Coolgardie 3 *(COO3 – Eastern Goldfields subregion)*

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Subregional description and biodiversity values

Description and area

Coolgardie 3 lies on the Yilgarn Craton's 'Eastern Goldfields Terrains'. The relief is subdued and comprises of gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line.

The vegetation is of Mallees, Acacia thickets and shrub-heaths on sandplains. Diverse *Eucalyptus* woodlands occur around salt lakes, on ranges, and in valleys. Salt lake support dwarf shrublands of samphire. Woodlands and *Dodonaea* shrubland occur on basic graninulites of the Fraser Range. The area is rich in endemic Acacias. The climate is Arid to Semi-arid with 200-300 mm of rainfall, sometimes in summer but usually in winter. The subregional area is 5, 102, 428 ha.

Dominant land use

The dominant land uses are (xi) UCL and Crown reserves (see Appendix B, key b), (ix) Grazing-Native pastures-leasehold (37.8%) freehold (7.15%),(xiii) conservation, (vii) Mining leases.

Continental Stress Class

The Continental Stress Class for COO3 is 5.

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

Rowles Lagoon, Clear and Muddy Lakes: This system of wetlands is the largest semi-permanent freshwater complex in the region and as such plays an important ecological role. With 41 species of waterbird, including eight protected by international treaty, it has more species than any other southern arid zone wetland in WA.

Plant assemblages of the Fraser Range Vegetation Complex: *Allocasuarina huegeliana* and *Pittosporum phylliraeoides* open woodland over *Beyeria lechenaultii* and *Dodonaea microzyga* Scrub and *Aristida contorta* bunch grasses (granite complex), on the slopes and summits of hills; *Acacia acuminata* Tall Shrubland dominated by *Melaleuca uncinata* and *Triodia scariosa* on uplands with shallow loamy sands; *Eucalyptus* aff. *uncinata* over *Cassia helmsii, Cryptandra miliaris, Dodonaea boroniifolia, D. stenozyga* and *Triodia scariosa* (*Eucalyptus effusa* Mallee) on colluvial flats with loamy clay sands, and; *E. oleosa, E. transcontinentalis, E. urna* Woodland on flats. Fraser Range is a unique landform that supports distinctive vegetation associations of mallees and low woodlands interspersed with herblands (Newbey *et al.* 1984). A number of plant species that occur there have restricted distributions (*Lasiopetalum ogilvieanum, Eucalyptus balladoniensis, Geococcus pusillus* etc.) while several other species are at the limit of their range (*Prostanthera serpyllifolia, Eucalyptus lesouefii*).

Plant assemblages of the Woodline Hills: *Baeckea recurva* Tall Shrubland on Proterozoic quartzite ridges on the Woodline Hills located 95 km south-east of Widgiemooltha and 100 km north-east of Norseman.

Swan Lake: A semi permanent freshwater lake that often persists when other water bodies have dried up in drought conditions and as such performs an important ecological function in addition to supporting at least 9 species of waterbirds.

Plant and Community Special Values Include: Declared rare flora *Gastrolobium graniticum, Pityrodia scabra, Daviesia microcarpa*, and *Eucalyptus platydisca*. Communities include arid zone eucalypt woodlands.

Fauna Special Values Include: Vulnerable and specially protected fauna Malleefowl (*Leipoa ocellata*), Carpet Python (*Morelia spilota imbricata*), Peregrine Falcon (*Falco peregrinus*), Chuditch (*Dasyurus geoffroii*) and the Freckled Duck (*Stictonetta naevosa*).

Ecosystems That Have Greater Than 85% of Their Total Extent Within Coolgardie 3 Subregion:

Beard Veg Code	Description
9	Medium woodland; coral gum (*E. torquata*) & goldfields blackbutt (*E. lesouefii*) (also some e10, 11)
123	Succulent steppe with open low woodland; sheoak over saltbush & bluebush
467	Mosaic: Medium woodland; salmon gum & gimlet/Hummock grasslands, mallee steppe; red mallee over spinifex *Triodia scariosa*
468	Medium woodland; salmon gum & goldfields blackbutt
481	Mosaic: Medium woodland; salmon gum & red mallee/Hummock grasslands, mallee steppe; red mallee over spinifex *Triodia scariosa*
488	Mosaic: Medium woodland; gimlet/Shrublands; mallee scrub *Eucalyptus eremophila*
489	Mosaic: Medium woodland; goldfields blackbutt & *Dundas blackbutt*/Shrublands; dodonaea scrub
500	Mosaic: Medium woodland; merrit & red mallee/Shrublands; dodonaea scrub
505	Low woodland; *Allocasuarina cristata* & eucalypts
506	Succulent steppe with woodland; salmon gum & bluebush
509	Succulent steppe with woodland; gimlet & saltbush
513	Mosaic: Medium woodland; salmon gum & Dundas blackbutt/Shrublands; mallee scrub *Eucalyptus eremophila*
525	Mosaic: Medium woodland; salmon gum & gimlet/Medium woodland; merrit & red mallee
542	Shrublands; mallee scrub marble gum (*Eucalyptus gongylocarpa*)
1294	Medium woodland; coral gum
2901	Mosaic: Medium woodland; *Allocasuarina cristata* & goldfields blackbutt Shrublands; *Acacia quadrimarginea* thicket

Centres of Endemism:

- Goldfields Woodlands- Exceptionally high diversity of Eucalyptus species with as many as 170 species occurring in the bioregion

High Species and Ecosystem Diversity:

- Eucalyptus Woodlands
- Subregion has high diversity in Acacia species
- Ephemeral flora communities of tertiary sandplain shrublands and of valley floor woodlands.

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 a report – Nature Conservation Reserves in the Eastern Goldfields (Henry-Hall *et al.* 1990). This report made recommendations on a nature conservation reserve system for the southern and central Goldfields which incorporates COO3. Most of the subregion is covered by a CALM Regional Management Plan (Department of Conservation and Land Management 1994b), 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)

Name and Code	Description[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Rowles Lagoon System (WA015)	B6, B10, B13	ii	iv	iii	v (rabbits, goats, foxes, cats, stray stock), vi (Saffron Thistle, Bathurst Burr, Brome Grass, Southern Liquorice), iv (grazing by stock which may also lead to siltation), xii (uncontrolled recreational use; and eutrophication)

[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]
Swan Lake	434832 E, 6559102 N, zone 51 30º 41' S 122º 40' E	B6 (area of wetland is 125 ha)	ii (one of very few freshwater wetlands that are usually inundated), iii (Due to the persistence in dry conditions this site may act as an important refuge for waterbirds. Site proposed as an important waterbird area in the eastern Goldfields by the RAOU).	i (the lake is situated in the middle of a sheep grazing paddock)	Currently vi, although likely to be iii or iv	ii	iv, vi (species unknown), v (rabbits, foxes, cats)
Lake Cowan	31º 42' S 121º 54' E	B12	iii, v (potential)	iii-iv	iv	iii	xii (possibly mining) but no known threats,
Lake Arrow	30º 32' S 121º 24' E	B8	ii, iii, iv (nomadic species)	iii	iv	iii	xii (possibly mining and roadworks)
Canegrass Swamp	30º 32' S 122º 01' E	B10	ii (freshwater), iii, iv (nomadic species)	iii	iv	iii	x (water extraction for mining or roadworks)
King of the West Lake	30º 30' S 121º 27' E	B8	ii, iii, iv (nomadic species)	iii	iv	iii	xii (recreation, urban proximity), iv
Lignum Swamp	30º 12' S 121º 30' E	B13	ii, iii, iv (nomadic species), v	iii	iv	iii	iv
Black Flag Lake	30º 34' S 121º 18' E	B8	ii, iii, iv (nomadic species)	iii	iv	iii	xii (mining, recreation), iv

[1]Appendix B, key d; [2]Appendix B, key c; [3]Appendix C, rank 2; [4]Appendix C, rank 3; [5]Appendix C, rank 1; [6]Appendix B, key e

Riparian Zone Vegetation

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

[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 Threatened Ecological Communities (TECs) listed in COO3.

Other ecosystems at risk

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Fraser Range vegetation complex Plant assemblages of the Fraser Range Vegetation Complex: *Allocasuarina huegeliana* and *Pittosporum phylliraeoides* open woodland over *Beyeria lechenaultii* and *Dodonaea microzyga* Shrublands and *Aristida contorta* bunch grasses (granite complex), on the slopes and summits of hills; *Acacia acuminata* Tall Shrubland dominated by *Melaleuca uncinata* and *Triodia scariosa* on uplands with shallow loamy sands; *Eucalyptus* aff. *uncinata* (KRN 7854) over *Cassia helmsii*, *Cryptandra miliaris*, *Dodonaea boroniifolia,* *D. stenozyga* and *Triodia scariosa* (*Eucalyptus effusa* Mallee) on colluvial flats with loamy clay sands, and; *E. oleosa, E. transcontinentalis, E. urna* Woodland on flats.	V	26, 28	ii-ii	iii	iii	iv (grazing), vi, vii, xii (mining)
Woodline Hills vegetation complexes (*Baeckea recurva* shrubland) (Newbey *et al*. 1984: Henry-Hall 1990) (N. Gibson, G. Keighery pers comm.).	V	32	ii-iii	iii	iii	xii (mining)
Southern Hills Vegetation Complex		43	ii	unknown	ii	iv, xii (soil compaction and erosion), vi
Flora and fauna assemblages of granite rock pools (J. Davis and S. Halse pers. comm.) (Pinder et al. in press).	V	41	iii	iii	ii	x, xi (fecal deposits from feral animals), v (goats, rabbits, stock), vi
Goldfields granite outcrop assemblages (Eranyinia Hill - Cowarna Downs Station) (Henry-Hall, 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), vi
Permanent to semi-permanent brackish to freshwater wetlands with belts of Samphire and *Melaleuca* around the perimeter, Goldfields region. Swan Lake - Cowarna Downs Station; Cane Grass Lagoon - east of Rowles Lagoon (Henry-Hall 1990; J. Angas, A. Chapman pers. comm.).	V	39	ii-iii	iv	ii	iv, v, vii, x
Mt Belches *Acacia quadrimarginea*/*Ptilotus obovatus* banded ironstone community. On Randell Timber Reserve. Has grazing coexistence with the reserve. (R. Thomas pers. comm.).	V	21	ii-iii	iv	ii	iv, v, xii (mining)
Halophytic communities of salt lake systems of the goldfields Lake Lefroy; Madoonia Downs Station (Handley 1991; J. Angas pers. comm.)	V	41	ii-iii	iv	ii	xii (mining)
Assemblages of the lignum Swamps of the Goldfields Region eg. Sheehan Swamp - Cowarna Downs; Brown Lagoon - east of Rowles Lagoon; Lignum Swamp - Mt Vetters Station) (I. Kealley, A. Chapman pers. comm.).	V	42	ii	iii	ii	xii (mining), iv
Peripheral claypans surrounding salt lakes (Lake Wannaway, Madoonia Downs; unnamed lake at 30 km peg north of Norseman) (J. Angas, A. Chapman pers. comm.)	V	43	ii-iii	iii	ii	xii (mining), iv
Rich ephemeral communities of outcrops and bottomlands in the Kurnalpi-Kalgoorlie area (McKenzie and Hall 1992)	V	43	ii-iii	iii	ii	iv, v (rabbits, goats), vi

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Mixed low woodlands of *Eucalyptus oleosa*, *Casuarina cristata* and *Acacia aneura* in the Kurnalpi-Kalgoorlie area (McKenzie and Hall 1992)	V	8	ii-iii	iii	ii	iv, v (goats, rabbits), vii, xii (mining)
Vegetation complexes of the Greenstone/ banded ironstone ranges of the goldfields (J. Angas pers. comm.).	V	32	ii-iii	iii	iii	vii, xii (mining)
Melaleuca spp. Shrublands. 70% alienated (Beard and Sprenger 1984) Southern Goldfields, Darling, Eastern South Coast (Hopkins *et al.* 1996)	V	28	ii	iii	iii	vii
Acacia - Casuarina - Melaleuca Thicket. 80% alienated (Beard and Sprenger 1984) Wheatbelt, Southern Goldfields, Darling, Northern Sandplain, Eastern South Coast, Southwest Interzone (Hopkins *et al.* 1996)	V	15	ii	iii	iii	vii
Eucalyptus, Acacia, Atriplex, Halosarcia Wooded Succulent Steppe 87% alienated (Beard and Sprenger 1984) Wheatbelt, Southern Goldfields, Southwest Interzone (Hopkins *et al.* 1996)	V	29	ii	iii	iii	vii
Eucalyptus loxophleba, *E. wandoo*, *E. salmonophloia* Woodland (Beard and Sprenger, 1984) Darling, Wheatbelt, Southern Goldfields, Eastern South Coast, Northern Sandplain, South West Interzone (Hopkins *et al.* 1996)	V	8	ii	iii	iii	vii, iii (woodland was extensively cut over for fuel and pit-tunnel props from 1890 to 1950 but is now regenerating), iv (goats)

[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	i	i	iii	v (foxes, cats)
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 2 (BIRDS)					
Leipoa ocellata	V	i	iii	iii	v (foxes, cats), vii, iv, ii
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA. DIVISION 2 (BIRDS)					
Falco peregrinus	SP	ii	vi	ii	ii, iv, vii
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA. DIVISION 3 (REPTILES)					
Morelia spilota imbricata	SP	ii	iii	iii	v (foxes, cats), iii, ii, vii

[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					
Conospermum toddii	CR	ii	iii-iv	iii	vii
Daviesia microcarpa	CR	Unknown	Unknown	ii	ii, vii, x, xii (low numbers, few populations)
Eucalyptus merrickiae	V	Unknown	Unknown	ii	vii
Eucalyptus platydisca	V	Unknown	Unknown	ii	vii, ii, xii (mining; limited distribution; close proximity to road)
Gastrolobium graniticum	V	Unknown	Unknown	iii	vii, ii, vi
Pityrodia scabra	V	Unknown	Unknown	iii	vii, ii, v, iv?

Species Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Boronia revoluta	V	Unknown	Unknown		vii, ii, xii (mining, limited distribution)
PRIORITY 1					
Acacia websteri	1	Unknown	Unknown	ii	ii, vii
Dampiera plumosa	1	Unknown	Unknown	ii	iv, vii
Diocirea microphylla	1	Unknown	Unknown	ii	iv, vii
Eremophila perglandulosa ms	1	Unknown	Unknown	ii	iv, vii
Eremophila praecox ms	1	Unknown	Unknown	ii	vii
Eucalyptus griffithsii subsp Widgiemooltha	1	Unknown	Unknown	ii	vii
Gnephosis intonsa	1	Unknown	Unknown	ii	iv, vii
Grevillea phillipsiana	1	Unknown	Unknown	ii	iv, vii
Halosarcia flabelliformis	1	Unknown	Unknown	ii	iv
Jacksonia sp Cundeelee	1	Unknown	Unknown	ii	vii
Lepidium fasciculatum	1	Unknown	Unknown	ii	iv, vii
Phebalium appressum	1	Unknown	Unknown	ii	vii, iv
Prostanthera splendens	1	Unknown	Unknown	ii	v (goats)
Ptilotus procumbens	1	Unknown	Unknown	ii	iv
PRIORITY 2					
Acacia kerryana	2	Unknown	Unknown	ii	vii, v (goats, rabbits)
Elachanthus pusillus	2	Unknown	Unknown	ii	iv
Eucalyptus jutsonii	2	Unknown	Unknown	ii	vii
Grevillea secunda	2	Unknown	Unknown	ii	iv
Hakea rigida	2	Unknown	Unknown	ii	vii, iv, v (rabbits, goats)
Micromyrtus serrulata	2	Unknown	Unknown	ii	vii, iv
Micromyrtus stenocalyx	2	Unknown	Unknown	ii	vii, iv
Phebalium clavatum	2	Unknown	Unknown	ii	vii, iv
Phlegmatospermum eremaeum	2	Unknown	Unknown	ii	iv, vi
Rumex crystallinus	2	Unknown	Unknown	ii	iv, vi
Stylidium choreanthum	2	Unknown	Unknown	ii	iv, 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
8	Medium woodland; salmon gum & gimlet	X			L
9	Medium woodland; coral gum (*E. torquata*) & goldfields blackbutt (*E. lesouefii*) (also some e10,11)	X	X		L
10	Medium woodland; red mallee group				H
20	Low woodland; mulga mixed with *Casuarina pauper* & *Eucalyptus* sp (e6?)				M
24	Low woodland; *Casuarina pauper*		X		L
40	Shrublands; acacia scrub, various species				L
85	Hummock grasslands, open low tree & mallee steppe; marble gum & mallee (*Eucalyptus youngiana*) over hard spinifex on sandplain				L
109	Hummock grasslands, shrub steppe; *Eucalyptus youngiana* over hard spinifex		X		L
110	Hummock grasslands, shrub steppe; red mallee over spinifex *Triodia scariosa*				M
123	Succulent steppe with open low woodland; sheoak over saltbush & bluebush				L
Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
125	Bare areas; salt lakes	X	X		L

128	Bare areas; rock outcrops	X	X		L
221	Succulent steppe; saltbush	X			L
435	Shrublands; *Acacia neurophylla*, *A. beauverdiana* & *A. resinomarginea* thicket				L
441	Succulent steppe with open low woodland; mulga & sheoak over bluebush		X		L
460	Succulent steppe; bluebush with saltbush in depressions				H
461	Succulent steppe with open low woodland; *Acacia papyrocarpa* over bluebush				M
467	Mosaic: Medium woodland; salmon gum & gimlet/Hummock grasslands, mallee steppe; red mallee over spinifex *Triodia scariosa*				H
468	Medium woodland; salmon gum & goldfields blackbutt	X	X		L
480	Succulent steppe with open low woodland; mulga & sheoak over salt bush				H
481	Mosaic: Medium woodland; salmon gum & red mallee/Hummock grasslands, mallee steppe; red mallee over spinifex *Triodia scariosa*		X		M
482	Medium woodland; merrit & red mallee				L
484	Shrublands; jam thicket				L
486	Mosaic: Medium woodland; salmon gum & red mallee/Shrublands; mallee scrub *Eucalyptus eremophila*				H
487	Medium woodland; redwood & red mallee (*E. oleosa*)				L
488	Mosaic: Medium woodland; gimlet/Shrublands; mallee scrub *Eucalyptus eremophila*				H
489	Mosaic: Medium woodland; goldfields blackbutt & Dundas blackbutt/Shrublands; dodonaea scrub				H
500	Mosaic: Medium woodland; merrit & red mallee/Shrublands; dodonaea scrub	X			L
501	Medium woodland; goldfields blackbutt		X		L
502	Medium woodland; goldfields blackbutt & red mallee				H
505	Low woodland; *Allocasuarina cristata* & eucalypts				H
506	Succulent steppe with woodland; salmon gum & bluebush	X	X		L
507	Succulent steppe with woodland; salmon gum & saltbush				H
508	Succulent steppe with open scrub; scattered mulga over saltbush		X		M
509	Succulent steppe with woodland; gimlet & saltbush	X			L
513	Mosaic: Medium woodland; salmon gum & Dundas blackbutt/Shrublands; mallee scrub *Eucalyptus eremophila*	X			L
518	Mosaic: Medium woodland; merrit & coral gum/Shrublands; mallee scrub *Eucalyptus eremophila*		X		L
519	Shrublands; mallee scrub, *Eucalyptus eremophila*				L
520	Shrublands; *Acacia quadrimarginea* thicket				H
521	Medium woodland; salmon gum & red mallee				H
522	Medium woodland; redwood (*E. transcontinentalis*) & merrit (*E. urna*)	X?	X		M
524	Medium woodland; Dundas blackbutt & red mallee	X	X		L
525	Mosaic: Medium woodland; salmon gum & gimlet/Medium woodland; merrit & red mallee				H
529	Succulent steppe with open low woodland; mulga & sheoak over bluebush		X		L
538	Shrublands; *Acacia brachystachya* scrub				L
540	Succulent steppe with open low woodland; sheoak over saltbush				M
542	Shrublands; mallee scrub marble gum (*Eucalyptus gongylocarpa*)		X		L
551	Shrublands; *Allocasuarina campestris* thicket				H
555	Hummock grasslands, mallee steppe; red mallee over spinifex *Triodia scariosa*				M
676	Succulent steppe; samphire				M
936	Medium woodland; salmon gum	X	X		L
Beard Veg Assoc	Ecosystem Description	IUCN I-IV	Non-IUCN Reserve	CALM-Purchased Lease	Priority
1241	Succulent steppe; bluebush				L
1294	Medium woodland; coral gum	X	X		L
1413	Shrublands; acacia, casuarina & melaleuca thicket		X		L
2009	Medium woodland; redwood & goldfields blackbutt		X		L
2901	Mosaic: Medium woodland; *Allocasuarina cristata* & goldfields blackbutt Shrublands; Acacia quadrimarginea thicket				H
2903	Medium woodland; Salmon gum, goldfield blackbutt, gimlet & Casuarina pauper				L
2904	Medium woodland; York gum, goldfield blackbutt, gimlet & Casuarina pauper				M
4641	Succulent steppe with open woodland; salmon gum & gimlet over bluebush				L
	Fraser Range vegetation complex Plant assemblages of the Fraser Range Vegetation Complex: Allocasuarina huegeliana and *Pittosporum phylliraeoides* open woodland over *Beyeria lechenaultii* and *Dodonaea*				H

	microzyga Shrublands and *Aristida contorta* bunch grasses (granite complex), on the slopes and summits of hills; *Acacia acuminata* Tall Shrubland dominated by *Melaleuca uncinata* and *Triodia scariosa* on uplands with shallow loamy sands; *Eucalyptus* aff. *uncinata* (KRN 7854) over *Cassia helmsii*, *Cryptandra miliaris*, *Dodonaea boroniifolia*, *D. stenozyga* and *Triodia scariosa* (*Eucalyptus effusa* Mallee) on colluvial flats with loamy clay sands, and; *E. oleosa*, *E. transcontinentalis*, *E. urna* Woodland on flats.				
	Woodline Hills vegetation complexes (*Baeckea recurva* shrubland)				H
	Flora and fauna assemblages of granite rock pools				H
	Goldfields granite outcrop assemblages (Eranyinia Hill - Cowarna Downs Station)				H
	Granite moss sheet communities				
	Permanent to semi-permanent brackish to freshwater wetlands with belts of Samphire and Melaleuca around the perimeter, Goldfields region. Swan Lake - Cowarna Downs Station; Cane Grass Lagoon - east of Rowles Lagoon				H
	Mt Belches *Acacia quadrimarginea* / *Ptilotus obovatus* banded ironstone community. On Randell Timber Reserve.		X		H
	Halophytic communities of salt lake systems of the goldfields Lake Lefroy Madoonia Downs Station				H
	Assemblages of the lignum Swamps of the Goldfields Region eg. Sheehan Swamp - Cowarna Downs; Brown Lagoon - east of Rowles Lagoon; Lignum Swamp - Mt Vetters Station)				H
	Peripheral claypans surrounding salt lakes (Lake Wannaway, Madoonia Downs; unnamed lake at 30 km peg north of Norseman) (J. Angas, A. Chapman pers. comm.)				H
	Rich ephemeral communities of outcrops and bottomlands in the Kurnalpi-Kalgoorlie area				H
	Mixed low woodlands of *Eucalyptus oleosa*, *Casuarina cristata* and *Acacia aneura* in the Kurnalpi-Kalgoorlie area				H
	Vegetation complexes of the Greenstone/banded ironstone ranges of the goldfields				H
	Melaleuca spp. Scrub. 70% alienated (Beard and Sprenger, 1984) Southern Goldfields, Darling, Eastern South Coast				H
	Acacia - Casuarina - Melaleuca Thicket. 80% alienated (Beard and Sprenger, 1984) Wheatbelt, Southern Goldfields, Darling, Northern Sandplain, Eastern South Coast, Southwest Interzone		X		M
	Eucalyptus, Acacia, Atriplex, Halosarcia Wooded Succulent Steppe 87% alienated (Beard and Sprenger 1984) Wheatbelt, Southern Goldfields, Southwest Interzone				M
	Eucalyptus loxophleba, *E. wandoo*, *E. salmonophloia* Woodland 97% alienated (Beard and Sprenger, 1984)) Darling, Wheatbelt, Southern Goldfields, Eastern South Coast, Northern Sandplain, South West Interzone				M

Subregional constraints in order of priority

(see Appendix B, key g)

Competing Land Uses: In particular prospective mining interests and to a lesser extent pastoral values.

Economic Constraints: In terms of the cost of land acquisition as well as constraints in terms of implementing management.

Other: We do not have fine enough resolution of biodiversity values in some areas e.g. greenstone communities to identify priorities for acquisition.

Bioregional and subregional priority for reserve consolidation

COO is reservation Class 3 (see Appendix D, and Appendix C, rank 4) with 11.3% of area in conservation reserve which is probably adequate at the bioregional level, however there is considerable bias at the subregional level with only 4.35% of COO3 (COO1 = 20.3% and COO2 = 14.8%) in reserve system so reservation class 2 is more appropriate. The subregional priority for reserve consolidation in COO3 is (ii) (IUCN I-IV). The reserve system is highly biased in terms of CAR criteria at the subregional level and is not comprehensive or representative in terms of ecosystem representation.

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). The overall reserve management rank is (ii) (see Appendix C, rank 5) because no feral predator control exist, although vegetation and soils are probably stable or regenerating from light grazing and timber removal early in the 20th century.

Class	Purpose	Name	Category	Reserve Management[1]
A	Conservation Of Flora And Fauna	Victoria Rock Nature Reserve	Nature Reserve	ii-iii
A	Conservation Of Flora And Fauna	Cardunia Rocks Nature Reserve	Nature Reserve	ii-iii
A	Conservation Of Flora And Fauna	Unnamed Nature Reserve	Nature Reserve	ii-iii
A		Karamindie Forest	State Forest	ii-iii
B	Conservation Of Flora And Fauna	Dundas Nature Reserve	Nature Reserve	ii-iii
C	Conservation Park	Rowles Lagoon Conservation Park	Conservation Park	iii
C	Conservation Of Flora And Fauna	Clear And Muddy Lakes Nature Reserve	Nature Reserve	iii
C	Conservation Of Flora And Fauna	Binaronca Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Kambalda Nature Reserve	Nature Reserve	ii-iii
C	Conservation Of Flora And Fauna	Kurrawang Nature Reserve	Nature Reserve	ii-iii
C	Timber	Brockway Timber Reserve	Section 5(g) reserve	ii-iii
C	Timber	Kangaroo Hills Timber Reserve	Section 5(g) reserve	ii-iii
C	Timber	Yallari Timber Reserve	Section 5(g) reserve	ii-iii
C	Timber	Lakeside Timber Reserve	Section 5(g) reserve	ii-iii
C	Timber	Scahill Timber Reserve	Section 5(g) reserve	ii-iii
C	Timber-Sandalwood	Coonana Timber Reserve	Section 5(g) reserve	ii-iii
C	Timber-Sandalwood	Emu Rocks Timber Reserve	Section 5(g) reserve	ii-iii
C	Timber-Sandalwood	Wallaby Rocks Timber Reserve	Section 5(g) reserve	ii-iii
C		Majestic Timber Reserve	Timber Reserve	ii-iii
C		Randell Timber Reserve	Timber Reserve	ii-iii
C		Kambalda Timber Reserve	Timber Reserve	ii-iii

[1]Appendix C, rank 5

Off reserve conservation

Priority species or groups and existing recovery plans

Species	Specific Recovery Plan	General Recovery Plan
Leipoa ocellata	Yes - Malleefowl Preservation Group have current Action Plan and ongoing research	Action Plan for Australian Birds; Goldfields Regional Management Plan.
Morelia spilota imbricata	No	Action Plan for Australian Reptiles; Goldfields Regional Management Plan.
Dasyurus geoffroii	Yes - RP	Action Plan for Australian Marsupials and Monotremes; Goldfields Regional Management Plan.
Falco peregrinus	No	Action Plan for Australian Birds; Goldfields Regional Management Plan.
Conospermum toddii	No	Goldfields Regional Management Plan.
Gastrolobium graniticum	No	Goldfields Regional Management Plan.
Pityrodia scabra	Yes – Interim Working Management Guidelines	Goldfields Regional Management Plan.

Appropriate species recovery actions

Species	Recovery Actions[1]	Recovery Descriptions
Leipoa ocellata	i, ii, iii, vii, xiv	Habitat retention through reserves or on other State lands or on private lands. Likely that control of foxes and cats would contribute to recovery. Other – reduction of sheep numbers on pastoral lands.
Morelia spilota imbricata	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.
Dasyurus geoffroii	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.
Falco peregrinus	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
Conospermum toddii	i, ii, iii, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Invasive weeds may pose a threat. Control of herbivores such as rabbits and goats may be required and if identified as an issue. Fencing could be an alternative to feral predator control. Understanding of life history requirements of all rare flora very limited and needs additional work. Capacity building required with industry.
Gastrolobium graniticum	i, ii, iii, xiii	Habitat retention through reserves or on other State lands or on private lands. Capacity building required with industry.
Pityrodia scabra	i, ii, iii, v, vi, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control of herbivores such as rabbits and goats may be required. Understanding of life history requirements of all rare flora very limited and needs additional work. Capacity building required with industry.

[1]Appendix B, key h.

Ecosystems and existing recovery plans

Ecosystem	Specific Recovery Plan	General Recovery Plan
Fraser Range	No	Goldfields Regional Management Plan.
Woodline Hills	No	Goldfields Regional Management Plan.
Swan Lake	No	No
Lake Cowan	No	No
Lake Arrow	No	No
Canegrass Swamp		Goldfields Regional Management Plan.
King of the West Lake	No	No
Lignum Swamp	No	No
Black Flag Lake	No	No
Ecosystem	Specific Recovery Plan	General Recovery Plan
Southern Hills Vegetation Complex	No	No
Flora and fauna assemblages of granite rock pools	No	No
Goldfields granite outcrop assemblages (Eranyinia Hill - Cowarna Downs Station)		Goldfields Regional Management Plan.
Granite moss sheet communities	No	No
Permanent to semi-permanent brackish to freshwater wetlands with belts of Samphire and *Melaleuca* around the perimeter, Goldfields region. Swan Lake - Cowarna Downs Station; Cane Grass Lagoon -		Goldfields Regional Management Plan.

east of Rowles Lagoon		
Mt Belches *Acacia quadrimarginea*/*Ptilotus obovatus* banded ironstone community.	No	No
Halophytic communities of salt lake systems of the goldfields Lake Lefroy; Madoonia Downs Station	No	No
Assemblages of the lignum Swamps of the Goldfields Region eg. Sheehan Swamp - Cowarna Downs; Brown Lagoon - east of Rowles Lagoon; Lignum Swamp - Mt Vetters Station)	No	No
Peripheral claypans surrounding salt lakes (Lake Wannaway, Madoonia Downs; unnamed lake at 30 km peg north of Norseman) (J. Angas, A. Chapman pers. comm.)	No	No
Rich ephemeral communities of outcrops and bottomlands in the Kurnalpi-Kalgoorlie area	No	No
Mixed low woodlands of *Eucalyptus oleosa*, *Casuarina cristata* and *Acacia aneura* in the Kurnalpi-Kalgoorlie area	No	No
Vegetation complexes of the Greenstone/ banded ironstone ranges of the goldfields	No	No
Melaleuca spp. Shrublands. 70% alienated	No	No
Acacia - Casuarina - Melaleuca Thicket. 80% alienated	No	No
Eucalyptus, Acacia, Atriplex, Halosarcia Wooded Succulent Steppe 87% alienated	No	No
Eucalyptus loxophleba, *E. wandoo*, *E. salmonophloia* Woodland	No	No

Appropriate ecosystem recovery actions

Ecosystem	Recovery Actions[1]	Recovery Descriptions
Fraser Range	i, iii, vi, vii	Habitat retention through reserves or on other State lands or on private lands. Destocking and feral animal control required to negate any further degradation of area
Woodline Hills	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
Lake Arrow	iii, v, xiii	Habitat protection on other state lands. Fencing. Capacity building required with mining industry.
Canegrass Swamp	i	Habitat protection through reserves
King of the West Lake	iii, v, xiii	Habitat protection on other state lands. Fencing. Capacity building required with pastoral industry.
Lignum Swamp	iii, v, xiii	Habitat protection on other state lands. Fencing. Capacity building required with pastoral industry.
Black Flag Lake	iii, v, xiii	Habitat protection on other state lands. Fencing. Capacity building required with pastoral industry.
Southern Hills Vegetation Complex	i, iii, vi	Habitat protection through reserves and on other state lands. Weed control.
Flora and fauna assemblages of granite rock pools	i, ii, iii	Habitat protection and retention through reserves, on private land and on other state land.

Ecosystem	Recovery Actions[1]	Recovery Descriptions
Assemblages of the lignum Swamps of the Goldfields Region eg. Sheehan Swamp - Cowarna Downs; Brown Lagoon - east of Rowles Lagoon; Lignum Swamp - Mt Vetters Station)	iii, v, xiii	Habitat protection on other state lands. Fencing. Capacity building with pastoral & mining industries.
Peripheral claypans surrounding salt lakes (Lake Wannaway, Madoonia Downs; unnamed lake at 30 km peg north of Norseman) (J. Angas, A. Chapman pers. comm.)	iii, v, xiii	Habitat protection on other state lands. Fencing. Capacity building with pastoral & mining industries.
Rich ephemeral communities of outcrops and bottomlands in the Kurnalpi-Kalgoorlie area	i, ii, iii	Habitat retention and protection in reserves, on private lands and on other state lands.
Mixed low woodlands of *Eucalyptus oleosa*, *Casuarina cristata* and *Acacia aneura* in the Kurnalpi-Kalgoorlie area	i, iii	Habitat retention and protection in reserves and on other state lands.
Vegetation complexes of the Greenstone/ banded ironstone ranges of the goldfields	i, iii, vii, ix	Habitat retention and protection in reserves and on other state lands. Feral animal control. Fire management.
Melaleuca spp. Shrublands. 70% alienated	i, iii	Habitat retention and protection in reserves and on other state lands.
Acacia - Casuarina - Melaleuca Thicket. 80% alienated	i, iii	Habitat retention and protection in reserves and on other state lands.
Eucalyptus, Acacia, Atriplex, Halosarcia Wooded Succulent Steppe 87% alienated	i, iii	Habitat retention and protection in reserves and on other state lands.
Eucalyptus loxophleba, *E. wandoo*, *E. salmonophloia* Woodland	i, iii	Habitat retention and protection in reserves and on other state lands.

[1]Appendix B, 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, pest management.

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

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 Including Local Government Planning and National Action Plan for Water Quality and Salinity.

Capacity Building with Industry: Partnerships with the mining industry, e.g. for the management of rare flora and fauna.

Environmental Management Systems and Ecologically Sustainable Product Marketing: Some pastoral areas already attempting to identify and implement ecologically sustainable practices through the EMU process developed by AgWA. 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, 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 subregional priority for NRM in COO3 is (ii) (see Appendix C, rank 7), indicating that there are significant

constraints to integrate conservation as part of a production or development system.

Data gaps

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

Vegetation and Regional Ecosystem Mapping: Regional survey of flora and vertebrate fauna has been published, but 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 McKenzie and Hall 1992 and Newbey *et al.* 1984.

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 McKenzie and Hall 1992 and Newbey *et al.* 1984.

Ecological and Life History Data: There is little data on habitat requirements of virtually all invertebrate species, most ephemeral plants, persisting Critical Weight Range mammals, and uncommon vertebrate and plant species. There is 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 etc.

Sources

References cited

No.	Author	Date	Title	Publication Details	Pub. Type
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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
181	Cogger, H., Cameron, E., Sadlier, R. and Eggler, P.	(1993).	The Action Plan for Australian Reptiles.	Australian Nature Conservation Agency, Canberra.	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
343	Handley, M.A.	(1991).	The biota of inland salt lakes of the Kambalda region, and coastal salt lakes of Esperance, Western Australia. A comparative study.	Honours thesis. Curtin University of Technology	O
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 CTRC 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
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-Zanthus Study Area.	Records of the Western Australian Museum Supplement No. 18, 21-158. Perth, WA.	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

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

Other relevant publications

See reference numbers 035, 041, 057, 064, 075, 080, 098, 101, 118, 164, 166, 182, 211, 217, 232, 240, 241, 258, 260, 268, 272, 278, 287, 313, 330, 390, 406, 415, 428, 459, 519, 544, 562, 577, 597, 647, 685 and 686 in Appendix A.