Mallee 1 *(MAL1 – Eastern Mallee subregion)*

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Subregional description and biodiversity values

Description and area

The Mallee bioregion is the south-eastern part of Yilgarn Craton is gently undulating, with partially occluded drainage. Mainly mallee over myrtaceous-proteaceous heaths on duplex (sand over clay) soils. Melaleuca shrublands characterise alluvia, and Halosarcia low shrublands occur on saline alluvium. A mosaic of mixed eucalypt woodlands and mallee occur on calcareous earth plains and sandplains overlying Eocene limestone strata in the east. The Eastern Mallee subregion comprises calcareous clays and loams as duplex soils that often contain sheet and modular kankar, outcrops of metamorphosed sandstone, and white and yellow sandplains and loamy plains with numerous saltpans (pan fields). Mallee on sandplains, samphire around small salt lakes, mallee and patches of woodland on clay, and scrub-heath on sandstone. Mallee with Boree (*Melaleuca pauperiflora*) on calcareous clay and loam. Climate is semi-arid (Dry) Warm Mediterranean and has 300 – 500 mm of annual rainfall during winter.

Dominant land use

Mainly (vii) grazing - improved pasture & (iv) cultivation - dry-land agriculture, with lesser areas of (xiii) conservation, (xi) UCL and Crown reserves, (xiv) roads and other easements, (v) forestry plantation (see Appendix B, key b).

Continental Stress Class

The Continental Stress Class for MAL1 is 4.

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

Rare Features Include:

- Gypsum dunes at Lake Tay contain rare plants such as *Anigozanthos bicolor* subsp. *minor, Eremophila lactea, Myoporum turbinatum, Ricinocarpos trichophorus*, etc;
- Rare birds such as Western Whipbird (*Psophodes nigrogularis oberon*), Western Ground Parrot (*Pezoporus wallicus*), Malleefowl (*Leipoa ocellata*), Cape Barren Goose (*Cereopsis novaehollandiae*), Slender-billed Thornbill (*Acanthiza iredalei*).
- Rare mammal *Dasyurus geoffroii*
- Rare reptiles *Parasuta spectabilis bushi* locations
- Rare ecosystems include Mixed thicket complex of the Russell Range – includes dominants *Eucalyptus doratoxylon, Adenanthos oreophilus, Dampiera parvilolia, Monaotoca oligarrhenoides*, DRF *Kennedia beckiana*, and priority taxa *Leucopogon apiculatus* and *Chorizema nervosum*.

Centres of Endemism:

- Plant assemblages of the Russell Range including Mt Ragged. Examples of endemics include *Darwinia* sp. Mt Ragged, *Dryandra longifolia* subsp *archeos, Phebalium rude* subsp. *lineare* and *Scaevola brookeana*.

Refugia:

- Peak Charles
- Mount Ragged
- Granite outcrops are also likely to be significant

High Species or Ecosystem Diversity:

- Plant assemblages of the Russell Range including Mt Ragged vegetation communities. Typical species include *Eucalyptus doratoxylon, Adenanthos oreophilus, Dampiera parvifolia*, and *Monotoca oligarrhenoides*. Endemics include *Dryandra longifolia* subsp *archeos, Phebalium rude* subsp. *lineare* and *Scaevola brookeana*.
- Salt Lake systems are also likely to have a high level of species diversity, but lack sufficient survey information to quantify this.

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 Wheatbelt in the CTRC Green Book (Conservation Through Reserves Committee 1974). Some, but not all, of these recommendations (with modification) were implemented over the following ten years. The subregion is covered by a CALM Regional Management Plan, that provides an overview of biota, addresses land and wildlife conservation issues, but was generalised in its attention to detail (Department of Conservation and Land Management 1992). The reviews and strategies therein (for reserve system development or management of weeds, fire, feral animals, mining, ecosystem rehabilitation & disease quarantine) do not address the specific needs of the subregion, or even the bioregion. Interim Management Guidelines are in place for Frank Hann, Peak Charles, and Cape Arid National Parks (Department of Conservation and Land Management 2000c). The South Coast Macro Corridor Project identifies areas in MAL1 where improved landscape connectivity will benefit biodiversity conservation.

Wetlands

Wetlands of National significance (DIWA listings)

There are no wetlands of national significance in MAL1.

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]
Bostock Swamp	33° 26' S 121° 48' E	B7	ii	ii	iii	i	i, ix, x
Harms Lake	32° 14' S 123° 04' E	B7	ii	iv	vi	i	Unknown threatening processes
Roberts Swamp	33° 11' S 121° 245 E	B10	ii	iii	vi	i	i, ix, x
Swan Lagoon	33° 153' S 121° 385 E	B7	ii	iii	iii	i	i, ix, x
Unknown Lakes (Salmon Gums)	32° 54' S 121° 50' E	B7	iii, iv	iii	vi	i	i, ix, x
Cascade west suite & Cascade east suite	3236400 6298000 325000 6293000	B10, B12	ii, iii	iii	vi	i	xii (road runoff), vi, iv
Reserve Swamp	318600 6297000	B10, B12	ii	Unknown	vi	i	xii (road runoff), vi, iv
Lort River mid suite & upper-mid suite	351000/6306000 341000/6318000	B2, B4	ii, iii	iii	iii	i	xi (surrounding land use)
Peak Charles System	32º 52' S 121º 09' E	B11, B12	ii	Unknown	vi	Unknown	Unknown threatening processes
Native Dog Swamp Suite	345300/6293200	B4	ii	Unknown	vi	Unknown	Unknown threatening processes
Clarke Road Suite	229300/6327600	B7, B8	v, iii	iv	iv	i	xii (gypsum mining)
Lake Chidnup	769000/6305000 33º 21' S 119º 53' E	B8	ii, iii	Unknown	vi	Unknown	Unknown threatening processes
Lake Tay	32º 54' S 120º 48' E	Unknown	ii	Unknown	vi	Unknown	Unknown threatening processes, xii (gypsum mining)
Bundara Suite	751500/6291000	B8	ii	Unknown	vi	Unknown	Unknown threatening processes

[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

A large number of wetlands are found in this subregion (ca 1000). Survey has not assessed all for subregional significance. Only those with documented survey are included in this table.

Riparian zone vegetation

Name	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Young River	i	iii	i	i, ii, iv, v (foxes & rabbits), ix, x
Lort River	ii	iii	i	i, ii, iv, v (foxes & rabbits), ix, x
Oldfield River	iv	unknown	i	Unknown threatening processes
Jerdacuttup River	iv	unknown	i	Unknown threatening processes

[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]
Plant assemblages of mixed thicket complexes in the Russell Range System	V	29	iii	iii	iii	vii, viii (*Phytophthora* sp.)
Herblands and Bunch Grasslands on gypsum lunette dunes alongside saline playa lakes	V	38	iii	iii	iii	vi, iv, x, xii (mining)

[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

Beard Veg Code	Description	Status[1]	NVIS[2]	Condition[3]	Trend[4]	Reliability[5]	Threatening Processes[6]

	Eucalyptus redunca and *E. uncinata* mallee scrub on sand over clays in valleys of the southern wheatbelt	-	29	unknown	vi	ii	ix
	Eucalyptus eremophila and *E. redunca* mallee scrub	-	29	unknown	vi	ii	i
	Eucalyptus eremophila and *E. forrestiana* mallee/very low forest scrub	-	29, 27	unknown	vi	ii	i, ix
	Eucalyptus eremophila mallee scrub	-	29	unknown	vi	ii	Unknown threatening processes
126	Bare areas; freshwater lakes	-	42	variable	iii	iii	ix, x
934	Shrublands; mallee scrub *Eucalyptus nutans*	-	29	ii-iii	iii	iii	ix
6048	Shrublands; banksia scrub-heath on sandplain in the Esperance Plains Region	-	30	ii-iii	iii	iii	i, viii (*Phytophthora* sp.)
51	Sedgeland; reed swamps, occasionally with heath	-	38	iii	ii	iii	ix, x
931	Medium woodland; yate	-	8	iii	ii	iii	ix
929	Low forest; moort *(E. platypus*)	-	4	iii	ii	iii	ix
552	Shrublands; *Casuarina acutivalvis* & calothamnus (also melaleuca) thicket on greenstone hills	-	32	iii	ii	iii	xii (mining)

[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)					
Dasyurus geoffroii	V	iii	iv	iii	v (fox, cat), ii
Parantechinus apicalis	E	unknown	unknown	unknown	Unknown threatening processes
***Eubalaena australis*	E	iii	v	ii	No known threatening processes
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 2 (BIRDS)					
Calyptorhynchus latirostris	E	i-ii	iii	ii	ii, i, xii (competition with bees and other birds for nest sites)
Acanthiza iredalei iredalei	V	ii	iv	ii	iv (sheep & rabbits)
Cereopsis novaehollandiae grisea	V	unknown	vi	unknown	xii (drought)
Leipoa ocellata	V	unknown	vi	unknown	v (fox), iii
Psophodes nigrogularis oberon	V	ii	iv	iii	vii, ii

Species Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
***Thalassarche cauta*	V	ii	v	iii	xii (commercial fishing)
OTHER SPECIES AT RISK WITHIN THE SUBREGION					
Neophoca cinerea	Near Threatened	i-ii	iii	iii	xii (small population size; commercial fisheries)
Falcunculus frontatus	Near Threatened	unknown	unknown	unknown	Unknown threatening processes
Morelia spilota	SP	unknown	unknown	unknown	Unknown threatening processes
Charadrius rubricollis	P4	unknown	unknown	unknown	Unknown threatening processes

Species marked with **asterisks indicate these species are occasional visitors to the subregion.
[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					
Anigozanthos bicolor subsp. *minor*	CR	unknown	iii	ii	ii, vii, i
Eremophila lactea	CR	ii	iv	ii	vii, ii, xii (roadworks), iv, i
Adenanthos eyrei	E	iii	iv	iii	vii, xii (population difficult to locate and naturally rare)
Conostylis lepidospermoides	E	unknown	ii-iii	iv	ii
Leucopogon marginatus	E	unknown	vi	unknown	Unknown threatening processes
Myoporum turbinatum	E	iii	iv	iii	vii (post fire species), ii, ix, xii (roadworks)
Ricinocarpos trichophorus	E	ii	iii	iii	vii, ii, ix, i, iv, x, xii (very hard to locate)
Drummondita longifolia	V	unknown	iv	ii	xii (very restricted distribution), vii
Eremophila denticulata subsp. *denticulata*	V	ii	iv	ii	vii, xii (roadworks)
Eucalyptus merrickiae	V	ii-iii	iv	ii	ii, ix, xii (roadworks)
PRIORITY 1					
Acacia diaphana	1	unknown	vi	iii	ii, v (stock), i
Acacia diminuta	1	unknown	vi	iii	Unknown threatening processes
Acacia sp. Esperance (MA Burgman 1833b)	1	unknown	vi	iii	ii, i
Astartea sp. Esperance (A Fairall 2431)	1	vi	unknown	unknown	Unknown threatening processes
Baeckea crassifolia var. *icosandra*	1	iii	vi	iii	Unknown threatening processes
Boronia baeckeacea subsp. *patula*	1	unknown	vi	unknown	Unknown threatening processes
Chorizema circinale	1	unknown	vi	unknown	Unknown threatening processes
Conostephium marchantiorum	1	iii	iv	iii	No known threatening processes
Conostephium uncinatum	1	iii	vi	iii	No known threatening processes
Darwinia calothamnoides ms	1	iii	vi	iii	xii (appears to be disturbance opportunist), vii
Darwinia sp. Mt Ney (MA Burgman & S McNee 1274)	1	unknown	iv	iii	vii
Dicrastylis archeri	1	iii	vi	iii	xii (appears to be disturbance opportunist)

Species Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Dicrastylis capitellata	1	ii-iii	vi	iii	Unknown threatening processes
Dillwynia acerosa	1	unknown	vi	unknown	Unknown threatening processes
Dodonaea hexandra	1	unknown	vi	iii	No known threatening processes, species is widely dispersed in Western Australia
Eremophila compressa	1	iii	iv	iii	vii, xii (appears to be disturbance opportunist)
Eucalyptus burgmaniana ms	1	iii	iii	iii	ii, i, xii (residential development)
Eucalyptus foliosa	1	unknown	vi	unknown	Unknown threatening processes
Eucalyptus varia subsp. *salsuginosa*	1	unknown	vi	iii	Unknown threatening processes
Eutaxia sp. Peak Eleanora (Burgman 3862)	1	unknown	vi	unknown	Unknown threatening processes
Hydrocotyle sp. Truslove (MA Burgman 4419)	1	unknown	iv	iii	Unknown threatening processes
Hydrocotyle vigintimilia ms	1	unknown	vi	unknown	Unknown threatening processes
Lepidium fasciculatum	1	unknown	iv	ii	ix, ii, i, xii (species is very hard to locate)
Leucopogon sp. Bonnie Hill (KR Newbey 9831)	1	iii	iii	iii	i, ii, vii, viii, genus currently undergoing taxonomic revision
Leucopogon sp. Mount Heywood (MA Burgman 1211) [aff. *hamulosus*]	1	iii	iv	iii	Unknown threatening processes, genus currently undergoing taxonomic revision
Leucopogon sp. Roberts Swamp (KR Newbey 8173)	1	ii-iii	iv	iii	ii, i, vii, viii (*Phytophthora* sp.), genus currently undergoing taxonomic revision
Leucopogon sp. South Coast (KR Newbey 8213)	1	iii	iii	iii	Unknown threatening processes, genus currently undergoing taxonomic revision
Melaleuca agathosmoides	1	ii	vi	iii	xii (mining; limited geographic range)
Mirbelia densiflora	1	iii	vi	iii	Unknown threatening processes
Philotheca gardneri subsp. *globosa*	1	unknown	vi	unknown	Unknown threatening processes
Pimelea pelinos	1	unknown	vi	ii	xii (limited geographic range)
Thysanotus baueri	1	iii	iv	iii	xii (species is poorly collected)
Verticordia sieberi var. *pachyphylla*	1	unknown	vi	iii	Unknown threatening processes
PRIORITY 2					
Acacia amyctica	2	iii	iv	iii	Unknown threatening processes
Acacia asepala	2	unknown	vi	iii	Unknown threatening processes
Angasomyrtus salina	2	iii	iv	iii	vii, ix, x, ii
Angianthus newbeyi	2	unknown	vi	unknown	Unknown threatening processes
Astartea sp. Jyndabinbin Rocks (KR Newbey 7689)	2	unknown	vi	unknown	Unknown threatening processes

Species Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Asteridea sp. Ragged (W Archer 1509903)	2	unknown	vi	unknown	Unknown threatening processes
Astroloma sp. Grass Patch (AJG Wilson 110)	2	iii	iv	iii	i, ii, ix, x, v (stock)
Bentleya diminuta	2	ii	vi	iii	xii (limited geographic range; road verge population; appears to be disturbance opportunist)
Boronia acanthoclada	2	unknown	vi	unknown	Unknown threatening processes
Boronia corynophylla	2	unknown	vi	unknown	Unknown threatening processes
Bossiaea cucullata	2	unknown	vi	unknown	Unknown threatening processes
Chthonocephalus multiceps	2	unknown	iv	iii	xii (species is poorly collected)
Comesperma calcicola ms	2	unknown	vi	unknown	Unknown threatening processes
Conospermum sigmoideum	2	unknown	vi	unknown	Unknown threatening processes
Darwinia luehmannii	2	unknown	vi	unknown	Unknown threatening processes
Darwinia sp. Peak Charles (AS George 10627)	2	unknown	vi	iii	vii
Daviesia campephylla	2	iii	iv	iii	xii (limited geographic range), vii
Daviesia newbeyi	2	unknown	vi	unknown	Unknown threatening processes
Dicrastylis obovata	2	unknown	vi	unknown	Unknown threatening processes
Drosera salina	2	unknown	vi	unknown	Unknown threatening processes
Elachanthus pusillus	2	unknown	vi	ii	Unknown threatening processes
Eremophila chamaephila	2	unknown	vi	unknown	Unknown threatening processes
Gastrolobium acrocaroli ms	2	unknown	vi	unknown	Unknown threatening processes
Gastrolobium rigidum	2	ii-iii	iv	iii	No known threatening processes, may be a disturbance opportunist
Goodenia scapigera subsp. *graniticola*	2	unknown	vi	unknown	Unknown threatening processes
Gratiola pedunculata	2	unknown	vi	unknown	Unknown threatening processes
Grevillea plurijuga subsp. *superba*	2	unknown	vi	unknown	Unknown threatening processes
Haegiela tatei	2	unknown	iv	iii	xii (species is poorly collected)
Hibbertia charlesii	2	unknown	vi	unknown	Unknown threatening processes
Hydrocotyle decipiens ms	2	unknown	vi	unknown	Unknown threatening processes
Isolepis australiensis	2	unknown	vi	unknown	Unknown threatening processes
Leucopogon sp. Kau Rock (MA Burgman 1126) [aff. *allittii*]	2	unknown	vi	unknown	Unknown threatening processes
Levenhookia pulcherrima	2	unknown	iv	ii	Unknown threatening processes
Melaleuca eximia	2	unknown	vi	unknown	Unknown threatening processes
Melaleuca viminea subsp. *appressa*	2	unknown	vi	ii	Unknown threatening processes

Species Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Olearia laciniifolia	2	ii	vi	ii	i, ii, xii (species is poorly collected), vii
Opercularia hirsuta	2	ii-iii	vi	ii	xii (very difficult to distinguish from other species of same genus)
Opercularia loganioides	2	ii-iii	vi	ii	xii (species is poorly collected), i, ii
Opercularia rubioides	2	unknown	vi	ii	Unknown threatening processes
Otion rigidum ms	2	unknown	vi	ii	Unknown threatening processes
Philotheca apiculata	2	unknown	vi	ii	Unknown threatening processes
Phlegmatospermum eremaeum	2	iii	iv	iii	xii (small population size)
Pimelea halophila	2	unknown	vi	ii	Unknown threatening processes
Spyridium subochreatum var. *subochreatum*	2	unknown	vi	ii	Unknown threatening processes
Thysanotus brachyantherus	2	unknown	vi	ii	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 Code	Ecosystem Description	IUCN Reserves	Non-IUCN Reserve	CALM Purchased Lease
8	Medium woodland; salmon gum & gimlet	X		
9	Medium woodland; coral gum (*E. torquata*) & goldfields blackbutt (*E. le souefii*) (also some e10, 11)			
10	Medium woodland; red mallee group	X		
41	Shrublands; teatree scrub	X		
47	Shrublands; tallerack mallee-heath	X		
51	Sedgeland; reed swamps, occasionally with heath			
122	Succulent steppe with open low woodland; *Acacia papyrocarpa* over saltbush & bluebush,			
125	Bare areas; salt lakes	X		
126	Bare areas; freshwater lakes			
128	Bare areas; rock outcrops	X		
221	Succulent steppe; saltbush			
413	Shrublands; *Acacia neurophylla* & A. species thicket	X		
479	Shrublands; mallee-heath (Nuytsland)	X		
482	Medium woodland; merrit & red mallee	X		
486	Mosaic: Medium woodland; salmon gum & red mallee/Shrublands; mallee scrub *Eucalyptus eremophila*	X		
493	Medium woodland; salmon gum mixed with merrit & red mallee	X		
507	Succulent steppe with woodland; salmon gum & saltbush			
510	Shrublands; Mt Ragged heath	X		
512	Shrublands; mallee scrub, *Eucalyptus eremophila* & Forrest's marlock (*E. forrestiana*)	X		
514	Shrublands; mallee scrub, white mallee (*Eucalyptus cooperiana*)	X		
515	Shrublands; mallee scrub, blue mallee (*Eucalyptus socialis*)	X		
516	Shrublands; mallee scrub, black marlock	X		
518	Mosaic: Medium woodland; merrit & coral gum/Shrublands; mallee scrub *Eucalyptus eremophila*	X		
519	Shrublands; mallee scrub, *Eucalyptus eremophila*	X		
521	Medium woodland; salmon gum & red mallee	X		
522	Medium woodland; redwood (*E. transcontinentalis*) & merrit (*E. flocktoniae*)		X	

Beard Veg Code	Ecosystem Description	IUCN Reserves	Non-IUCN Reserve	CALM Purchased Lease
524	Medium woodland; Dundas blackbutt & red mallee	X		
552	Shrublands; *Casuarina acutivalvis* & calothamnus (also melaleuca) thicket on greenstone hills	X		
924	Shrublands; mallee scrub, *Eucalyptus eremophila* & red mallee	X		
925	Shrublands; mallee scrub, red mallee	X		
929	Low forest; moort (*E. platypus*)	X		
931	Medium woodland; yate	X		
934	Shrublands; mallee scrub *Eucalyptus nutans*	X		
936	Medium woodland; salmon gum	X		
1047	Shrublands; *Eucalyptus incrassata* mallee-heath	X		
1413	Shrublands; acacia, casuarina & melaleuca thicket	X		
1516	Shrublands; mallee scrub, black marlock & Forrest's marlock	X		
1519	Shrublands; mallee scrub, *Eucalyptus eremophila* & banksia			
2048	Shrublands; scrub-heath in the Mallee Region			
4048	Shrublands; scrub-heath in the Esperance Plains incl. Mt Ragged scrub-heath	X		
6048	Shrublands; banksia scrub-heath on sandplain in the Esperance Plains Region	X		

Subregional constraints in order of priority

Subregional constraints affecting ability to acquire the above ecosystem and vegetation types to the reserve system are irreplacibility, economic constraints and competing land-uses (major components of the landscape are covered by mines, mining tenements or exploration leases and to a lesser extent grazing) (see Appendix B, key g).

Bioregional and subregional priority for reserve consolidation

The Mallee bioregion is IBRA Reservation Class 5 (>15% of its area reserved in any CALM tenure). However, MAL1 is reservation Class 4 because <15 % of its area reserved (any tenure), its western and central parts have been cleared for wheatfields leaving a biased reserve system and salinity problems are ubiquitous so Class 3 is more appropriate (see Appendix D, and Appendix C, rank 4).

Reserve management standard

Most MAL 2 reserves are relatively undisturbed, however potential does exist for hydrological disturbance to occur on those reserves located within the agricultural cleared area. Minor agricultural weed invasion on sandy soils along western and northern boundaries of conservation reserves does occur. Wildfire management facilities are limited by resources, except for fire breaks and fire-access tracks which are installed and maintained. Feral herbivore grazing activities by the rabbits does occur across many of the reserves and no feral predator control systems are in place (except for Cape Arid National Park).

Land status Class	Purpose	Reserve Number	Name	Category	Reserve Management[1]
B	Conservation of Flora & Fauna	36957	Dundas	Nature Reserve	ii-iii
A	Conservation of Flora & Fauna		Salmon Gums Nature Reserve	Nature Reserve	ii
C	Conservation of Flora & Fauna	16801	Truslove North	Nature Reserve	ii
C	Conservation of Flora & Fauna	27985	Truslove Townsite	Nature Reserve	ii
A	National Park	36004	Peak Charles	National Park	ii
A	Conservation of Flora & Fauna	31799	Muntz Road	Nature Reserve	ii
A	Conservation of Flora & Fauna		Wittenoom Hills	Nature Reserve	ii
A	Conservation of Flora & Fauna & Water	8019	Swan Lagoon	Nature Reserve	ii
A	Conservation of Flora & Fauna & Water	3042	Jeffrey Lagoon	Nature Reserve	ii
A	Conservation of Flora &Fauna	29012	Bishops Road Nature Reserve	Nature Reserve	ii
A	Conservation of Flora &Fauna	30583	Griffiths Road	Nature Reserves	ii
A	Conservation of Flora &Fauna		Grass Patch (East)	Nature Reserves	ii
C	Conservation of Flora &Fauna	35659	Unnamed	Nature Reserves	ii

Land status Class	Purpose	Reserve Number	Name	Category	Reserve Management[1]
C	Catchment Protection & Conservation of Flora &Fauna	43949	Unnamed	Nature Reserves	ii
A	Conservation of Flora &Fauna	31744	Cascades	Nature Reserves	ii
C	Conservation of Flora &Fauna	31745	Cascades	Nature Reserves	ii
A	Conservation of Flora &Fauna	31743	Cascades	Nature Reserves	ii
A	Conservation of Flora &Fauna	31742	Fields		ii
C	Conservation of Flora &Fauna	43221	Unnamed	Nature Reserves	ii
A	Conservation of Flora &Fauna	36608	Dowak	Nature Reserves	ii
C	Conservation of Flora &Fauna	33501	Unnamed	Nature Reserves	ii
A	Conservation of Flora &Fauna	33113	Unnamed	Nature Reserves	ii
A	Conservation of Flora &Fauna	29860	Red Lake	Nature Reserves	ii
C	Conservation of Flora &Fauna	27768	Ridley South	Nature Reserves	ii
C	Conservation of Flora &Fauna	28300	Ridley North	Nature Reserves	ii
A	Conservation of Flora &Fauna	27386	Mount Ridley	Nature Reserves	ii
A	Conservation of Flora &Fauna	27384	Mount Burdett	Nature Reserves	ii
A	Conservation of Flora &Fauna	27387	Burdett South	Nature Reserves	ii
A	Conservation of Flora &Fauna	27388	Burdett North	Nature Reserves	ii
A	Conservation of Flora &Fauna	32776, 32777, 32779, 32780	Kau Rock Group	Nature Reserves	ii
A	Conservation of Flora &Fauna	32782	Mount Ney	Nature Reserves	ii
A	Conservation of Flora &Fauna	32129, 32130, 32783	Part Beaumont Group	Nature Reserves	ii
A	Conservation of Flora &Fauna	32131	Unnamed	Nature Reserves	ii
A	Conservation of Flora & Fauna & Water	38334	Unnamed	Nature Reserves	ii
A	Conservation of Flora &Fauna	32784	Neredup	Nature Reserves	ii
A	Conservation of Flora &Fauna	38544	Niblick	Nature Reserves	ii
A	Conservation of Flora &Fauna	38545	Clyde Hill	Nature Reserves	ii
A	National Park	24047	Cape Arid	National Park	iii
C	Conservation of Flora &Fauna	41934	Unnamed	Nature Reserves	ii
A	Primitive Area for the Preservation and Study of Flora, Fauna, Geological and Anthropological Features	27632	Nuytsland	Nature Reserve	i-ii

[1]Appendix C, rank 5

Off reserve conservation

Priority species or groups

Species	Beard Veg Assoc	Specific Recovery Plan	General Recovery Plan	Prioritise for Subregion[1]
Anigozanthos bicolor subsp. *minor*	50	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii
Conostylis lepidospermoides	47	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii
Eremophila denticulata subsp. *denticulata*	929, 931	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii

Species	Beard Veg Assoc	Specific Recovery Plan	General Recovery Plan	Prioritise for Subregion[1]
Eremophila lactea	940, 942	IRP 1999-2002	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	ii
Eucalyptus merrickiae	125, 519	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii
Myoporum turbinatum	125	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	ii
Ricinocarpos trichophorus	47	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iv

[1]Appendix C, rank 6

There are a number of action plans that cover a wide range of species that are applicable for birds (Garnett and Crowley 2000), marsupials and monotremes (Maxwell *et al.* 1996), reptiles (Cogger *et al.* 1993), rodents (Lee 1995), seals (Shaugnessy 1999), albatrosses and petrels (Environment Australia 2001) and Declared Rare and poorly known flora of the Esperance region (Craig and Coates 2001).

Appropriate species recovery actions

Species	Beard Veg Assoc	Species Recovery[1]	
Anigozanthos bicolor subsp. *minor*	50	ii, iii, ix	Habitat protection on private lands and on other state lands; Fire management.
Conostylis lepidospermoides	47	ii, iii, xiv	Habitat protection on private lands and on other state lands; Other - roadside markers.
Eremophila denticulata subsp. *denticulata*	929, 931	iii, ix, xiv	Habitat protection on other state lands; Fire management; Other - roadside markers.
Eremophila lactea	940, 942	ii, iii, ix, xiv, xii	Habitat protection on private lands and on other state lands; Fire management; Other - roadside marking; Research - further survey, seed collection
Eucalyptus merrickiae	125, 519	iii, ii, ix, xiv, xi	Habitat protection on other state lands and on private lands; Fire management; Other - roadside markers; Reinstatement of hydrology.
Myoporum turbinatum	125	ii, iii, i, xi, ix, vi, xiv	Habitat retention and protection on private lands, on other state lands, and through reserves; Reinstatement of hydrology; Fire management; Weed control; Other - roadside markers)
Ricinocarpos trichophorus	47	iii, ix	Habitat protection on other state lands; Fire management.

[1]Appendix B, key h

Ecosystems and appropriate recovery plans

Ecosystem	Specific Recovery Plan	General Recovery Plan
Banded ironstone range plant communities	No	South Coast Regional Management Plan

Appropriate ecosystem recovery actions

Ecosystem	Species Recovery[1]	Recovery Descriptions
Banded ironstone range plant communities	i, ii, iii, xiii	Habitat retention and protection through reserves, on private lands and on other state lands; Capacity building with community, landholders, industry and institutions.

[1]Appendix B, key h

Subregion priority for off reserve conservation

The Subregional priority for off-park conservation in MAL1 is (iv) (see Appendix C, rank 6), limited off park measures are required.

Conservation actions as an integral part of NRM

Existing NRM actions

Incentives: Tax deductions for fencing on pastoral leases

Legislation: Pastoral Act has regulations on stocking rates, etc; Wildlife Conservation Act; Sandalwood Act.

Threat Abatement Planning: Vegetation management plans; pest management; feral animal control; Kangaroo shooting; Dingo baits; Callicivirus control of rabbit populations

Environmental Management Systems: Interim Management Guidelines only.

Capacity Building: the Macro Corridor project is used as a tool to be used to identify strategic landscape level connectivity.

Other Planning Opportunities: e.g. South Coast Regional Integrated Planning Team (SCRIPT); Bushfire control program.

Feasible Opportunities for NRM

Incentives: Pastoral leases in good condition could be converted to conservation estate.

Legislation: Wildlife Conservation Act and Sandalwood Act are both outdated and need to be repealed. More wide-ranging and comprehensive legislation is required.

Institutional Reform: Pastoral leases in good condition could be converted to conservation estate.

Threat Abatement Planning: More comprehensive controls need to be developed for foxes, rabbits and cats.

Codes of Practice: There is a need to develop codes of practice and standards of management for pastoral lands.

Capacity Building: Closer liaisons need to be developed with community groups and land holders on issues, e.g. pastoral industry; There is further scope for the Macro Corridor project is used as a tool to be used to identify strategic landscape level connectivity.

Other Planning Opportunities: Closer liaisons with local governments are also required for relevant issues.

Other: There is a need to identify and establish other conservation areas that contain values not already represented in CALM estate. e.g. this may include granite outcrops from Cape Arid National Park to Dundas Nature Reserve.

Impediments or constraints to opportunities

A number of impediments exist including the Land Administration Act and operations of the Pastoral Land Board, Conservation Through Reserves is limited through mining leases and tenements. There is a need to increase awareness of conservation values through education of various industries (mining, pastoral) and the public in general. The Macro Corridor concept is a useful tool to raise awareness of biodiversity issues, however, existing land use conflicts have implication for natural land management. Limited financial resources are also a major constraint.

Subregions where specific NRM actions are a priority to pursue

The subregional NRM priority for MAL1 is (iii) (see Appendix C, rank 7). The capacity for conservation to be integrated into NRM to achieve significant biodiversity outcomes has been recognised. NRM instruments in place with some achieved biodiversity 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. Veg map resolution is 1:250 000 at best.

Systematic Fauna Survey: Very limited systematic quadrat-based fauna survey (Department of Conservation and Land Management 2000a; Barrett 1996). Other data is confined to bird atlas. No funding for ongoing monitoring of stratified set of LTERM quadrats currently being sampled across the subregion. Most reserves don't have long-term survey data on species presence or absence, even for vertebrates.

Floristic Data: No systematic quadrat-based flora survey. Most reserves don't have long-term survey data on species presence or absence; data is confined to specific threatened flora, and a few large reserves. No funding for ongoing monitoring of stratified set of LTERM quadrats currently being sampled across the subregion.

Ecological and Life History Data: There is little data on habitat requirements of virtually all invertebrate species, most ephemeral plants (except some DRF), persisting CWR mammals (except Dibbler, Chuditch), persisting E / V birds (except Hooded Plover, Malleefowl, Western Whipbird), 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 foxes,

Other Priority Data Gaps: Including:

- No quantitative data on the affect of exotic predators, weed colonisation, fragmentation & farm clean-up, fire, and affect of mining and exploration on communities.
- Effect of rising water table on species composition of communities on composition of vegetation communities remaining within the agricultural landscape.

Sources

References cited

No.	Author	Date	Title	Publication Details	Pub. Type
043	Barrett, S.	(1996).	Biological survey of mountains of southern Western Australia.	Department of Conservation and Land Management.	R
181	Cogger, H., Cameron, E., Sadlier, R. and Eggler, P.	(1993).	The Action Plan for Australian Reptiles.	Australian Nature Conservation Agency, Canberra.	R
190	Conservation Through Reserves	(1974).	Conservation Reserves in Western	Department of Conservation and	R

	Committee		Australia. Systems 1, 2, 3, 4, 5, 8, 9, 10, 11, 12. Report of the Conservation Through Reserves Committee to the Environmental Protection Authority.	Environment (WA).	
194	Craig G.F and Coates D.J.	(2001).	Declared Rare and Poorly Known Flora in the Esperance District. Wildlife Management Program No 21.	Department of Conservation and Land Management, Western Australia.	R
230	Department of Conservation and Land Management	(1992).	South Coast Region Regional Management Plan 1992-2002. Management Plan No. 24.	Department of Conservation and Land Management.	O
239	Department of Conservation and Land Management	(2000a).	CALM Biodiversity Survey of the Agricultural Zone June 2000 Status Report. Salinity Action Plan Biological Survey of the Agricultural Zone.	Department of Conservation and Land Management, Western Australia.	R
790	Environment Australia in consultation with the Albatross and Giant-Petrel Recovery Team	(2001).	Recovery Plan for Albatrosses and Giant Petrels	Environment Australia, Canberra.	O
298	Garnett, S.T. and Crowley, G.M.	(2000).	The Action Plan for Australian Birds.	Environment Australia, Canberra.	R
483	Maxwell, S., Burbidge, A.A. and Morris, K. (eds).	(1996).	The 1996 Action Plan for Australian Marsupials and Monotremes. Wildlife Australia Endangered Species Program Project Number 50.	Environment Australia, Canberra.	R
781	Shaugnessy, P.D.	(1999).	The action plan for Australian seals	Environment Australia, Canberra.	O
807	Stack, G. and Brown, A.	(1999).	Milky Emu Bush (*Eremophila lactea*) Interim Recovery Plan 1999-2002 (IRP No 38)	Department of Conservation and Land Management, Perth.	O

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

Other relevant publications

See reference numbers 014, 045, 050, 101, 156, 263, 273, 278, 307, 328, 340, 354, 373, 409, 410, 454, 485, 580, 581, 587, 590, 675, 677 and 695 in Appendix A.