

Coolgardie 2 (COO2 – Southern Cross subregion)

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Subregional description and biodiversity values

Description and area

The subregion has subdued relief, comprising gently undulating uplands dissected by broad valleys with bands of low greenstone hills. It lies on the 'Southern Cross Terrains' of the Yilgarn Craton. The granite strata of Yilgarn Craton are interrupted by parallel intrusions of Archaean Greenstone. Drainage is occluded. It has an arid to semi-arid Warm Mediterranean climate with 250-300 mm of mainly winter rainfall.

Valleys have Quaternary duplex and gradational soils, and include chains of saline playa-lakes. Diverse Eucalyptus woodlands (*Eucalyptus salmonophloia*, *E. salubris*, *E. transcontinentalis*, *E. longicornis*) rich in endemic eucalypts occur around these salt lakes, on the low greenstone hills, valley alluvials and broad plains of calcareous earths. The salt lake surfaces support dwarf shrublands of samphire. The granite basement outcrops at mid-levels in the landscape and supports swards of *Borya constricta*, with stands of *Acacia acuminata* and *Eucalyptus loxophleba*. Upper levels in the landscape are the eroded remnants of a lateritic duricrust yielding yellow sandplains, gravelly sandplains and laterite breakaways. Mallees (*Eucalyptus leptopoda*, *E. platycoryx* and *E. scyphocalyx*) and scrub-heaths (*Allocasuarina corniculata*, *Callitris preissii*, *Melaleuca uncinata* and *Acacia beauverdiana*) occur on these uplands, as well as

on sand lunettes associated with playas along the broad valley floors, and sand sheets around the granite outcrops. The scrubs are rich in endemic acacias and Myrtaceae. The subregional area is 7, 041, 232 ha.

Dominant land use

The dominant land uses are (ix) Grazing – native pastures (17%) (see Appendix B, key b), (xi) UCL & Crown Reserves (66.74%), Cultivation -Dry Land agriculture (2.27%), Conservation reserves (11.53%).

Continental Stress Class

The Continental Stress Class for COO2 is 4.

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

Rare Features:

- Arid woodlands include rare plants such as *Tetradlea harperi*, *T. aphylla*, *T. paynteri*, *Gastrolobium graniticum*, *Eremophila virens*, *Myriophyllum lapidicola*, etc;
- Rare vertebrates such as the Chuditch (*Dasyurus geoffroyi*), Slender-Billed Thornbill (*Acanthiza iredalei*), Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Malleefowl (*Leipoa ocellata*), Carpet Python (*Morelia spilota imbricata*), Major Mitchell's Cockatoo (*Cacatua leadbeateri*), and Red-tailed Black Cockatoo (*Calyptorhynchus banksii*).

The Following Ecosystems Have Greater Than 85% of Their Total Extent Within The Coolgardie 2 Subregion:

Beard Veg Code	Description
144	Medium woodland; wandoo, salmon gum, morrel, gimlet & rough fruited mallee
147	Succulent steppe with scrub; acacia species over saltbush
148	Medium woodland; gimlet
435	Shrublands; <i>Acacia neurophylla</i> , <i>A. beauverdiana</i> & <i>A. resinomarginea</i> thicket
436	Shrublands; <i>Acacia</i> sp.
535	Medium woodland; rough fruited mallee on greenstone hills
537	Medium woodland; morrel (<i>E. longicornis</i>)
554	Low woodland over scrub; <i>Casuarina pauper</i> over bowgada scrub
1063	Medium-Low woodland; York gum & cypress pine (<i>Callitris glaucophylla</i>)
1071	Succulent steppe with scrub; acacia species over saltbush & bluebush
1078	Medium woodland; salmon gum, redwood, merrit, gimlet & <i>Eucalyptus sheathiana</i>

Centres of Endemism:

- Fauna: sandplain *Ctenotus* (*Ctenotus xenopleura*), *Nephrurus stellatus*
- Flora: Banded-ironstone hill flora, sandplain acacias & myrtaceae, goldfields woodlands (mainly for eucalypts).

High Species and Ecosystem Diversity:

Banded ironstone ranges, ephemeral flora communities of Tertiary sandplain scrubs and of valley floor woodlands (up to 60 species per quadrat). The subregion is itself a biogeographic interzone.

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 Eastern Goldfields (System 11) in the CTRC Green Book. Some, but not all of these recommendations (with modification) were implemented over the following two

years. A review of outstanding recommendations was initiated in 1988 and culminated in the production of the report Nature Conservation Reserves in the Eastern Goldfields, Western Australia (Henry-Hall *et al* 1990). This report made recommendations on a nature conservation reserve system for the southern and central Goldfields, which incorporates COO2. The subregion is covered by a CALM Regional Management Plan, published in 1994, that provides an overview of the region's biota, addresses land and wildlife conservation issues, but was written to cover a third of WA and therefore was generalised in its attention to detail. 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 subregions, or even bioregions, individually (Department of Conservation and Land Management 1994b).

Wetlands

Wetlands of National significance (DIWA listings)

No nationally significant wetlands are known in COO2.

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

Name	Location (Grid reference)	Description	Special Values ¹	Condition ²	Trend ³	Reliability ⁴	Threatening Processes ⁵
Wallagne Soak	220000 E 6599000 N zone 51	C1. Artificial wetland at foot of large granite tor.	ii, iii	iv	iv	ii	v (foxes, cats & rabbits), vi, vii. The entire regional bat fauna recorded at dam which is surrounded by uncleared vegetation)
Lake Deborah East	151287 E 6601828 N zone 51	B8. Saltlake with samphire and peripheral lunettes, kopi dunes & woodlands.	ii	iii	iv	ii	v (foxes, cats & rabbits), vi, vii, xii (salt mining)
Lake Deborah West	125207 E 6588022 N zone 51	B8. Saltlake with samphire and peripheral lunettes, kopi dunes & woodlands.	ii	iii	iv	ii	v (foxes, cats & rabbits), vi, vii, xii (salt mining)
Johnston Lakes	289090 E 6429841 N zone 51	B8. Part of a large saltlake chain with samphire and peripheral lunettes, kopi dunes & woodlands.	ii	iii	iv	ii	v (foxes, cats & rabbits), vi, vii
Eva Lake	193864 E 6563452 N zone 51	B8. Part of a large saltlake chain with samphire and peripheral lunettes, kopi dunes & woodlands.	ii	iii	iv	ii	v (foxes, cats & rabbits), vi, vii

Name	Location (Grid reference)	Description	Special Values ¹	Condition ²	Trend ³	Reliability ⁴	Threatening Processes ⁵
Unnamed Lake South of Boondine Hill	148953 E 6626679 N zone 51	B8. Part of a large saltlake chain with samphire and peripheral lunettes, kopi dunes & woodlands.	ii	iii	iv	ii	v (foxes, cats & rabbits), vi, vii
Lake Walton	216726 E 6576050 N zone 51	B8. Part of a large saltlake chain with samphire and peripheral lunettes, kopi dunes & woodlands.	ii	iii	iv	ii	v (foxes, cats & rabbits), vi, vii

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

Riparian zone vegetation

Name	Condition ¹	Trend ²	Reliability ³	Threatening Processes ⁴
All fringing vegetation of riparian zones	iii	iv	ii	vi, vii, v (foxes, cats & rabbits)

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

Ecosystems at risk

Threatened ecological communities (TECs)

There are no Threatened Ecological Communities (TECs) are listed in COO2.

Other ecosystems at risk

Community	Status	NVIS ¹	Condition ²	Trend ³	Reliability ⁴	Threatening Processes ⁵
Banded Ironstone Hills with <i>Dryandra arborea</i> . (A. Brown pers. comm.).	V	21	iv	iii	ii	iv, v (goats, rabbits), vii
Flora and fauna assemblages of granite rock pools (J. Davis and S. Halse pers. comm.) (Pinder <i>et al.</i> 2000).	V	41	iii	iii-iv	ii	x, xi (faecal deposits from feral animals), v (goats, rabbits, stock)
Goldfields granite outcrop assemblages rocks east of Lake Johnson (Henry-Hall <i>et al.</i> 1990; J. Angas pers. comm.) (Mt Bevan telecom tower – A. Brown pers. comm.).	V	41	iii	iii	iii	xii (recreation; proposal to mine), v (goats), vi
Granite moss sheet communities (S. Halse pers. comm. 2000).	V	43	iii	iii	iii	xii (recreation), v (trampling by goats)
Duladgin Ridge vegetation complex (G. Keighery and N. Gibson pers comm.; Beard 1972d)	V	27, 21	iii	iv	iii	v (rabbits), vi, vii
Helena and Aurora Range vegetation complexes (Beard 1972b; Dell <i>et al.</i> 1985; Henry-Hall <i>et al.</i> 1990; Gibson <i>et al.</i> 1997; Lyons and Chapman 1997). Subject to imminent exploration programs for iron ore mining (Portman mining Co.) (R. Thomas pers. comm. 2000).	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Koolyanobbing vegetation complexes (G. Keighery and N. Gibson pers comm.; Beard 1972b) Subject to imminent exploration programs for iron ore mining (Portman mining Co.) (R. Thomas pers. comm. 2000).	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Highclere Hills vegetation complex (Beard 1972b; Newbey and Hnatiuk 1985; Dell <i>et al.</i> 1985; Henry-Hall 1990; Gibson and Lyons 1997a)	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Hunt Range vegetation complex (Gibson and Lyons 1997a; Beard 1972b; Beard 1978; Dell <i>et al.</i> 1985; Newbey & Hnatiuk 1985; Department of Conservation and Land Management 1994b).	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?

Community	Status	NVIS ¹	Condition ²	Trend ³	Reliability ⁴	Threatening Processes ⁵
Mount Dimer vegetation complex (Beard 1972b; N. Gibson and G. Keighery pers. comm.)	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Diehardy Range vegetation complex (G. Keighery and N. Gibson pers comm.; Henry-Hall <i>et al.</i> 1990; Beard 1972b). Subject to imminent exploration programs for iron ore mining (Portman mining Co.) (R. Thomas pers. comm. 2000).	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Mount Manning Range vegetation complex (Beard 1972b; Beard 1990; Henry-Hall <i>et al.</i> 1990; Keighery <i>et al.</i> 1995; Gibson and Lyons 1997c). Subject to imminent exploration programs for iron ore mining (Portman mining Co.) (R. Thomas pers. comm. 2000).	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Mount Jackson Range vegetation complex (Henry-Hall <i>et al.</i> 1990; G. Keighery and N. Gibson pers comm.; Beard 1972b). Subject to imminent exploration programs for iron ore mining (Portman mining Co.) (R. Thomas pers. comm. 2000).	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Yilgarn Hills vegetation complex (G. Keighery and N. Gibson pers comm.; Newbey <i>et al.</i> 1995; Beard 1972b).	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Ironcap Hills complexes (Mt Holland, Mid, North and South Ironcap Hills and Hatters Hill) (sufficient data may be available from Hopkins <i>et al.</i> (1996) to allow assessment against criteria for TECs) (Newbey <i>et al.</i> 1984; G. Keighery and N. Gibson pers. comm.; Beard 1972b).	V	27, 21	iii	iv	iii	xii (mining), vii, v (rabbits), vi?
Acacia - Casuarina - Melaleuca Thicket. 80% alienated (Beard and Sprenger 1984) Wheatbelt, Southern Goldfields, Darling, Northern Sandplain, Eastern South Coast, Southwest Interzone (Hopkins <i>et al.</i> 1996).	V	26, 28	ii	iv	iii	ii, iv, vii, v
Eucalyptus, Acacia, Atriplex, Halosarcia Wooded Succulent Steppe 87% alienated (Beard and Sprenger 1984) Wheatbelt, Southern Goldfields, Southwest Interzone (Hopkins <i>et al.</i> 1996).	V	8, 31	ii	iv	ii-iii	ii, iv, vii, v
<i>Eucalyptus loxophleba</i> , <i>E. wandoo</i> , <i>E. salmonophloia</i> Woodland (Beard and Sprenger 1984) Darling, Wheatbelt, Southern Goldfields, Eastern South Coast, Northern Sandplain, South West Interzone (Hopkins <i>et al.</i> 1996).	V	8	ii	iv	ii-iii	ii, iv, vii, v
Plant Assemblages of the Bremer Range		43	ii	unknown	ii	xii (mining)

¹Appendix B, key f; ²Appendix C, rank 2; ³Appendix C, rank 3; ⁴Appendix C, rank 1; ⁵Appendix 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)					
<i>Dasyurus geoffroii</i>	V	i	i	iii	v (foxes, cats), ii, iv, vii; likely to be extinct in subregion
SCHEDULE 1: RARE/LIKELY TO BECOME EXTINCT, DIV 2 (BIRDS)					
<i>Calyptorhynchus latirostris</i>	E	i	iii	iii	ii, vii
<i>Acanthiza iredalei iredalei</i>	V	ii	iii	ii	iv
<i>Leipoa ocellata</i>	V	i	iii	iii	v (foxes & cats), vii, iv, ii
SCHEDULE 4: OTHER SPECIALLY PROTECTED FAUNA. DIVISION 3 (REPTILES)					
<i>Morelia spilota imbricata</i>	SP	ii	iii	iii	v (foxes & cats), iii, ii, vii

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

Declared rare and priority flora

Species Name	Status	Condition ¹	Trend ²	Reliability ³	Threatening Processes ⁴
DECLARED RARE FLORA					
<i>Eremophila virens</i>	E	ii-iii	iv	iii	iv,
<i>Tetradlea paynterae</i>	E	iii	iv	iii	xii (mining), iv
<i>Gastrolobium graniticum</i>	V	ii-iii	iv	iii	vii, ii
<i>Myriophyllum lapidicola</i>	V	ii-iii	vi	iii	x, xii (aquatic plant that grows in

					granite pools after rain)
<i>Pityrodia scabra</i>	V	ii-iii	iv	iii	vii, ii, v, iv
<i>Tetralthea aphylla</i>	V	iii	iv	iii	xii (mining), iv
<i>Tetralthea harperi</i>	V	iii	iv	iii	xii (mining), iv
PRIORITY 1					
<i>Acacia adinophylla</i>	1	Unknown	Unknown	ii	iv, vii
<i>Acacia ependunculata</i>	1	Unknown	Unknown	ii	iv, vii
<i>Calothamnus superbus</i>	1	Unknown	Unknown	ii	iv, vii
<i>Calytrix cresswellii</i>	1	Unknown	Unknown	ii	iv, vii
<i>Chamelaucium paynteri</i>	1	Unknown	Unknown	ii	iv, vii
<i>Diocirea microphylla</i>	1	Unknown	Unknown	ii	iv, vii
<i>Gnephosis intonsa</i>	1	Unknown	Unknown	ii	iv, vii
<i>Grevillea phillipsiana</i>	1	Unknown	Unknown	ii	iv, vii
<i>Homalocalyx grandiflorus</i>	1	Unknown	Unknown	ii	iv, vii
<i>Lepidium merrallii</i>	1	Unknown	Unknown	ii	iv, vii
<i>Leptospermum macgillivrayi</i>	1	Unknown	Unknown	ii	iv, vii
<i>Persoonia leucopogon</i>	1	Unknown	Unknown	ii	iv, vii
<i>Ricinocarpos brevis</i> ms	1	Unknown	Unknown	ii	iv, vii
<i>Stenanthemum newbeyi</i>	1	Unknown	Unknown	ii	iv, vii
PRIORITY 2					
<i>Acacia kerryana</i>	2	Unknown	Unknown	ii	iv, vii
<i>Acacia subrigida</i>	2	Unknown	Unknown	ii	iv, vii
<i>Dampiera orchardii</i>	2	Unknown	Unknown	ii	iv, vii
<i>Elachanthus pusillus</i>	2	Unknown	Unknown	ii	iv, vii
<i>Frankenia brachyphylla</i>	2	Unknown	Unknown	ii	iv, vii
<i>Haegiela tatei</i>	2	Unknown	Unknown	ii	iv, vii
<i>Hakea rigida</i>	2	Unknown	Unknown	ii	iv, vii
<i>Jacksonia jackson</i>	2	ii-iii	iv	ii	iv, vii, xii (mining)
<i>Lepidium genistoides</i>	2	Unknown	Unknown	ii	iv, vii
<i>Leucopogon breviflorus</i>	2	Unknown	Unknown	ii	iv, vii
<i>Malleostemon</i> sp Adelong	2	Unknown	Unknown	ii	iv, vii
<i>Phebalium clavatum.</i>	2	Unknown	Unknown	ii	iv, vii
<i>Phlegmatospermum eremaeum</i>	2	Unknown	Unknown	ii	iv, vii
<i>Stylidium choreanthum</i>	2	Unknown	Unknown	ii	iv, vii
<i>Trachymene moorei</i> subsp <i>moorei</i> ms	2	Unknown	Unknown	ii	iv, vii

¹Appendix C, rank 2; ²Appendix C, rank 3; ³Appendix C, rank 1; ⁴Appendix 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
8	Medium woodland; salmon gum & gimlet	X	X		L
9	Medium woodland; coral gum (<i>E. torquata</i>) & goldfields blackbutt (<i>E. le souefii</i>) (also some e10,11)				L
18	Low woodland; mulga (<i>Acacia aneura</i>)				L
19	Low woodland; mulga between sandridges				L
20	Low woodland; mulga mixed with <i>Allocasuarina cristata</i> & Eucalyptus sp (e6?)				L
24	Low woodland; <i>Allocasuarina cristata</i>	X			L
36	Shrublands; thicket, acacia-casuarina alliance ?species				L
39	Shrublands; mulga scrub				L
40	Shrublands; acacia scrub, various species				L
98	Hummock grasslands, shrub steppe; kanji over soft spinifex & <i>T. basedowii</i>	X			L
123	Succulent steppe with open low woodland; sheoak over saltbush & bluebush				L
125	Bare areas; salt lakes	X	X		L
127	Bare areas; mudflats				L
128	Bare areas; rock outcrops	X	X		L
141	Medium woodland; York gum, salmon gum & gimlet	X			L
142	Medium woodland; York gum & salmon gum	X			L
143	Medium woodland; York gum, salmon gum & <i>Casuarina pauper</i>	X			L
144	Medium woodland; wandoo, salmon gum, morrel, gimlet & rough fruited mallee	X			L
147	Succulent steppe with scrub; acacia species over saltbush	X			M
148	Medium woodland; gimlet	X			H
202	Shrublands; mulga & <i>Acacia quadrimarginea</i> scrub	X			M
221	Succulent steppe; saltbush				L
256	Low woodland; York gum, and cypress pine (adjacent to e6pMLi)	X			L
314	Succulent steppe with open woodland; york gum over saltbush	X			L
352	Medium woodland; York gum				L
357	Medium woodland over scrub; York gum over bowgada & jam (<i>Acacia acuminata</i>)				L
408	Shrublands; scrub-heath on coastal association, yellow sandplain	X			M
420	Shrublands; bowgada & jam scrub				L
435	Shrublands; <i>Acacia neurophylla</i> , <i>A. beauverdiana</i> & <i>A. resinomarginea</i> thicket	X	X		L
436	Shrublands; Acacia sp.		X		L
437	Shrublands; Mixed acacia thicket on sandplain	X	X		L
468	Medium woodland; salmon gum & goldfields blackbutt				L
483	Hummock grasslands, mixed sandplain - open mallee over sparse dwarf shrubs with spinifex; red mallee & mixed sparse dwarf shrubs over <i>Triodia basedowii</i>				L
484	Shrublands; jam thicket				M
491	Medium woodland; morrel & Dundas blackbutt (<i>E. dundasii</i>)				H
501	Medium woodland; goldfields blackbutt				M
504	Low woodland; mulga & red mallee				M
507	Succulent steppe with woodland; salmon gum & saltbush				H
508	Succulent steppe with open scrub; scattered mulga over saltbush	X			L
511	Medium woodland; salmon gum & morrel	X			L
516	Shrublands; mallee scrub, black marlock	X			L
Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
519	Shrublands; mallee scrub, <i>Eucalyptus eremophila</i>	X			L
520	Shrublands; <i>Acacia quadrimarginea</i> thicket	X	X		L
521	Medium woodland; salmon gum & red mallee				M
522	Medium woodland; redwood (<i>E. transcontinentalis</i>) & merrit (<i>E. flocktoniae</i>)	X	X		H

535	Medium woodland; rough fruited mallee on greenstone hills				H
536	Medium woodland; morrell & rough fruited mallee (<i>E. corrugata</i>)				H
537	Medium woodland; morrel (<i>E. longicornis</i>)				H
538	Shrublands; <i>Acacia brachystachya</i> scrub	X	X		L
551	Shrublands; <i>Allocasuarina campestris</i> thicket	X			L
552	Shrublands; <i>Casuarina acutivalvus</i> & <i>calothamnus</i> (also <i>melaleuca</i>) thicket on greenstone hills				H
554	Low woodland over scrub; <i>Allocasuarina cristata</i> over bowgada scrub	X			L
555	Hummock grasslands, mallee steppe; red mallee over spinifex <i>Triodia scariosa</i>	X	X		L
676	Succulent steppe; samphire				L
936	Medium woodland; salmon gum	X	X		M
941	Mosaic: Medium woodland: salmon gum & morrel/Shrublands: mallee scrub, redwood				H
946	Medium woodland; wandoo				M
1024	Shrublands; mallee & casuarina thicket	X			L
1063	Medium-Low woodland; York gum & cypress pine (<i>Callitris columellaris</i>)	X			L
1067	Medium woodland; salmon gum, morrel, gimlet & rough fruited mallee	X			L
1068	Medium woodland; salmon gum, morrel, gimlet & <i>Eucalyptus sheathiana</i>	X			L
1071	Succulent steppe with scrub; acacia species over saltbush & bluebush	X	X		L
1078	Medium woodland; salmon gum, redwood, merrit, gimlet & <i>Eucalyptus sheathiana</i>	X			L
1148	Shrublands; scrub-heath in the Coolgardie Region	X	X		L
1271	Bare areas; claypans				M
1413	Shrublands; acacia, casuarina & melaleuca thicket	X	X		L
2009	Medium woodland; redwood & goldfields blackbutt				M
2048	Shrublands; scrub-heath in the Mallee Region				L
2904	Medium woodland; York gum, goldfield blackbutt, gimlet & <i>Allocasuarina cristata</i>				H
	Banded Ironstone Hills with <i>Dryandra arborea</i> . (A. Brown pers. comm.).				H
	Flora and fauna assemblages of granite rock pools				H
	Goldfields granite outcrop assemblages, rocks east of Lake Johnson				H
	Granite moss sheet communities				H
	Duladgin Ridge vegetation complex				M
	Helena and Aurora Range vegetation complexes				H
	Koolyanobbing vegetation complexes				H
	Highclere Hills vegetation complex				M
	Hunt Range vegetation complex				M
	Mount Dimer vegetation complex				M
	Diehardy Range vegetation complex				H
	Mount Manning Range vegetation complex				H
	Mount Jackson Range vegetation complex				H
	Yilgarn Hills vegetation complex				M
	Ironcap Hills complexes (Mt Holland, Mid, North and South Ironcap Hills and Hatters Hill)				H

Subregional constraints in order of priority

(see Appendix B, key g)

Competing Land Uses: Major components of the landscape are covered by mines, mining tenements, exploration leases and to a lesser extent grazing.

Bioregional and subregional priority for reserve consolidation

Coolgardie Bioregion is IBRA Reservation Class 3 (11.3 % of its area reserved in IUCN I-IV) (see Appendix D, and Appendix C, rank 4). COO2 is listed as reservation Class 4 because 14.18 % of its area is reserved (IUCN I-IV), however, the south-western parts have been cleared for wheat fields and salinity problems are emerging so Class 3 is more appropriate.

Reserve management standard

In COO, no feral predator programs are in place yet. Wildfire management facilities are limited by resources, except for fire breaks and fire-access tracks which are installed and maintained in all reserves. Mining activities (exploration) are supervised (except for old exploration drill holes which often remain open), and feral herbivore grazing activities now minimal (e.g. Callicivirus has reduced rabbit populations; there are still relatively few goats). Therefore, the overall management rank is (ii) (see Appendix C, rank 5), due to the lack of feral predator control although vegetation and soils probably stable or regenerating from light grazing and timber removal early in the 20th century.

Class	Purpose	Name	Category	Reserve Management Rank ¹
		Mt. Elvire	Leasehold	ii-iii
		Jaurdi Station	Leasehold	ii-iii
A	Conservation Park	Goldfields Woodlands Conservation Park	Conservation Park	ii-iii
A	National Park	Goldfields Woodlands National Park	National Park	ii-iii
A	National Park	Boorabbin National Park	National Park	ii-iii
A	Conservation Of Flora And Fauna	Victoria Rock Nature Reserve	Nature Reserve	ii-iii
A	Conservation Of Flora And Fauna	Wockallarry Nature Reserve	Nature Reserve	ii-iii
A	Conservation Of Flora And Fauna	Walyahmoning Nature Reserve	Nature Reserve	ii-iii
A	Conservation Of Flora And Fauna	Lake Cronin Nature Reserve	Nature Reserve	ii-iii
A	Conservation Of Flora And Fauna	Karroun Hill Nature Reserve	Nature Reserve	ii-iii
A	Water And Conservation Of Flora And Fauna	Geeraning Nature Reserve	Nature Reserve	ii-iii
A	Water And Conservation Of Flora And Fauna	Yanneymoon Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Duladgin Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Jilbadji Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Condarnin Rock Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Biljahnje Rock Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Mount Manning Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Yellowdine Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Dordie Rock Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Burra Rock Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Cave Hill Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Baladjie Lake Nature Reserve	Nature Reserve	ii-iii
C	Timber	Scahill Timber Reserve	Section 5(g) reserve	ii-iii

¹Appendix C, rank 5

Off reserve conservation

Priority species or groups and existing recovery plans

Species	Specific Recovery Plan	General Recovery Plans
<i>Acanthiza iredalei iredalei</i>	No	Action Plan for Australian Birds; Goldfields Regional Management Plan.
<i>Calyptorhynchus latirostris</i>	Yes – Draft RP	Action Plan for Australian Birds; Goldfields Regional Management Plan.
<i>Dasyurus geoffroii</i>	Yes – IRP	Action Plan for Australian Marsupials and Monotremes; Goldfields Regional Management Plan.
<i>Morelia spilota imbricata</i>	No	Action Plan for Australian Reptiles; Goldfields Regional Management Plan.
<i>Leipoa ocellata</i>	Yes - National Recovery Plan for Malleefowl	Action Plan for Australian Birds; Goldfields Regional Management Plan.
<i>Eremophila virens</i>	No	Goldfields Regional Management Plan
<i>Gastrolobium graniticum</i>	No	Goldfields Regional Management Plan
<i>Myriophyllum lapidicola</i>	No	Goldfields Regional Management Plan
<i>Pityrodia scabra</i>	Yes - IRP	Goldfields Regional Management Plan
<i>Tetralthea aphylla</i> .	No existing recovery plans. Probably a genuinely rare species limited by suitable habitat.	Goldfields Regional Management Plan
<i>Tetralthea harperi</i>	No existing recovery plans. Probably a genuinely rare species limited by suitable habitat.	Goldfields Regional Management Plan
<i>Tetralthea paynterae</i>	No existing recovery plans. Probably a genuinely rare species limited by suitable habitat.	Goldfields Regional Management Plan

Appropriate species recovery actions

Species	Recovery Actions ¹	Recovery Descriptions
<i>Acanthiza iredalei iredalei</i>	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
<i>Calyptorhynchus latirostris</i>	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
<i>Dasyurus geoffroii</i>	i, ii, iii, vii, x	Habitat retention through reserves or on other State lands or on private lands. Translocation from secure population would be required. Control of foxes and cats would be necessary
<i>Morelia spilota imbricata</i>	i, ii, iii, vii	Habitat retention through reserves or on other State lands or on private lands. Likely that control of foxes and cats would contribute to recovery
<i>Leipoa ocellata</i>	i, ii, iii, vii	Habitat retention through reserves or on other State lands on private lands. Likely that control of foxes and cats would contribute to recovery
<i>Eremophila virens</i>	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
<i>Gastrolobium graniticum</i>	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
<i>Myriophyllum lapidicola</i>	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
<i>Pityrodia scabra</i>	i, ii, iii, v, vi, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands.
<i>Tetralthea aphylla</i> .	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
<i>Tetralthea harperi</i>	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
<i>Tetralthea paynterae</i>	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.

¹Appendix A, key h.

Ecosystems

Ecosystem	Specific Recovery Plan	General Recovery
Banded Ironstone <i>Tetralthea</i> spp communities threatened by proposed mining activities	No existing recovery plans. Probably genuinely rare species limited by suitable habitat.	Goldfields Regional Management Plan
CWR mammal habitats	Yes – RP for Chuditch	Goldfields Regional Management Plan
Johnston Lakes	No	South Coast Management Plan
Eva Lake	No	Goldfields Regional Management Plan
Unnamed Lake South of Boondine Hill	No	Goldfields Regional Management Plan

Lake Walton	No	Goldfields Regional Management Plan
Flora and fauna assemblages of granite rock pools	No	
Goldfields granite outcrop assemblages rocks east of Lake Johnson	No	South Coast Management Plan
Duladgin Ridge vegetation complex	No	Goldfields Regional Management Plan
Helena and Aurora Range vegetation complexes	No	Goldfields Regional Management Plan
Highclere Hills vegetation complex	No	Goldfields Regional Management Plan
Hunt Range vegetation complex	No	Goldfields Regional Management Plan
Mount Dimer vegetation complex	No	Goldfields Regional Management Plan
Diehardy Range vegetation complex	No	Goldfields Regional Management Plan
Mount Manning Range vegetation complex	No	Goldfields Regional Management Plan
Mount Jackson Range vegetation complex	No	Goldfields Regional Management Plan
Ironcap Hills complexes (Mt Holland, Mid, North and South Ironcap Hills and Hatters Hill)	No	South Coast Management Plan
Acacia - Casuarina - Melaleuca Thicket. 80% alienated	No	Goldfields Regional Management Plan
Eucalyptus, Acacia, Atriplex, Halosarcia Wooded Succulent Steppe 87% alienated	No	Goldfields Regional Management Plan
<i>Eucalyptus loxophleba</i> , <i>E. wandoo</i> , <i>E. salmonophloia</i> Woodland	No	Goldfields Regional Management Plan

Existing ecosystem recovery plans and appropriate recovery actions

Ecosystem	Recovery Actions ¹	Recovery Descriptions
Banded Ironstone <i>Tetratheca</i> spp communities threatened by proposed mining activities	i, ii, iii, xiii	All identified vegetation complexes would require habitat retention through reserves or on other State lands or on private lands. Capacity building required with industry.
CWR mammal habitats	i, ii, iii, ix, v	Habitat retention through reserves or on other State lands or on private lands. Appropriate fire management. Stock exclusion from habitats.
Lake Deborah East	iii	Habitat protection on other state lands.
Lake Deborah West	iii	Habitat protection on other state lands.
Johnston Lakes	i	Habitat retention through reserves.
Flora and fauna assemblages of granite rock pools	i, ii, iii	Habitat retention and protection through reserves, on private land and on other state lands.
Goldfields granite outcrop assemblages rocks east of Lake Johnson	i	Habitat retention through reserves.
Granite moss sheet communities	i, ii, iii	Habitat retention and protection through reserves, on private land and on other state lands.
Duladgin Ridge vegetation complex	i	Habitat retention through reserves.
Helena and Aurora Range vegetation complexes	i	Habitat retention through reserves.
Koolyanobbing vegetation complexes	iii, xiii	Habitat protection on other state lands. Capacity building with mining companies.
Highclere Hills vegetation complex	iii, xiii	Habitat protection on other state lands. Capacity building with the pastoral industry.
Ecosystem	Recovery Actions ¹	Recovery Descriptions
Mount Dimer vegetation complex	i	Habitat retention through reserves.
Diehardy Range vegetation complex	i	Habitat retention through reserves, included in proposed reserve extension.
Mount Manning Range vegetation complex	i	Habitat retention through reserves, included in proposed reserve extension.
Mount Jackson Range vegetation complex	i	Habitat retention through reserves, included in proposed reserve extension.
Ironcap Hills complexes (Mt Holland, Mid, North and South Ironcap Hills and Hatters Hill)	i	Habitat retention through reserves, included in proposed reserve extension.
Acacia - Casuarina - Melaleuca Thicket. 80% alienated	i, iii, ix, xii	Habitat retention through reserves and on other state lands. Fire management. Research.
Eucalyptus, Acacia, Atriplex, Halosarcia Wooded Succulent Steppe 87% alienated	i, iii, ix, xii	Habitat retention through reserves and on other state lands. Fire management. Research.
<i>Eucalyptus loxophleba</i> , <i>E. wandoo</i> , <i>E. salmonophloia</i> Woodland	i, iii	Habitat retention through reserves and on other state lands.
Plant Assemblages of the Bremer Range	iii	Habitat retention on other state lands.

¹Appendix A, key h.

Subregion priority for off reserve conservation

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

Conservation actions as an integral part of NRM

Existing NRM actions

Threat Abatement Planning as Part of NRM: e.g. vegetation management plans, and pest management.

Industry Codes of Practice.

Environmental Management Systems and Ecologically Sustainable Product Marketing.

Feasible opportunities for NRM

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

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

Other Planning Opportunities: Include Local Government Planning and National Action Plan for Water Quality and Salinity.

Impediments or constraints to opportunities

A number of impediments exist including the Land Administration Act and operations of the Pastoral Land Board, so 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. Limited financial resources are also a major constraint.

Subregions where specific NRM actions are a priority to pursue

The NRM priority for COO2 is (iii) (see Appendix C, rank 7), indicating that 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 and, although regional survey of flora and vertebrate fauna has been published, it is based on very sparse sampling.

Systematic Fauna Survey: Data is confined to vertebrates and is sparse (60 quadrats across subregion), quadrats only positioned on widespread surface-types, and only 3 – 4 quadrats per surface-type, few quadrats have been sampled on more than three occasions. The Western Australian Biological Surveys Committee conducted extensive surveys in the Eastern Goldfields, see

Dell *et al.* 1985, Keighery *et al.* 1995, Newbey *et al.* 1984 and McKenzie and Hall 1982.

Floristic Data: Data is sparse (about 130 quadrats across subregion), quadrats positioned on widespread surface-types as well as some of the localised substrates of particular interest. The Western Australian Biological Surveys Committee conducted extensive surveys in the Eastern Goldfields, see Dell *et al.* 1985, Keighery *et al.* 1995, Newbey *et al.* 1984 and McKenzie and Hall 1982.

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

Other Priority Data Gaps Include:

- No quantitative data on the affect of exotic predators, weed colonisation, fire, mineral-extraction on greenstone surfaces (particularly banded ironstones).

Sources

References cited

No.	Author	Date	Title	Publication Details	Pub. Type
081	Beard, J.S.	(1990).	Plant Life of Western Australia.	Kangaroo Press, Kenthurst NSW.	B
725	Beard, J.S.	(1978).	Vegetation Survey of Western Australia, 1:250,000 series. The Vegetation of the Kalgoorlie area Western Australia.	Vegmap Publications, Sydney.	O
056	Beard, J.S.	(1972b).	Vegetation Survey of Western Australia 1:250000 series - Jackson.	Vegmap publications, Applecross, W.A.	O
058	Beard, J.S.	(1972d).	Vegetation Survey of Western Australia 1:250000 series - Southern Cross.	Vegmap publications, Applecross, W.A.	O
084	Beard, J.S. and Sprenger, B.S.	(1984).	Geographical data from the vegetation survey of Western Australia. Vegetation Survey of Western Australia. Occasional Paper No 2.	Vegmap Publications, Applecross.	O
090	Benshemesh, J.	(2000).	National Recovery Plan for Malleefowl.	Department of Environment and Heritage, South Australia.	R
142	Cale, B.	(2000).	Carnaby's Black-Cockatoo (<i>Calyptrorhynchus latirostris</i>). Draft Recovery Plan Recovery Plan No.	Department of Conservation and Land Management.	R
181	Cogger, H., Cameron, E., Sadler, R. and Egger, P.	(1993).	The Action Plan for Australian Reptiles.	Australian Nature Conservation Agency, Canberra.	R
217	Dell, J., How, R.A., Newbey, K.R. and Hnatiuk, R.J.	(1985).	The biological survey of the eastern Goldfields of Western Australia. Part 3. The Jackson-Kalgoorlie Study Area.	Records of the Western Australian Museum Supplement No. 23, 1-168. Perth, WA.	R
231	Department of Conservation and Land Management	(1994b).	Goldfields Region Management Plan 1994-2004. Management Plan No. 27.	Department of Conservation and Land Management.	R
231	Department of Conservation and Land Management	(1994b).	Goldfields Region Management Plan 1994-2004. Management Plan No. 27.	Department of Conservation and Land Management.	R
298	Garnett, S.T. and Crowley, G.M.	(2000).	The Action Plan for Australian Birds.	Environment Australia, Canberra.	R
721	Gibson, N. and Lyons, M.N.	(1997a).	Floristic survey of the Highclere Hills of the eastern goldfields of Western Australia.	Department of Conservation and Land Management, Western Australia, 1-25	R
722	Gibson, N. and Lyons, M.N.	(1997b).	Floristic survey of the Hunt Range, Yendilberin and Watt Hills of the eastern goldfields of Western Australia.	Department of Conservation and Land Management, Western Australia, 1-27	R
723	Gibson, N. and Lyons, M.N.	(1997c).	Floristic survey of the Mt. Manning Range of the eastern goldfields of Western Australia.	Department of Conservation and Land Management, Western Australia, 1-24	R
305	Gibson, N., Lyons, M.N. and Lepschi, B.J.	(1997).	Flora and vegetation of the eastern goldfield ranges. Part 1, Helena and Aurora Range.	CALMScience 2, pp. 231-246.	J
354	Henry-Hall, N.J., Hopper, S.D., McKenzie, N.L. and Keighery, S.D.	(1990).	Nature Conservation Reserves in the Eastern Goldfields, Western Australia - Southern Two Thirds of CTCR System 11.	Report submitted to EPA Red Book Task Force.	R
371	Hopkins, A.J.M., Coker, J., Beeston, G.R., Bowen, P. and Harvey, J.M.	(1996).	Conservation Status of Vegetation Types throughout Western Australia, Australian Nature Conservation Agency National Reserves Systems Co-operative Program Project No N703 Final Report May 1996.	Department of Conservation and Land Management, Western Australia and Department of Agriculture, Western Australia.	R
428	Keighery, G.J., McKenzie, N.L. and Hall, N.J. (eds.)	(1995).	The biological survey of the eastern Goldfields of Western Australia. Part 11. Boorabbin-Southern Cross Study Area.	Records of the Western Australian Museum Supplement No. 49, 1-138. Perth, WA.	R
458	Lyons, M.N. and Chapman, A. (eds.)	(1997).	A Biological Survey of the Helena and Aurora Range, Eastern Goldfields Western Australia.	Unpublished Report for 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
491	McKenzie, N.L. and Hall, N.J. (eds.)	(1992).	The biological survey of the eastern Goldfields of Western Australia. Part 8. Kurnalpi-Kalgoorlie Study Area.	Records of the Western Australian Museum Supplement No. 41, 1-125. Perth, WA.	J
530	Newbey, K.R., Dell, J., How, R.A. and Hnatiuk, R.J.	(1984).	The biological survey of the eastern Goldfields of Western Australia. Part 2. Widgiemooltha-Zanithus Study Area.	Records of the Western Australian Museum Supplement No. 18, 21-158. Perth, WA.	R
726	Newbey, K.R., Keighery, G.J. and Hall, N.J.	(1995).	The biological survey of the eastern Goldfields of Western Australia. Vegetation and flora. Part 11. Boorabbin-Southern Cross Study Area.	Records of the Western Australian Museum Supplement 49, 17-31, 66-167	R
724	Newby, K.R. and Hnatiuk, R.J.	(1985).	The Biological Survey of Eastern Goldfields of Western Australia - Part 3 Jackson-Kalgoorlie Study Area Vegetation and Flora	Records of the Western Australian Museum Supplement Number 23	R
532	Orell, P., and Morris, K.	(1994).	Chuditch Recovery Plan 1992-2001. WA Wildlife Management Program No. 13.	Department of Conservation and Land Management, Perth.	R
553	Pinder, A.M., Halse, S.A., Shiel, R.J. and McRae, J.M.	(2000).	Granite outcrop pools in south-western Australia: foci of diversification and refugia for aquatic invertebrates.	Journal of the Royal Society of Western Australia 83:149-161.	J

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

Other relevant publications

See reference numbers 055, 057, 075, 080, 098, 101, 103, 106, 118, 164, 166, 182, 211, 232, 241, 258, 260,

268, 278, 287, 313, 370, 390, 406, 459, 519, 526, 577, 597, 647, 685, 686 and 709 in Appendix A.