Murchison 2 *(MUR2 – Western Murchison subregion)*

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Subregional description and biodiversity values

Description and area

Northern part of the 'Murchison' Terrains of the Yilgarn Craton. Mulga low woodlands, often rich in ephemerals (usually with bunch grasses), on outcrop and fine-textured Quaternary alluvial and eluvial surfaces (extensive hardpan washplains that dominate and characterise the subregion) mantling granitic and greenstone strata of the northern part of the Yilgarn Craton. Surfaces associated with the occluded drainage occur throughout with hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and Halosarcia low shrublands on saline alluvia. Contains the headwaters of the Murchison and Wooramel Rivers, which drain the subregion westwards to the coast. Arid climate with bimodal rainfall that usually falls in winter. The subregional area is 7,847,996 ha.

Dominant land use

(see Appendix B, key b)

Mainly (ix) grazing native pastures (96.2%), with lesser areas of (xi) UCL and Crown reserves (2.81%). (xiii) Conservation lands only constitute 0.06% of the subregion; a significant proportion of conservation estate in the subregion falls outside the IUCN I-IV categories. (vii) Mining interest in nickel and gold mining in particular are considerable, however most mining leases still come under the pastoral lands act and as such are still required to be stocked.

Continental Stress Class

The Continental Stress Class for MUR2 is 3.

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

In 1974 the Conservation Through Reserves Committee (CTRC) made recommendations for reserves within the Murchison Region (System 10) in the CTRC Green Book. It is only in the last 10 years that any significant areas of the region have been added to the Conservation estate. 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An unpublished report by Department of Conservation and Land Management - "Gascoyne - Murchison Strategy, Establishment and Management of a Conservation Reserve System"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)).

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

Rare Features:

- Calcrete aquifers in the eastern part of the subregion are known to support a wide range of subterranean aquatic fauna that are short range endemics. Our understanding of biogeography for these groups is currently very limited but work by Humphries et al. suggests that there is significant stygofauna in the Murchison system, at Austin Downs and Killara Stations.
- Rare fauna for the subregion include *Acanthiza iredalei iredalei, Dasycercus cristicauda* (Mulgara) and *Egernia stokesii badia*.
- Rare flora known for the subregion includes *Darwinia* sp. Carnamah (J Coleby-Williams 148).

Ecosystem Types That Have at Least 85% of Their Total Extent Confined to the Murchison 2 Subregion:

Beard Veg Code	Description
362	Mosaic: Shrublands; bowgada & minnieritchie scrub with scattered mulga/Scattered groups of saltbush/bluebush
300	Mosaic: Low woodland; mulga/Succulent steppe; saltbush & bluebush
305	Medium woodland over scrub; coolibah over bowgada
1125	Succulent steppe with scrub; *Acacia victoriae* & snakewood over saltbush & bluebush
1126	Low woodland; mulga & minnieritchie
1128	Mosaic: Succulent steppe with open scrub; scattered *Acacia sclerosperma* & bowgada over saltbush & bluebush/Succulent steppe; samphire
34	Shrublands; acacia scrub with scattered mulga
Beard Veg Code	Description
187	Succulent steppe with open scrub; scattered *Acacia victoriae* & snakewood over various species
261	Succulent steppe with low woodland; snakewood over saltbush & bluebush
288	Mosaic: Scattered low trees; mulga/Succulent steppe; sparse saltbush & bluebush on greenstone
306	Low woodland; *Casuarina ?obesa* (salt lake)
327	Shrublands; mulga, bowgada, *Acacia quadrimarginea* & minnieritchie scrub
340	Succulent steppe with scrub; bowgada scrub over various species
341	Low woodland over scrub; mulga over *Acacia sclerosperma* bowgada, *A. victoriae* & minnieritchie (*A. grasbyi*)

Centres of Endemism:

- Calcrete aquifers in the eastern part of the subregion are known to support a wide range of subterranean aquatic fauna that are short range endemics. Our understanding of biogeography for these groups is very limited but work by Humphries *et al.* (2001) suggests that there is significant stygofauna in the Murchison system, at Austin Downs and Killara Stations.
- The elapid snake *Pseudechis butleri* is known to be regionally endemic.

Refugia:

- Wooleen Lake: A floodplain lake and associated marshes with samphire on the floor and lignum and *Eucalyptus camaldulensis* low open woodland around the margins. Important waterbird breeding habitat. Significant breeding area for Gull-billed Terns (*Gelochelidon nilotica*).
- Anneen Lake: A large saline or brackish lake and marsh with numerous islands and peninsulas. Significant breeding area for Gull-billed Terns (*Gelochelidon nilotica*) and Whiskered Terns (*Chidoias hybrida*). Refuge for other waterbirds.

Wetlands

Wetlands of National significance (DIWA listings

Name and Code	Description[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Wooleen Lake (WA061)	B6	ii - iii	vi	iii	iv, v (goats, foxes, cats & rabbits)
Breberle Lake (WA057)	B6, B14	ii - iii	vi	iii	iv, v (goats, foxes, cats & rabbits)
Anneen Lake (WA056)	B8, B12	ii - iii	vi	iii	iv, v (goats, foxes, cats & rabbits), xii (nearby mining operations)

[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]
Mungawolagudgi Claypan (Muggon Station)	330,000mE 7,050,000mN	B6	ii, v (contains significant *Melaleuca uncinata* shrublands and vegetation types associated with dunes)	iii	iv	i	v (goats), x (increase inflow of sediments due to erosion of catchment)

[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]
Wooramel River	i	iii	ii	iv, v (goats, rabbits & foxes) vi (buffel grass, saffron thistle, thorn apple, mexican poppy), x
Murchison River	i	iii	ii	iv, v (goats, rabbits & foxes) vi (buffel grass, saffron thistle, thorn apple, mexican poppy), 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)

There are no declared Threatened Ecological Communities (TECs) in MUR2.

Other ecosystems at risk

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability Rank[4]	Threatening Processes[5]
Subterranean fauna of the Murchison Basin. Calcrete formations north east of Cue (B. Humphreys pers. comm.).	V	N/A	iii	iv	iii	xi, ix
Mount Narryer and Jack Hills vegetation complexes (R. Shepherd, B. Barton pers. comm.);	V		ii	iv	i	iv, v (goats, rabbits, foxes), vii
Stony bluebush mixed shrubland (SBMS) of the Sandstone-Yalgoo-Paynes Find area (Payne *et al*. 1998)	V	31	ii	iv	ii	iv, v (goats, rabbits, foxes), vii
Hardpan plain mulga shrubland with scattered chenopods (HMCS) of the Sandstone-Yalgoo-Paynes Find area (Payne *et al*. 1998)	V	22	ii	iv	ii	iv, v (goats, rabbits, foxes), vii
Melaleuca wetlands and spinifex areas of the Lake System on Muggon Station (B. Barton, R. Shepherd pers. comm.)	V	15, 33	ii	v	ii	iv, v (goats, rabbits, foxes), x (hydrology change increasing sedimentation due to erosion in catchment)
Alluvial plain snakewood chenopod shrubland (ASWS) of the Sandstone-Yalgoo-Paynes Find area (Payne *et al*. 1998)	V	22	iii	iv	ii	iv, v (goats, rabbits), vii
Breakaway footslope chenopod low shrubland of the Sandstone-Yalgoo-Paynes Find area (Payne *et al*. 1998)	V	31	ii	iv	ii	iv, v (goats, rabbits), vii
Shrubland communities of lake frontages, Murchison area. Polelle Station good condition (A. Mitchell pers. comm.)	V		ii	vi	i	iv, v (goats, rabbits), x changed hydrology from erosional surfaces
Floodplains of the Carnarvon Basin, Wooramel and Gascoyne Rivers (Burbidge and McKenzie 1995; Wilcox and McKinnon 1992).	V	Variable	ii	iii	i	iv, v (goats, rabbits), vi (Buffel Grass), vii
Assemblages of the inland Granites (Murchison) (A. Brown, S. Hopper pers. comm.)	V	41	ii	iv	ii	iv, v (goats, rabbits),
Hardpan mulga (*Acacia aneura*) shrublands HPMS; Murchison River catchment (Curry 1994)	V	20	iii	iv	ii	iv, v (goats, rabbits), vii
Bluebush (*Maireana* spp.) shrublands BLUS; Murchison River catchment (Curry 1994).	V	31	ii	iv	ii	iv, v (goats, rabbits), vii
Mixed halophytic shrublands MXHS; Murchison River catchment (Curry 1994) (R. Shepherd pers. comm.).	V	39	ii	iii	ii	iv, v (goats, rabbits), vii
Stony mulga (*Acacia aneura*) mixed shrubland SMMS; Murchison River catchment (Curry 1994)	V	21	iii	iv	ii	iv, v (goats, rabbits), vii
Saltbush (*Atriplex* spp.) shrublands SALS; Murchison River catchment (Curry 1994) (R. Shepherd pers. comm.).	V	31	ii	iii	ii	iv, v (goats, rabbits), vii

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability Rank[4]	Threatening Processes[5]
Stony snakewood (*Acacia xiphophylla*) shrublands SSWS; Murchison River catchment (Curry 1994).	V	21	ii	iv	ii	iv, v (goats, rabbits), vii
Calcrete shrubby grasslands CSHG; Murchison River catchment (Curry 1994).	V	37	iii	iv	ii	iv, v (goats, rabbits), vii
Non-calcareous shrubby grasslands NCSG; Murchison River catchment (Curry 1994).	V	37	iii	iii	ii	iv, v (goats, rabbits), vii
Creekline grassy shrublands CRGS; Murchison River catchment (Curry 1994).	V	37	ii	iii	ii	iv, v (goats, rabbits), vii
Calcrete Eucalypt woodlands of Murchison River catchment (Curry 1994).	V	8	iii	iv	ii	iv, v (goats, rabbits), vii
Assemblages of specific lake communities e.g. Lake Austin, Lake Annean (ANCA 1996 - Lake Annean) (R. Shepherd pers. comm.)	V	N/A	ii	vi	i	iv, v (goats, rabbits)
Eucalyptus camaldulensis woodlands that are Major Mitchell nesting sites on Berringarrah and Milly Milly Stations along the Murchison River (N. McKenzie data) (P. Brown, R. Shepherd, B. Barton pers. comm.)	V	8	iii	vi	ii	iv, v (goats, rabbits), vii
Aquatic fauna assemblages of Fish Holes on Doolgunna Station. Possibly have endemic fish and turtles (K. Tinley pers. comm.). Fish since collected and sent to Museum now awaiting ID.	V	N/A	ii	vi	ii	v (Tilapia)
Assemblages of the perched lake at Weld Range (K. Tinley Pers. comm.)	V	N/A	ii	vi	i	Potential damage from cattle
Marloo land system Mitchell Grass floodplain, top end type Mia Mia Station (K. Tinley pers. comm.)		34	ii	vi	Unknown	iv, xii (erosion)
Merbla land system Unique treeless grassland (K. Tinley pers. comm.)		37	ii	vi	Unknown	iv, xii (erosion)
CWR Mammals. Extant species include *Dasycercus cristicauda,* Species extinct in subregion include *Macrotis lagotis, Pseudomys chapmanii.*	E	N/A	i	ii	iii	v (cats, foxes), ii, vii, iv

[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	ii	iii	iii	v (foxes & cats), vii
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 2 (BIRDS)					
Leipoa ocellata	V	ii	iii	iii	v (foxes & cats), iv
Acanthiza iredalei iredalei	V	ii	iv	ii	vii
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 3 (REPTILES)					
Egernia stokesii badia	E	ii	iii	ii	v (foxes & cats), 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					
Eremophila rostrata ms	DRF	unknown	vi	iii	v (goats), iv, xii (mining)
PRIORITY 1					
Baeckea sp. Mount Barloweerie (JZ Weber 5079)	1	unknown	vi	iii	v (goats), iv
Dicrastylis sp. Cue (AA Mitchell 764)	1	unknown	vi	ii	v (goats), iv, vi
Eremophila flaccida subsp. *attenuata* ms	1	unknown	vi	ii	v (goats), iv, vi
Eremophila micrantha ms	1	unknown	vi	ii	iv, v, (goats), vi, vii
Eremophila ringens ms	1	unknown	vi	ii	v (goats), iv, vi
Gnephosis cassiniana	1	unknown	vi	iii	i, ii
Goodenia berringbinensis	1	unknown	vi	ii	v (goats), vi, vii
Gunniopsis divisa	1	unknown	vi	ii	v (goats), vi, vii
Lepidium xylodes	1	unknown	vi	ii	v (goats), iv, vi, vii
Neotysonia phyllostegia	1	unknown	vi	ii	iv, v (goats), vi, vii
Philotheca citrina	1	unknown	vi	ii	v (goats), iv, vii, iv
Prostanthera petrophila	1	unknown	vi	ii	v (goats), iv
Ptilotus astrolasius var. *luteolus*	1	unknown	vi	ii	iv, v (goats), vii, vi
Ptilotus lazaridis	1	unknown	vi	ii	iv, v, (goats), x
Rhodanthe sphaerocephala	1	unknown	vi	ii	iv, v (goats) vii , vi
PRIORITY 2					
Melaleuca oldfieldii	2	unknown	vi	ii	i, ii, iv, vi, vii, ix
Persoonia brachystylis	2	unknown	vi	ii	iv, v (goats), vi, vii
Podotheca pritzelii	2	unknown	vi	ii	i, ii, x, xi, iv, v (goats)
Scholtzia sp. Eradu (RD Royce 8016)	2	unknown	vi	ii	i, 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	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
11	Medium woodland; coolibah (*E. microtheca*)				L
18	Low woodland; mulga (*Acacia aneura*)	X	X	X	M
28	Open low woodland; mulga				H
29	Sparse low woodland; mulga, discontinuous in scattered groups			X	H
34	Shrublands; acacia scrub with scattered mulga				H
39	Shrublands; mulga scrub		X		H
107	Hummock grasslands, shrub steppe; mulga and *Eucalyptus kingsmillii* over hard spinifex			X	L
125	Bare areas; salt lakes			X	L
128	Bare areas; rock outcrops				L
160	Shrublands; snakewood & *Acacia victoriae* scrub				M
162	Shrublands; snakewood scrub			X	L
165	Low woodland; mulga & snakewood (*A. eremaea*)				L
166	Low woodland; mulga & *Acacia victoriae*			X	H
167	Shrublands; *Acacia victoriae* & snakewood open scrub				L
169	Shrublands; mulga & minnieritchie scrub				H
182	Low woodland; mulga & bowgada (*A. ramulosa*)				H
183	Low woodland; mulga, *Acacia victoriae* & snakewood				H
184	Shrublands; mulga & bowgada scrub				H
187	Succulent steppe with open scrub; scattered *Acacia victoriae* & snakewood over various species				H
Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
188	Shrublands; mulga & *Acacia sclerosperma* scrub				H
202	Shrublands; mulga & *Acacia quadrimarginea* scrub			X	M
204	Succulent steppe with open scrub; scattered mulga & *Acacia*				H

	sclerosperma over saltbush & bluebush				
205	Shrublands; *Acacia sclerosperma* & bowgada scrub	X		X	L
228	Shrublands; *Acacia quadrimarginea* scrub				M
229	Mosaic: Shrublands; bowgada and associated spp scrub/Shrublands; bowgada & grevillea scrub			X	L
240	Succulent steppe with open scrub; scattered *Acaica sclerosperma* & bowgada over saltbush & bluebush			X	L
261	Succulent steppe with low woodland; snakewood over saltbush & bluebush			X	L
264	Low woodland; *Acacia victoriae* & snakewood				M
266	Mosaic: Shrublands; bowgada scrub/Succulent steppe; saltbush & bluebush			X	H
267	Succulent steppe with open scrub; scattered *Acaica sclerosperma* & *A. victoriae* over saltbush & bluebush				H
268	Succulent steppe with open scrub; scattered *Acacia sclerosperma* over saltbush & bluebush				H
269	Low woodland over scrub; mulga over bowgada scrub			X	H
288	Mosaic: Scattered low trees; mulga/Succulent steppe; sparse saltbush & bluebush on greenstone				H
300	Mosaic: Low woodland; mulga/Succulent steppe; saltbush & bluebush				H
305	Medium woodland over scrub; coolibah over bowgada				H
306	Low woodland; *Casuarina ?obesa* (salt lake)				H
325	Succulent steppe; saltbush & samphire				L
326	Low woodland over scrub; mulga over bowgada & minnieritchie scrub				H
327	Shrublands; mulga, bowgada, *Acacia quadrimarginea* & minnieritchie scrub			X	H
340	Succulent steppe with scrub; bowgada scrub over various species				H
341	Low woodland over scrub; mulga over *Acacia sclerosperma bowgada, A. victoriae* & minnieritchie (*A. grasbyi*)				H
352	Medium woodland; York gum				L
358	Shrublands; bowgada & *Acacia quadrimarginea* on stony ridges				L
361	Shrublands; bowgada & minnieritchie scrub with scattered mulga			X	H
362	Mosaic: Shrublands; bowgada & minnieritchie scrub with scattered mulga/Scattered groups of saltbush/bluebush	X			H
363	Shrublands; bowgada scrub with scattered cypress pine	X			L
364	Shrublands; bowgada scrub with scattered eucalypts & cypress pine				L
395	Hummock grasslands, mixed sandplain; bowgada, mallee, heath and spinifex				H
404	Shrublands; bowgada & *Acacia murrayana* scrub				H
415	Succulent steppe with open scrub; scattered mulga & other wattle(s) over saltbush & bluebush			X	L
420	Shrublands; bowgada & jam scrub				M
483	Hummock grasslands, mixed sandplain - open mallee over sparse dwarf shrubs with spinifex; red mallee & mixed sparse dwarf shrubs over *Triodia basedowii*				L
676	Succulent steppe; samphire				L
1125	Succulent steppe with scrub; *Acacia victoriae* & snakewood over saltbush & bluebush			X	H
1126	Low woodland; mulga & minnieritchie				H
1128	Mosaic: Succulent steppe with open scrub; scattered *Acaica sclerosperma* & bowgada over saltbush & bluebush/Succulent steppe; samphire				H
Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
2081	Shrublands; bowgada and associated spp. scrub	X	X	X	L
	Subterranean fauna of the Murchison Basin. Calcrete formations north east of Cue.				H
	Mount Narryer and Jack Hills vegetation complexes				H
	Stony bluebush mixed shrubland (SBMS) of the Sandstone-Yalgoo-Paynes Find area				H
	Hardpan plain mulga shrubland with scattered chenopods (HMCS) of the Sandstone-Yalgoo-Paynes Find area				H
	Melaleuca wetlands and spinifex areas of the Lake System on Muggon Station			X	M
	Alluvial plain snakewood chenopod shrubland (ASWS) of the Sandstone-Yalgoo-Paynes Find area			X	L
	Breakaway footslope chenopod low shrubland of the Sandstone-Yalgoo-Paynes Find area			X	M
	Shrubland communities of lake frontages, Murchison area. Polelle Station good condition				H
	Floodplains of the Carnarvon Basin, Wooramel and Gascoyne Rivers				H
	Assemblages of the inland Granites (Murchison)			X	H

	Hardpan mulga (*Acacia aneura*) shrublands HPMS; Murchison River		X		H
	Bluebush (*Maireana* spp.) shrublands BLUS; Murchison River catchment				H?
	Mixed halophytic shrublands MXHS; Murchison River catchment				L
	Stony mulga (*Acacia aneura*) mixed shrubland SMMS; Murchison River catchment		X		H
	Saltbush (*Atriplex* spp.) shrublands SALS; Murchison River catchment			X	H
	Stony snakewood (*Acacia xiphophylla*) shrublands SSWS; Murchison River catchment			X	L
	Calcrete shrubby grasslands CSHG; Murchison River catchment				H?
	Non-calcareous shrubby grasslands NCSG; Murchison River catchment.				H?
	Creekline grassy shrublands CRGS; Murchison River catchment				H?
	Calcrete Eucalypt woodlands of Murchison River catchment				H
	Assemblages of specific lake communities e.g. Lake Austin, Lake Annean				H
	Eucalyptus camaldulensis woodlands that are Major Mitchell nesting sites on Berringarrah and Milly Milly Stations along the Murchison River				H
	Eucalyptus ferriticola over shrubs on drainage lines in Murchison e.g. Doolgunna Station			X	M
	Aquatic fauna assemblages of Fish Holes on Doolgunna Station. Possibly have endemic fish and turtles			X	L
	Assemblages of the perched lake at Weld Range				H
	CWR Mammals. Extant species include *Dasycercus cristicauda,* Species extinct in subregion include *Macrotis lagotis, Pseudomys chapmanii.*				H

Subregional constraints in order of priority
(see Appendix B, key g)

Competing Land Use: The primary issue in that pastoralism occupies more than 96% of the region and mining also has considerable interests.

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 the majority of the subregion is significant due to pastoral practices and the impacts of feral herbivores

Bioregional and subregional priority for reserve consolidation

MUR is reservation class 2 (see Appendix D, and Appendix C, rank 4) with only 1.39% of area in conservation reserve (IUCN I-IV) At the subregional level MUR1 has 1.82% in reserve (IUCN I-IV) while MUR2 has only 0.053% 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 1 is more appropriate for MUR2.

Reserve management standard

The Reserve Management Rank is (i) (see Appendix C, rank 5), indicating that there is very limited management presence. Reserve management is limited to some fire access track maintenance and removal of goats to varying degrees. No feral predator baiting programs exist.

Off reserve conservation

Priority species or groups

Species	Beard Vegetation Association or Ecosystem	Recovery Plan?
Stygofauna	Calcrete aquifers	no
Leipoa ocellata	20 – Low woodland: mulga mixed with *Allocasuarina cristata* and *Eucalyptus* sp.	Recovery Plan for Mallee Fowl, The Action Plan for Australian Birds 2000
Acanthiza iredalei iredalei		The Action Plan for Australian Birds 2000
Dasycercus cristicauda	18 – Low woodland: mulga (*Acacia aneura*); 39 – Shrublands: mulga scrub; 107 – Hummock grasslands, shrub steppe: mulga and *Eucalyptus kingsmillii* over hard spinifex	1996 Action Plan for Australian Marsupials and Monotremes
Egernia stokesii badia	205 – Shrublands: *Acacia sclerosperma* & bowgada scrub; 243 – Shrublands: bowgada & minnieritchie scrub; 365 – Shrublands: bowgada & jam scrub with scattered York gum and red mallee	The Action Plan for Australian Reptiles

Appropriate species recovery actions

Species	Recovery Actions[1]	Recovery Descriptions
Stygofauna	i, ii, iii	Protection of calcrete deposits from weeds and eutrophication. Habitat retention through reserves or on other State lands or on private lands.

Leipoa ocellata	i, ii, iii, vii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. CWR species that is no longer extant in the subregion. Control of feral animals, notably foxes, as well as fire management are essential.
Acanthiza iredalei iredalei	i, ii, iii, vii	Habitat retention through reserves or on other State lands or on private lands. Control of foxes and cats. Reduction in habitat degradation through grazing pressure.
Dasycercus cristicauda	i, ii, iii, vii, ix, xii	CWR species that requires specific fire age spinifex habitat. Predated upon by foxes and cats. Ecological research currently being conducted by D. J. Pearson.
Egernia stokesii badia	i, ii, v, vii, ix	Habitat retention through reserves or on other State lands or on private lands. Control of foxes and cats. Reduction in habitat degradation through grazing pressure.
Baeckea sp. Mt Barloweerie (JZ Weber 5079)	v (goats), iv	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores such as rabbits and goats required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Dicrastylis sp. Cue (AA Mitchell 764)	v (goats), iv, vi	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Eremophila flaccida subsp. *attenuata* ms	v (goats), iv, vi	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as rabbits and goats required.. Understanding of life history requirements for all rare flora very limited and requires additional research.

Species	Recovery Actions[1]	Recovery Descriptions
Eremophila micrantha ms	iv, v (goats), vi, vii	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as rabbits and goats may be required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Eremophila ringens ms	v (goats), iv, vi	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as rabbits and goats required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Eremophila rostrata ms	v (goats), iv, xii (mining)	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Arrange protection from mining activities. Control of grazing by sheep and goats required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Gnephosis cassiniana	i, ii	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Demarcation of road and rail reserve populations.
Goodenia berringbinensis	v (goats), vi, vii	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as rabbits and goats required.. Understanding of life history requirements for all rare flora very limited and requires additional research.
Gunniopsis divisa	v (goats), vi, vii	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Lepidium xylodes	v (goats), iv, vi, vii	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Melaleuca oldfieldii	i, ii, iv, vi, vii, ix	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Neotysonia phyllostegia	iv, v (goats), vi, vii	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Persoonia brachystylis	iv, v (goats), vi, vii	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Philotheca citrina	v (goats), iv, vii, iv	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Podotheca pritzelii	i, ii, x, xi, iv, v (goats)	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats may be required. Understanding of life history requirements for all rare flora very limited and requires additional research.

Species	Recovery Actions[1]	Recovery Descriptions
Prostanthera petrophila	v (goats), iv	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Ptilotus astrolasius var. *luteolus*	iv, v (goats), vii, vi	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Ptilotus lazaridis	iv, v, (goats), x	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Rhodanthe sphaerocephala	iv, v (goats), vii, vi	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats may be required. Understanding of life history requirements for all rare flora very limited and requires additional research.
Scholtzia sp. Eradu (RD Royce 8016)	i, ii, iv, v (goats), vii	Habitat retention through reserves or on other State lands or on private lands. Investigation of disturbance requirements for regeneration required. Control of herbivores such as sheep, rabbits and goats may be required. Understanding of life history requirements for all rare flora very limited and requires additional research.

[1]Appendix B, key h.

There are no specific regional recovery plans for any of the above biota / systems. Most species of flora have broad discussion of actions required to assist recovery detailed in the publication Declared Rare and Poorly Known Flora in the Geraldton District (Patrick 2001). Other Recovery Plans include: National Recovery Plan for Malleefowl; The Action Plan for Australian Birds, 2000; Action Plan for Australian Marsupials and Monotremes; The Action Plan for Australian Reptilles.

Ecosystems and appropriate recovery actions

Beard Veg Code	Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
11	Medium woodland; coolibah (*E. microtheca*)	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
18	Low woodland; mulga (*Acacia aneura*)	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
28	Open low woodland; mulga	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
29	Sparse low woodland; mulga, discontinuous in scattered groups	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
34	Shrublands; acacia scrub with scattered mulga	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
39	Shrublands; mulga scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
Beard Veg Code	Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
107	Hummock grasslands, shrub steppe; mulga and *Eucalyptus kingsmillii* over hard spinifex	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
125	Bare areas; salt lakes	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
128	Bare areas; rock outcrops	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity

			building required with industry.
160	Shrublands; snakewood & *Acacia victoriae* scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
162	Shrublands; snakewood scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
165	Low woodland; mulga & snakewood (*A. eremaea*)	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
166	Low woodland; mulga & *Acacia victoriae*	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
167	Shrublands; *Acacia victoriae* & snakewood open scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
169	Shrublands; mulga & minnieritchie scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
182	Low woodland; mulga & bowgada (*A. ramulosa*)	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
183	Low woodland; mulga, *Acacia victoriae* & snakewood	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
184	Shrublands; mulga & bowgada scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
187	Succulent steppe with open scrub; scattered *Acacia victoriae* & snakewood over various species	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
188	Shrublands; mulga & *Acacia sclerosperma* scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
202	Shrublands; mulga & *Acacia quadrimarginea* scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.

Beard Veg Code	Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
204	Succulent steppe with open scrub; scattered mulga & *Acacia sclerosperma* over saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
205	Shrublands; *Acacia sclerosperma* & bowgada scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
228	Shrublands; *Acacia quadrimarginea* scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
229	Mosaic: Shrublands; bowgada and associated spp scrub/Shrublands; bowgada & grevillea scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
240	Succulent steppe with open scrub; scattered *Acaica sclerosperma* & bowgada over saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
261	Succulent steppe with low woodland; snakewood over saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
264	Low woodland; *Acacia victoriae* & snakewood	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
266	Mosaic: Shrublands; bowgada scrub/Succulent steppe; saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
267	Succulent steppe with open scrub; scattered *Acaica sclerosperma* & *A. victoriae* over saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
268	Succulent steppe with open scrub; scattered *Acacia sclerosperma* over saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
269	Low woodland over scrub; mulga over bowgada scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
288	Mosaic: Scattered low trees; mulga/Succulent steppe; sparse saltbush & bluebush on greenstone	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
300	Mosaic: Low woodland; mulga/Succulent steppe; saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
305	Medium woodland over scrub; coolibah over bowgada	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
306	Low woodland; *Casuarina ?obesa* (salt lake)	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.

Beard Veg Code	Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
325	Succulent steppe; saltbush & samphire	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
326	Low woodland over scrub; mulga over bowgada & minnieritchie scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
327	Shrublands; mulga, bowgada, *Acacia quadrimarginea* & minnieritchie scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
340	Succulent steppe with scrub; bowgada scrub over various species	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
341	Low woodland over scrub; mulga over *Acacia sclerosperma bowgada, A. victoriae* & minnieritchie (*A. grasbyi*)	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
352	Medium woodland; York gum	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
358	Shrublands; bowgada & *Acacia quadrimarginea* on stony ridges	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
361	Shrublands; bowgada & minnieritchie scrub with scattered mulga	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
362	Mosaic: Shrublands; bowgada & minnieritchie scrub with scattered mulga/Scattered groups of saltbush/bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
363	Shrublands; bowgada scrub with scattered cypress pine	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
364	Shrublands; bowgada scrub with scattered eucalypts & cypress pine	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
395	Hummock grasslands, mixed sandplain; bowgada, mallee, heath and spinifex	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
404	Shrublands; bowgada & *Acacia murrayana* scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
415	Succulent steppe with open scrub; scattered mulga & other wattle(s) over saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
420	Shrublands; bowgada & jam scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.

Beard Veg Code	Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
483	Hummock grasslands, mixed sandplain - open mallee over sparse dwarf shrubs with spinifex; red mallee & mixed sparse dwarf shrubs over *Triodia basedowii*	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
676	Succulent steppe; samphire	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
1125	Succulent steppe with scrub; *Acacia victoriae* & snakewood over saltbush & bluebush	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
1126	Low woodland; mulga & minnieritchie	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
1128	Mosaic: Succulent steppe with open scrub; scattered *Acaica sclerosperma* & bowgada over saltbush & bluebush/Succulent steppe; samphire	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
2081	Shrublands; bowgada and associated spp. scrub	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Subterranean fauna of the Murchison Basin. Calcrete formations north east of Cue.	i, ii, iii, xiii	Habitat retention through reserves or on other State lands or on private lands. Capacity building required with industry.
	Mount Narryer and Jack Hills vegetation complexes	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Stony bluebush mixed shrubland (SBMS) of the Sandstone-Yalgoo-Paynes Find area	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Hardpan plain mulga shrubland with scattered chenopods (HMCS) of the Sandstone-Yalgoo-Paynes Find area	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Melaleuca wetlands and spinifex areas of the Lake System on Muggon Station	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Alluvial plain snakewood chenopod shrubland (ASWS) of the Sandstone-Yalgoo-Paynes Find area	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Breakaway footslope chenopod low shrubland of the Sandstone-Yalgoo-Paynes Find area	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Shrubland communities of lake frontages, Murchison area. Polelle Station good condition	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Floodplains of the Carnarvon Basin, Wooramel and Gascoyne Rivers	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
Beard Veg Code	Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
	Assemblages of the inland Granites (Murchison)	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Hardpan mulga (*Acacia aneura*) shrublands HPMS; Murchison River	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Bluebush (*Maireana* spp.) shrublands	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands.

	BLUS; Murchison River catchment		Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Mixed halophytic shrublands MXHS; Murchison River catchment	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Stony mulga (*Acacia aneura*) mixed shrubland SMMS; Murchison River catchment	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Saltbush (*Atriplex* spp.) shrublands SALS; Murchison River catchment	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Stony snakewood (*Acacia xiphophylla*) shrublands SSWS; Murchison River catchment	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Calcrete shrubby grasslands CSHG; Murchison River catchment	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Non-calcareous shrubby grasslands NCSG; Murchison River catchment.	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Creekline grassy shrublands CRGS; Murchison River catchment	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Calcrete Eucalypt woodlands of Murchison River catchment	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Assemblages of specific lake communities e.g. Lake Austin, Lake Annean	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Eucalyptus camaldulensis woodlands that are Major Mitchell nesting sites on Berringarrah and Milly Milly Stations along the Murchison River	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control most particularly goats. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Aquatic fauna assemblages of Fish Holes on Doolgunna Station. Possibly have endemic fish and turtles	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
	Assemblages of the perched lake at Weld Range	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.
Beard Veg Code	Ecosystem Description	Recovery Actions[1]	Recovery Descriptions
	CWR Mammals. Extant species include *Dasycercus cristicauda,* Species extinct in subregion include *Macrotis lagotis, Pseudomys chapmanii.*	i, ii, iii, vii, vi, v, xiii	Habitat retention through reserves or on other State lands or on private lands. Feral animal control. Weed control. Fencing of sensitive areas where there are heavy goat numbers, as exclosures. Capacity building required with industry.

[1]Appendix B, key h.

Existing ecosystem recovery plans

There are no recovery plans that are relevant to ecosystems at risk in MUR2.

Subregion priority for off reserve conservation

The subregional priority for off park conservation is (ii) (see Appendix C, rank 6), indicating that significant off park effort is needed, resource constraints, and community capacity is limited.

Conservation actions as an integral part of NRM

Existing NRM actions

Institutional Reform: Through the Gascoyne Murchison Strategy. Purchase of leases for conservation estate.

Threat Abatement Planning as Part of NRM: e.g. Vegetation management plans, 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 Conservation District Committees through the region.

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.

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 GMS. Needs 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. Conservation Through Reserves 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

The NRM priority for MUR2 is (i) (see Appendix C, rank 7), indicating that there are major constraints to implement effective NRM actions and achieve biodiversity outcomes. Much of MUR is severely degraded through past agricultural practices (primarily sheep & cattle grazing) and feral herbivores. Under the pastoral lands 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

Data gaps

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

Vegetation and Regional Ecosystem Mapping: No regolith mapping available. Regional ecosystem mapping has been produced at the broad scale, 1:1 000 000 for Beard's vegetation, and 1:500 000 for Landsystems by the Western Australian Dept. Agriculture (Payne *et al.* 1998).

Systematic Fauna Survey: Data is very sparse. Few quadrats have been sampled on more than two occasions. Most reserves don't have long-term survey data on species presence or absence, even for vertebrates. Fauna of wetlands and stygofauna are poorly understood or sampled.

Floristic Data: No regional survey of flora has been completed. Flora of wetlands has been poorly sampled. Inventory sites were surveyed by the Departments of Agriculture and Land Administration in the Murchison rangelands providing limited plant identification. Condition sites were examined to see the effects of grazing on various plant species and the data set is essentially perennials and some other palatable species (Payne *et al.*1987).

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. There is little data to provide a regional context on population-trends for even ecologically significant specie, including rabbits, goats and foxes.

Other Priority Data Gaps Include:

- No quantitative data on the affect of exotic predators, weed colonisation, fragmentation, fire, mineral-extraction on greenstone surfaces.

Sources

References cited

No.	Author	Date	Title	Publication Details	Pub. Type
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712	Burbidge, A. and McKenzie, N.	(1995).	Patterns in nature: the biodiversity of the Carnarvon Basin.	Landscope 11(2), 15-20	J
181	Cogger, H., Cameron, E.,	(1993).	The Action Plan for Australian Reptiles.	Australian Nature Conservation	R

	Sadlier, R. and Eggler, P.			Agency, Canberra.	
719	Curry, P.J.	(1994).	An inventory and condition survey of the Murchison River catchment, Western Australia	Western Australian Department of Agriculture Technical bulletin 84, Perth	R
298	Garnett, S.T. and Crowley, G.M.	(2000).	The Action Plan for Australian Birds.	Environment Australia, Canberra.	R
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537	Patrick, S.J.	(2001).	Declared Rare and Poorly Known Flora in the Geraldton District. Wildlife Management Program No. 26.	Department of Conservation and Land Management.	R
540	Payne, A.L., Curry, P.J., Spencer, G.F.	(1987).	An inventory and condition survey of rangelands in the Carnarvon Basin, Western Australia No. 73.	Western Australian Department of Agriculture.	R
542	Payne, A.L., Van Vreeswyk, A.M.E., Pringle, H.J.R., Leighton, K.A., and Hennig, P.	(1998).	Technical Bulletin No 90., An inventory and condition survey of the Sandstone-Yalgoo-Paynes Find area, Western Australia.	Agriculture Western Australia.	R
695	Wilcox, D.G.and McKinnon, E.A.	(1992).	A Report on the Condition of the Gascoyne Catchment.	Department of Agriculture, Western Australia.	R

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

Other relevant publications

See reference numbers 026, 067, 075, 094, 098, 101, 118, 137, 191, 241, 267, 268, 272, 273, 278, 279, 299, 357, 370, 371, 372, 381, 387, 395, 405, 406, 407, 419, 429, 450, 451, 459, 498, 507, 519, 526, 584, 641, 650, 679, 685 and 686 in Appendix A.