage, regional alluvial process-control, biological refuge, riverine ecosystems	i	iii	iii	x (floods, massive bed-load), vi (buffel grass), iv (cattle), v (foxes, cats, rabbits, goats)

[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]
Gascoyne River	i	iii	iii	iv, v (goats, rabbits), vi (Buffel grass, Athel pine), ii, x
Wooramel River	i	iii	iii	iv, v (goats, rabbits), vi (Buffel grass, Athel pine), ii, x

[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]
Hypersaline microbial community number 2 (Hamelin stomatolite)	V	16	iii	iii	i	xii (recreation; climate change leading to change in sea level; nutrient enrichment)

[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 water soaks and wetlands on western edge of the Kennedy Ranges (B. Barton pers. comm.). Not distinct floristically but are geologically, flora highly variable, classified same as Callytharra claypans (G. Keighery pers. comm.).	V	16	i-ii	iii	i	iv, v (goats)
Invertebrate assemblages of Mooka Springs (-245253S, 1145827E). Spring in the Kennedy Range threatened by feral goats. Has rich representative invertebrate community (W. Kay, M. Smith, M. Scanlon, S. Halse pers. comm.).	V	16	i-ii	iii	i	v (goats), iv

Reptile assemblages of islands, gulfs and peninsulas, Shark Bay (Storr and Harold 1990)	V	Various	ii	iii	i	v (cats, foxes, goats), iv, vii
Invertebrate assemblages of Callytharra Spring, Wooramel River (-255232S, 1153007E). Permanent Spring on the Wooramel river. High aquatic invertebrate diversity (W. Kay, M. Smith, M. Scanlon, S. Halse pers. comm.).	V	16	i	iii	i	iv (cattle), v (goats)
Plant assemblages dominated by *Acacia sibilans* (Myall) occurs. The number of trees is estimated to be very few, occurs on Yaringa Station and possibly Carbla and Woodleigh (J. Stretch pers. comm.).	V	21	ii	iii	i	iv, v (goats, rabbits)
Plant assemblages (spinifex dominated) of sand dune mesa topping the Kennedy Range National Park (B. Barton pers. comm.)	V	33	iii	iii	i	v (goats)
Flora and fauna assemblages of the gorges of Wooramel River (B. Barton pers. comm., T. Brandis pers. comm.)	V	16	i	vi	i	iv, v (goats)
Mangrove communities dominated by *Avicennia* (Shark Bay) (B. Barton pers. comm.)	V	40	iii	vi	i	i (through industry), x (siltation), xii (fishing)
Floodplains of the Carnarvon Basin, Wooramel and Gascoyne Rivers (Burbidge and McKenzie 1995; Wilcox and McKinnon 1992). Not in reserve system, is widespread but highly modified. Is a major break in floristics between tropics and south (G. Keighery pers. comm.).	V	?21, 27	i	iii	ii	iv, v (goats, rabbits)
Acacia drephanophylla (Hamelin Wattle) on calcareous substrates. Regionally restricted. From Carnarvon Basin Land Systems >800km^2.	V	21	ii	vi	ii	iv, v (goats, rabbits)
Inland Mangrove assemblage *(Avicennia marina*) of Lake MacLeod. Western shore, photograph in (Burbidge and McKenzie 1995).	V	40	ii-iii	iv	i	x (inflows to lake due to degradation of catchment), xii (mining activities)
Lake MacLeod invertebrate assemblages. Saline aquatic community with strong marine affinities with particularly rich copepod element, is effectively a well developed, very rich birrida community with strong marine and terrestrial components with especially rich hypactacoid community (Halse *et al.* 2000). (A. Storey pers. comm.)	V	41	ii-iii	v	i	x (potential inflows to lake due to degradation of catchment), xii (mining activities)
Fish assemblages of Blue Holes, Lake MacLeod. (Fish have been collected by Andrew Storey.)	V	41	Unknown	v	i	x (inflows to lake due to degradation of catchment), xii (mining activities)
Samphire communities of Lake MacLeod (Burbidge and McKenzie 1995)	V	40	ii	iv	i	x (inflows to lake due to degradation of catchment), xii (mining activities)

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Assemblages of the Gascoyne Delta system (T. Brandis pers. comm.).	V	Various	i	vi	i	iv, v (goats, rabbits), vi (athel pine), xii (development)
River Land System vegetation on Gascoyne River in Carnarvon. (J. Stretch pers. comm.)	V	Various	i	vi	i	xii (development), iv, v (goats, rabbits), vi (athel pine)
Specific Seagrass Communities, Shark Bay and elsewhere. (Walker 1990, Walker 1989).	V	Marine	ii-iii	vi	i	xii (boating, pearling, aquaculture, trawling)
Sponge community at Shark Bay. (R.I.T. Prince pers. comm.).	V	Marine	ii-iii	vi	i	xii (dredging, boating, pearling, aquaculture, trawling)

[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)					
Pseudomys fieldi	E	islands: iii mainland: extinct	v	iv	v
Dasycercus cristicauda	V	ii	iii	ii	vii, iv, v (foxes, cats)
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 2 (BIRDS)					
Leipoa ocellata	V	ii	v	iii	v (foxes, cats), ii, iv
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 3 (REPTILES)					
Caretta caretta	E	ii	iii	ii	v (foxes, cats) xi
Chelonia mydas	E	ii	iii	ii	v (foxes, cats) xi
Dermochelys coriacea	E	ii	iii	ii	v (foxes, cats) xi
Egernia stokesii badia	E	ii	iii	ii	v (foxes, cats) ii
Ctenotus zastictus	V	iii	iv	ii	iv
Egernia stokesii aethiops	V	iii	iv	ii	v (foxes, cats) ii
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA, DIV 3 (REPTILES)					
Aspidites ramsayi	SP	ii	iii	ii	v (foxes, cats) ii
OTHER SPECIES AT RISK WITHIN THE SUBREGION					
Acanthiza iredalei		ii	iv	iii	iv, v (goats, rabbits, foxes, cats)
Malurus lamberti		ii	iv	iii	v (foxes, cats), ii, iv

[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]
DECLARED RARE FLORA					
Thryptomene wittweri	V	ii	iii	iii	v (goats), iv
PRIORITY 1					
Chthonocephalus oldfieldianus	1	ii	iii	ii	v (goats), iv, vi
Chthonocephalus spathulatus	1	ii	iv	ii	v (goats), iv, vi
Chthonocephalus tomentellus	1	iii	iv	ii	v (goats), iv, vi
Gnephosis sp. Billabong (B Nordenstam and A Anderberg 203)	1	i	iii	ii	v (goats), iv, vi, vii
Rhodanthe ascendens	1	ii	iii	ii	iv, v (goats), vi, vii
Rhodanthe sp. Overlander (PS Short 2096)	1	ii	iii	ii	iv, v (goats)
Sclerolaena stylosa	1	ii	iii	ii	iv, ii, v (goats)
Tetragonia coronata	1	ii	iii	ii	iv, vi, x
Species Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
PRIORITY 2					
Abutilon sp. Hamelin (AM Ashby 2196)	2	iii	iv	ii	v (goats), iv, vi
Abutilon sp. Quobba (H Demarz 3858)	2	iii	iv	ii	v (goats), iv, vi
Acacia ryaniana	2	iii	iii	ii	v (goats), iv, vi
Chthonocephalus muellerianus	2	iii	iv	ii	v (goats), iv, vi
Platysace sp. Kennedy (PG Wilson 8450)	2	ii	vi	ii	iv, v (goats), vi, vii
Ptilotus alexandri	2	iii	iv	ii	v (goats), iv, vii, vi
Rumex crystallinus	2	ii	iii	ii	iv, v (goats), vii
Scaevola chrysopogon	2	iii	iv	ii	iv, v (goats), vii

[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	Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
18	Low woodland; mulga (*Acacia aneura*)				L
21	Low woodland; waterwood				M
39	Shrublands; mulga scrub				M
43	Low forest; mangroves (Kimberley) or thicket; mangroves (Pilbara)	X	X		L
95	Hummock grasslands, shrub steppe; acacia & grevillea over *Triodia basedowii*			X	H
112	Hummock grasslands, shrub steppe; *Acacia ligulata* over *Triodia plurinervata*	X			H
125	Bare areas; salt lakes				L
127	Bare areas; mudflats	X			L
129	Bare areas; drift sand	X			L
158	Hummock grasslands, shrub steppe; kanji over *Triodia basedowii*			X	H
160	Shrublands; snakewood & *Acacia victoriae* scrub	X		X	L
162	Shrublands; snakewood scrub				L
163	Shrublands; eremophila and cassia dwarf scrub				L
166	Low woodland; mulga & *Acacia victoriae*				L
167	Shrublands; *Acacia victoriae* & snakewood open scrub				L
168	Shrublands; mulga, *Acacia victoriae* & snakewood scrub				H
182	Low woodland; mulga & bowgada (*A. ramulosa*)			X	H
184	Shrublands; mulga & bowgada scrub			X	M
186	Shrublands; *Acacia sclerosperma* & *A. victoriae* open scrub				H
200	Mosaic: Low woodland over scrub; mulga over bowgada scrub/Shrublands; bowgada & grevillea scrub on sandhills				H
205	Shrublands; *Acacia sclerosperma* & bowgada scrub		X	X	H
206	Shrublands; bowgada & grevillea scrub				M
208	Mosaic: Shrublands; *Acacia sclerosperma* & bowgada scrub/Shrublands; bowgada & grevillea scrub				L
209	Shrublands; *Acacia sclerosperma* & minnieritchie scrub	X	X		H
221	Succulent steppe; saltbush	X	X		L
224	Shrublands; waterwood & *Acacia victoriae* scrub	X	X		H
226	Mosaic: Shrublands; *Acacia sclerosperma* & bowgada scrub/Succulent steppe; samphire				H
229	Mosaic: Shrublands; bowgada and associated spp scrub/Shrublands; bowgada & grevillea scrub			X	H
242	Succulent steppe with scrub; snakewood over saltbush				H
243	Shrublands; bowgada & minnieritchie scrub	X	X		H
244	Shrublands; *Acacia sclerosperma* & *A. victoriae* scrub			X	H
245	Mosaic: Shrublands; bowgada & minnieritchie scrub/Succulent steppe; saltbush & bluebush				H

Beard Veg Assoc	Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
246	Hummock grasslands, low tree steppe; *Eucalyptus dongarraensis* & *E. foecunda* over *Triodia plurinervata*				H
248	Shrublands; bowgada scrub with scattered red mallee & *Eucalyptus* sp.				L
264	Low woodland; *Acacia victoriae* & snakewood	X		X	H
265	Low woodland; *Acacia sclerosperma* & *A. victoriae*				H
266	Mosaic: Shrublands; bowgada scrub/Succulent steppe; saltbush & bluebush				H
267	Succulent steppe with open scrub; scattered *Acaica sclerosperma* & *A. victoriae* over saltbush & bluebush				H
269	Low woodland over scrub; mulga over bowgada scrub				H
281	Shrublands; mulga & bowgada open scrub				H
282	Shrublands; *Acacia sclerosperma* & *A. victoriae* sparse scrub				H
283	Shrublands; *Acacia sclerosperma*, bowgada & *A. victoriae* scrub			X	M
284	Mosaic: Shrublands; *Acacia sclerosperma* & bowgada scrub/Shrublands; snakewood & *A. victoriae* scrub				H
301	Hummock grassland; shrub steppe; mixed scrub, hard spinifex (*Triodia basedowii*) with dwarf shrubs	X		X	L
303	Sparse succulent steppe; bluebush with very sparse snakewood shrubs			X	H
304	Sparse low woodland; *Acacia victoriae* & snakewood in scattered groups				H
307	Low woodland; bowgada & *Acacia subtessarogona*			X	M
308	Mosaic: Shrublands; *Acacia sclerosperma* sparse scrub/Succulent steppe; saltbush & bluebush				H
320	Shrublands; bowgada & *Acacia victoriae* scrub				H
321	Mosaic: Shrublands; *Acacia sclerosperma* & bowgada scrub/Succulent steppe; saltbush & bluebush				H
323	Shrublands; *Acacia sclerosperma*, bowgada & snakewood scrub				H
325	Succulent steppe; saltbush & samphire				H
328	Succulent steppe with scrub; waterwood & *Acacia sclerosperma* over saltbush & samphire				H
329	Shrublands; dwarf waterwood (*Acacia coriacea*) shrubs on recent dunes				H
342	Mosaic: Low woodland; waterwood/Shrublands; *Acacia sclerosperma* & bowgada scrub			X	L
344	Mosaic: Shrublands; bowgada scrub and associated sp/Shrublands; *Acacia sclerosperma*, bowgada & *A. victoriae* scrub	X			H
345	Mosaic: Shrublands; *Acacia sclerosperma* & *A. victoriae* patchy scrub, barren/Succulent steppe; saltbush & bluebush				H
346	Mosaic: Shrublands; Acacia sclerosperma, A. victoriae & snakewood scrub / Shrublands; patches of low mixed scrub	X			H
347	Mosaic: Shrublands; *Acacia sclerosperma*, *A. victoriae* & snakewood scrub patches/Succulent steppe; bluebush	X			H
349	Mosaic: Shrublands; bowgada scrub with scattered mulga/Shrublands; bowgada & grevillea scrub			X	H
360	Shrublands; bowgada scrub with scattered mulga				H
363	Shrublands; bowgada scrub with scattered cypress pine	X			L
364	Shrublands; bowgada scrub with scattered eucalypts & cypress pine				L
368	Shrublands tree-heath between sandhills; *Banksia ashbyi*, *Grevillea gordoniana*, *Acacia* spp., *Melaleuca* and mallee		X		L
658	Shrublands; *Acacia sclerosperma* & snakewood scrub (also with some waterwood)				H
662	Hummock grassland; shrub steppe; mixed acacia scrub & dwarf scrub with soft spinifex & *T. basedowii*	X			L
676	Succulent steppe; samphire	X	X	X	L
1101	Shrublands; *Acacia ligulata* x *rostellifera* thicket	X	X		L

Beard Veg Assoc	Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
1103	Shrublands; *Acacia* & *Lamarchea* thicket	X			L
1105	Hummock grasslands, grass steppe; spinifex *Triodia plurinervata*	X			L
1271	Bare areas; claypans			X	L
1322	Shrublands; *Acacia sclerosperma*, *A. victoriae* & snakewood scrub				H
1325	Succulent steppe with very open low trees; coolibah over saltbush & samphire				H
2081	Shrublands; bowgada and associated spp. scrub	X	X	X	M
2675	Hummock grasslands, low tree & shrub steppe; scattered eucalypts,				L

	kanji over *Triodia pungens* & *T. basedowii*				
2685	Shrublands; *Acacia quadrimarginea* & jam scrub on greenstone	X			H
3432	Mosaic: Low woodland; waterwood/Shrublands; *Acacia sclerosperma*, *A. victoriae* & *A. subtessarogona* scrub				H
	Permanent water soaks and wetlands on western edge of the Kennedy Ranges (B. Barton pers. comm.). Not distinct floristically but are geologically, flora highly variable, classified same as Callytharra claypans (G. Keighery pers. comm.).	X		X	H
	Invertebrate assemblages of Mooka Springs (-245253,S, 1145827E). Spring in the Kennedy Range threatened by feral goats. Has rich representative invertebrate community (W. Kay, M. Smith, M. Scanlon, S. Halse pers. comm.).				H
	Reptile assemblages of islands, gulfs and peninsulas, Shark Bay (Storr and Harold 1990)	X		X	H
	Invertebrate assemblages of Callytharra Spring, Wooramel River (-255232S, 1153007E). Permanent Spring on the Wooramel river. High aquatic invertebrate diversity threatened by cattle (W. Kay, M. Smith, M. Scanlon, S. Halse pers. comm.).				H
	Plant assemblages dominated by *Acacia sibilans* (Myall) occurs. The number of trees is estimated to be very few, occurs on Yaringa Station and possibly Carbla and Woodleigh (J. Stretch pers. comm.).				H
	Plant assemblages (spinifex dominated) of sand dune mesa topping the Kennedy Range National Park (B. Barton pers. comm.)	X			L
	Flora and fauna assemblages of the gorges of Wooramel River (B. Barton pers. comm., T. Brandis pers. comm.)				H
	Mangrove communities dominated by *Avicennia* (Shark Bay) (B. Barton pers. comm.).	X			L-M
	Hypersaline community number 2. Stromatolites of Hamelin Pool (Burne 1991/92; P. Brown pers. comm.).	X			L
	Acacia drephanophylla (Hamelin Wattle) on calcareous substrates. Regionally restricted. From Carnarvon Basin Land Systems >800km^2.				H
	Inland Mangrove assemblage *(Avicennia marina*) of Lake MacLeod Western shore, photograph in Landscope article by Burbidge and McKenzie (1995).				H
	Lake MacLeod invertebrate assemblages. Saline aquatic community with strong marine affinities with particularly rich copepod element, is effectively a well developed, very rich birrida community with strong marine and terrestrial components with especially rich hypactacoid community (Halse *et al.* 2000). (A. Storey pers. comm.)				H
	Fish assemblages of Blue Holes, Lake MacLeod. (Fish have been collected by Andrew Storey)				H
	Samphire communities of Lake MacLeod (Burbidge and McKenzie 1995)				H
	Assemblages of the Gascoyne Delta system (T. Brandis pers. comm.).				H
Beard Veg Assoc	Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
	River Land System vegetation on Gascoyne River in Carnarvon. (J. Stretch pers. comm.)				H
	Specific Seagrass Communities. Shark Bay and elsewhere (Walker 1990, Walker 1989).	X?			H
	Sponge community at Shark Bay. (R.I.T. Prince pers. comm.).	X?			H

Subregional constraints in order of priority

(see Appendix B, key g)

Competing Land Use: This is the primary issue in that pastoralism occupies greater than 90% of the region and mining has interests in areas.

Economic Constraints: In terms of the cost of land and the cost of subsequent management.

Other: Difficulties in identifying biodiversity values in some areas due to lack of resolution of data; level of degradation of much of the subregion is significant due to pastoral practices and the impacts of feral herbivores.

Bioregional and subregional priority for reserve consolidation

CAR is reservation class 3 (see Appendix D, and Appendix C, rank 4) with only 3.45% of area in conservation reserve (IUCN I-IV). At the subregional level CAR1 has 2.2% in reserve (IUCN I-IV) while CAR2 has 3.9% in conservation reserve. The current reserve system is highly biased in terms of CAR criteria and is not comprehensive or representative in terms of ecosystem representation so Class 2 with possibility of changing to a higher primary classification is appropriate.

Reserve management standard

CAR2 reserves are generally large and with little access. Management resources are hampered by the logistics of travel etc. Wildfire management facilities are limited by resources, with no strategic firebreaks or prescribed burning. Feral herbivore grazing activities now widespread (e.g. Callicivirus hasn't made a observable difference to rabbit numbers, goats are common throughout), and feral predator control systems are not in place in any area. The overall reserve management rank for CAR2 is poor(i) (see Appendix C, rank 5).

Francis Peron National Park: Feral control in place (Callicivirus hasn't made an observable difference to rabbit numbers), and re-introduction of mammal species and mallee fowl has been done. There is a number of dedicated staff on site. Wildfire management facilities are limited by resources, with no strategic firebreaks or prescribed burning in the past five years. The Park has a management plan in place, but actions are not necessarily funded so may not be undertaken.

Shark Bay Marine Park: Dedicated staff and equipment, Park management plan in place. The Park has a management plan in place, but actions are not necessarily funded so may not be undertaken. The reserve management standard is good (iii) but needs further resourcing.

Hamelin Pool Marine Reserve: Low impacts, Park has a management plan in place, but actions are not necessarily funded so may not be undertaken.

South Peron (5h reserve): Feral control in place (Callicivirus hasn't made an observable difference to rabbit numbers), harvesting of sandalwood, wildfire management facilities are limited by resources, with no strategic fire breaks or prescribed burning. The Park has a management plan in place, but actions are not necessarily funded so may not be undertaken.

Kennedy Range National Park (and adjacent ex – Stations): Large area with little access. Management resources are hampered by the logistics of travel etc. Wildfire management facilities are limited by resources, with no strategic firebreaks or prescribed burning. Feral herbivore grazing activities now widespread (e.g. Callicivirus hasn't made an observable difference to rabbit numbers, goats are found throughout), and feral predator control systems are not in place. The Park has a management plan in place, but actions are not necessarily funded so may not be undertaken.

Pimbee (ex station): Large area with little access. Management resources are hampered by the logistics of travel etc. Wildfire management facilities are limited by resources, with no strategic firebreaks or prescribed burning. Feral herbivore grazing activities now widespread (e.g. Callicivirus hasn't made an observable difference to rabbit numbers, goats are common throughout), and feral predator control systems are not in place. Interim Management Guidelines in place, but actions are not necessarily funded so may not be undertaken.

Off reserve conservation

Priority species or groups and existing recovery plans

Species	Beard Vegetation Association/Ecosystem	Specific Recovery Plan	General Recovery Plan
Pseudomys fieldi	1100 – Hummock grassland: dwarf steppe, mixed ericoid shrubs & spinifex	Yes - RP	Action Plan for Australian Marsupials and Monotremes
Leipoa ocellata	17 – Shrublands: *Acacia rostellifera* thicket; 260 – Mosaic: Shrublands tree-heath between sandhills, *Banksia ashbyi*, *Grevillea gordoniana*, *Acacia* spp., *Melaleuca* and mallee/Shrublands scrub-heath; 246 – Hummock grasslands: low tree steppe, *Eucalyptus dongarraensis* & *E. foecunda* over *Triodia plurinervata*; 365 – Shrublands: bowgada & jam scrub with scattered York and red mallee; 368 – Shrublands: tree-heath between sandhills, *Banksia ashbyi*, *Grevillea gordoniana*, *Acacia* spp., *Melaleuca* and mallee.	Malleefowl Preservation Society has current Action Plan and ongoing research	Action Plan for Australian Birds
Acanthiza iredalei	676 – Succulent steppe: samphire; 984 – Mosaic: Shrublands, acacia and melaleuca scrub/Succulent steppe, saltbush	No	Action Plan for Australian Birds
Malurus lamberti	402 – Shrublands: heath on coastal limestone; 1099 – Hummock grasslands: shrub steppe: wattle scrub & heath *Acacia ligulata x rostellifera*; 1100 – Hummock grassland: dwarf shrub steppe, mixed ericoid shrubs & Spinifex; 1423 – Shrublands: scrub-heath in Shark Bay Area, mainly *Acacia* spp.; 1550 – Shrublands: dwarf scrub (Dirk Hartog Island).	No	Action Plan for Australian Birds including a Coordinated Conservation Plan for the Shark Bay area.
Caretta caretta	Beaches for breeding	No	Action Plan for Australian Reptiles
Chelonia mydas	Beaches for breeding	No	Action Plan for Australian Reptiles
Dermochelys coriacea	Beaches for breeding	No	Action Plan for Australian Reptiles
Egernia stokesii badia	205 Shrublands; *Acacia sclerosperma* & bowgada scrub; 243 Shrublands; bowgada & minnieritchie scrub	No	Action Plan for Australian Reptiles
Egernia stokesii aethiops	205 Shrublands; *Acacia sclerosperma* & bowgada scrub; 243 Shrublands; bowgada & minnieritchie scrub	No	Action Plan for Australian Reptiles
Aspidites ramsayi	112 Hummock grasslands, shrub steppe; *Acacia ligulata* over *Triodia plurinervata*; 205 Shrublands; *Acacia sclerosperma* & bowgada scrub; 243 Shrublands; bowgada & minnieritchie scrub, 246 Hummock grasslands, low tree steppe; *Eucalyptus dongarraensis* & *E. foecunda* over *Triodia plurinervata*,	No	Action Plan for Australian Reptiles
Dasycercus cristicauda	301 Hummock grassland; shrub steppe; mixed scrub, hard spinifex (*Triodia basedowii*) with dwarf shrubs	No	Action Plan for Australian Marsupials and Monotremes
Ctenotus zastictus	246 Hummock grasslands, low tree steppe; *Eucalyptus dongarraensis* & *E. foecunda* over *Triodia plurinervata*	No	Action Plan for Australian Reptiles

Species	Beard Vegetation Association/Ecosystem	Specific Recovery Plan	General Recovery Plan
Threatened flora of CAR2	Various	No	No recovery plan exists for threatened flora in the CAR2 subregion. Although no Endangered flora occurs further research into the status of vulnerable species and management requirement is needed

Appropriate species recovery actions

Species	Recovery Actions[1]	Recovery Descriptions
Pseudomys fieldi	i, ii, iii, vii, ix, xii	Monitoring of existing populations. Where control of feral predators has been achieved and suitable habitat occurs reintroduction to create new mainland populations.
Leipoa ocellata	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of feral predators and herbivores (goats) required. Reduction of grazing intensity may be required.
Acanthiza iredalei	i, ii, iii, vii, xii	Habitat retention through reserves or on other State lands or on private lands.
Malurus lamberti	xii, vii	Control of herbivores such as rabbits and goats may be required. Monitoring of existing populations.
Caretta caretta	i, vii, xii, xiii	Protection of breeding sites. Control of feral predators of eggs etc (primarily foxes). Monitoring of populations and research into threats. Education of boat operators, ecotourism operators and general public
Chelonia mydas	i, vii, xii, xiii	Protection of breeding sites. Control of feral predators of eggs etc (primarily foxes). Monitoring of populations and research into threats. Education of boat operators, ecotourism operators and general public
Dermochelys coriacea	i, vii, xii, xiii	Protection of breeding sites. Control of feral predators of eggs etc (primarily foxes). Monitoring of populations and research into threats. Education of boat operators, ecotourism operators and general public
Egernia stokesii badia	x, xii, i	Research into threatening processes other than ferals (e.g. fire regime). Habitat retention through reserves or on other State lands or on private lands. Reintroduction to previous areas of habitat.
Egernia stokesii aethiops	x, i	Research into threatening processes other than ferals (e.g. fire regime). Habitat retention through reserves or on other State lands or on private lands.
Aspidites ramsayi	x, vii, xii, i	Research into threatening processes other than ferals (e.g. fire regime). Habitat retention through reserves or on other State lands or on private lands. Reintroduction to previous areas of habitat.
Dasycercus cristicauda	x, xii, i	Research into threatening processes other than ferals (e.g. fire regime). Habitat retention through reserves or on other State lands or on private lands.
Ctenotus zastictus	x, xii, i	Research into threatening processes other than ferals (e.g. fire regime). Habitat retention through reserves or on other State lands or on private lands.
Abutilon sp. Hamelin (AM Ashby 2196)	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Abutilon sp. Quobba (H Demarz 3858)	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Acacia ryaniana	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.

Species	Recovery Actions[1]	Recovery Descriptions
Chthonocephalus muellerianus	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Chthonocephalus oldfieldianus	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Chthonocephalus spathulatus	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Chthonocephalus tomentellus	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Gnephosis sp. Billabong (B Nordenstam and A Anderberg 203)	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Platysace sp. Kennedy (PG Wilson 8450)	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Ptilotus alexandri	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Rhodanthe ascendens	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Rhodanthe sp. Overlander (PS Short 2096)	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Rumex crystallinus	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Scaevola chrysopogon	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Sclerolaena stylosa	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Sondottia glabrata	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Tetragonia coronata	i, iii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Research into the effects of fire as well as the species general biology.
Thryptomene wittweri	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores (goats) required. Understanding of life history requirements for all rare flora very limited and needs additional research.

[1]Appendix B, key h

Ecosystems and appropriate recovery actions

Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
Permanent water soaks and wetlands on western edge of the Kennedy Ranges (B. Barton pers. comm.). Not distinct floristically but are geologically, flora highly variable, classified same as Callytharra claypans (G. Keighery pers. comm.).	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management, especially of mulgara habitat at Kennedy Range National Park.
Invertebrate assemblages of Mooka Springs (-245253,S, 1145827E). Spring in the Kennedy Range threatened by feral goats. Has rich representative invertebrate community (W. Kay, M. Smith, M. Scanlon, S. Halse pers. comm.).	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.

Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
Reptile assemblages of islands, gulfs and peninsulas, Shark Bay (Storr and Harold 1990)	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.
Invertebrate assemblages of Callytharra Spring, Wooramel River (-255232S, 1153007E). Permanent Spring on the Wooramel river. High aquatic invertebrate diversity threatened by cattle (W. Kay, M. Smith, M. Scanlon, S. Halse pers. comm.).	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.
Plant assemblages dominated by *Acacia sibilans* (Myall) occurs. The number of trees is estimated to be very few, occurs on Yaringa Station and possibly Carbla and Woodleigh (J. Stretch pers. comm.).	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.
Plant assemblages (spinifex dominated) of sand dune mesa topping the Kennedy Range National Park (B. Barton pers. comm.)	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management, especially of mulgara habitat at Kennedy Range National Park.
Flora and fauna assemblages of the gorges of Wooramel River (B. Barton pers. comm., T. Brandis pers. comm.)	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.
Mangrove communities dominated by *Avicennia* (Shark Bay) (B. Barton pers. comm.).	i, iii	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases).
Hypersaline community number 2. Stromatolites of Hamelin Pool (Burne 1991-1992; P. Brown pers. comm.).	i, iii	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases).
Acacia drephanophylla (Hamelin Wattle) on calcareous substrates. Regionally restricted. From Carnarvon Basin Land Systems >800km^2.	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats. Fire management, especially of mulgara habitat at Kennedy Range National Park.
Inland Mangrove assemblage *(Avicennia marina*) of Lake MacLeod. Western shore, photograph (Burbidge and McKenzie 1995).	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.
Lake MacLeod invertebrate assemblages. Saline aquatic community with strong marine affinities with particularly rich copepod element is effectively a well developed, very rich birrida community with strong marine and terrestrial components with especially rich hypactacoid community (Halse *et al*. 2002). (A. Storey pers. comm.)	i, iii	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases).
Fish assemblages of Blue Holes, Lake MacLeod. (Fish have been collected by Andrew Storey).	i, iii	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases).
Samphire communities of Lake MacLeod (Burbidge and McKenzie 1995)	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.
Assemblages of the Gascoyne Delta system (T. Brandis pers. comm.).	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.
Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
River Land System vegetation on Gascoyne River in Carnarvon. (J. Stretch pers. comm.)	i, iii, v, vi, vii, ix	Habitat protection through reserves, more reservation needed of high priority areas, habitat protection on state lands (pastoral leases). Fencing of sensitive areas as exclosures where there are heavy goat numbers. Weed control for critical habitats. Feral animal control, especially of goats and foxes. Fire management.
Specific Seagrass Communities. Shark Bay and elsewhere (Walker 1990, Walker 1989).	N/A	N/A
Sponge community at Shark Bay. (R.I.T. Prince pers. comm.).	N/A	N/A

[1]Appendix B, key h

Existing ecosystem recovery plans

There are no recovery plans currently written for any of the ecosystems at risk in CAR2.

Subregion priority for off reserve conservation

The subregional priority for off park conservation is (ii) (see Appendix C, rank 6), indicating that a large off-park effort is required.

Conservation actions as an integral part of NRM

Existing NRM actions

Institutional Reform: Through the Gascoyne Murchison Strategy, including purchase of leases for conservation estate.

Threat Abatement Planning: Including vegetation management plans, and pest management.

Industry Codes of Practice: Particularly in relation to pastoral, mining and exploration activities

Environmental Management Systems and Ecologically Sustainable Product Marketing

Integration With Property Management Planning, Catchment Planning and Landcare: Through Land Care District committees through the region.

Feasible opportunities for NRM

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

Institutional Reform: Including 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.

Environmental Management Systems and Ecologically Sustainable Product Marketing: Some pastoral areas are attempting to identify and implement ecologically sustainable practices through the EMU process developed by the Rangelands Environmental Management Program of GMS. Requires a greater level of support to be successful.

Impediments or constraints to opportunities

A number of impediments exist including the Land Administration Act and operations of the Pastoral Land Board. Both the act and the Pastoral Land Board have requirements of Pastoral Leases that may not be consistent with conservation. CTR is limited by the presence of mining leases and tenements. There is a need to increase awareness of conservation values through education of major industries (mining, agricultural) and the public in general. Limited financial resources are also a major constraint.

Subregions where specific NRM actions are a priority to pursue

CAR2 has an NRM priority of (i) (see Appendix C, rank 7), indicating that there are major constraints to implement effective NRM actions to achieve biodiversity outcomes. Much of CAR is severely degraded through past agricultural practices (primarily sheep & cattle grazing) and feral herbivores. Under the Land Administration Act leases are still required to maintain certain stock levels that do not necessarily fit with conservation values. Pastoral Industry reform is essential to achieve desired conservation outcomes. Similar situation to MUR1 & MUR2.

Data gaps

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

Vegetation and Regional Ecosystem Mapping: Regolith mapping available at scale of 1:250 000. Vegetation map resolution is 1:250 000 at best.

Systematic Fauna Survey: Regional survey of fauna has been completed, but it was confined to vertebrates and selected invertebrate taxa. Also, sampling was sparse (ca. 40 terrestrial quadrats and 10 wetland quadrats across subregion), with quadrats positioned only on the most widespread surface-types, only 2-3 quadrats per surface-type, and few quadrats were sampled on more than two occasions. Most reserves don't have long-term survey data on species presence or absence even for vertebrates.

Floristic Data: Regional survey of flora has been completed, but it was based on sparse sampling (about 170 quadrats across subregion), with quadrats positioned on only the most widespread surface-types. Additional Herbarium collections have been made elsewhere in the subregion, however these were mainly for taxonomic purposes. Inventory sites were surveyed by the Departments of Agriculture and Land Administration in the Carnarvon Basin rangelands providing limited plant identification.

Ecological and Life History Data: There is little data on habitat requirements of virtually all invertebrate species, most ephemeral plants, persisting CWR mammals, and uncommon vertebrate- and plant-species. There are no data to provide a regional context on life-history (including population-trend) of most species, including CWR mammals and introduced pests such as rabbits, goats, cats and foxes.

Other Priority Data Gaps Include:
No quantitative data on the affect of exotic predators, weed colonisation, fire, introduced herbivores, mineral-extraction on gypsum surfaces of Lake MacLeod.

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

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