Swan Coastal Plain 1 *(SWA1 – Dandaragan Plateau subregion)*

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Subregional description and biodiversity values

Description and area

The plateau is bordered by Derby and Dandaragan Faults. Cretaceous marine sediments are mantled by sands and laterites. Characterised by *Banksia* low woodland, Jarrah - Marri woodland, Marri woodland, and by scrub-heaths on laterite pavement and on gravelly sandplains. The climate is Warm Mediterranean and annual rainfall is 700 mm and the subregional area is 447,862 ha.

Dominant land use
(see Appendix B, key b)

Dominant land use is mainly (iv) dry-land agriculture (92.6%), with lesser areas of (xiii) conservation (6.78%), (xi) UCL and Crown reserves and (xiv) roads and other easements (0.43 % combined).

Continental Stress Class

The Continental Stress Class for SWA1 is 2.

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

Rare Features:

- The rare vertebrates found in SWA1 include Peregrine Falcon (*Falco peregrinus*), Malleefowl (*Leipoa ocellata*), Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Baudin's Cockatoo (*Calyptorhynchus baudinii*), Chuditch (*Dasyurus geoffroii*), and Carpet Python (*Morelia spilota imbricata*).
- Large numbers of rare flora are recorded from the area.

Ecosystem Types That Have at Least 85% of Their Total Extent Confined to SWA1 Subregion:

Beard Veg Assoc	Description
1015	Mosaic: Shrublands; scrub-heath on the Swan Coastal Plain 1 Shrublands; dryandra heath
1040	Medium woodland; York gum & *Casuarina obesa*
1036	Low woodland; *Banksia prionotes*
1027	Mosaic: Medium open woodland, jarrah & marri, with low woodland; banksia/Medium sparse woodland; jarrah & marri
1019	Medium sparse woodland; jarrah & marri
1020	Mosaic: Medium forest; jarrah-marri 1 Medium woodland; marri-wandoo
1038	Medium open woodland, eucalypts (e2?), with low woodland; *Banksia attenuata* & *B. menziesii*
1039	Shrublands; mallee with scattered York gum

High Species and Ecosystem Diversity:
The area exhibits a degree of floristic endemism however there are no specific significant centers of endemism are currently identified.

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 Northern Sandheaths (System 5) which constitutes the northern section of SWA1 in the CTRC Green Book (Environmental Protection Agency 1974). Recommendations for reserves in the southern section of SWA1 were made in the recommendations for System 6 Country areas and were endorsed by Cabinet in the CTRC Red Book (Environmental Protection Agency 1983). Some, but not all of these recommendations were implemented (with modification) over the following ten years.

The southern half of the subregion is covered by a CALM Regional Management Plan published in 1987 and updated in 1994 (Department of Conservation and Land Management 1994a). These documents provide an overview of biota, addresses land and wildlife conservation issues, but are generalised in 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 necessarily address the specific needs of the subregion.

Wetlands

Wetlands of National significance (DIWA listings)

Name and Code	Description[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Wannamal Lake System (SWA025WA)	B7, B13, B6	ii	iii	iii	ix, x (increased inundation), iv (grazing on private land), v (foxes, cats & rabbits), i, vi

[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)

There are no wetlands of subregional significance in SWA1.

Riparian zone vegetation

Name	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Moore River	i	iii	ii	ix, x (increased flow), i, ii, iv, v (foxes, rabbits & goats), vi (caster oil bush, wild oats, Victorian tea tree), iii, viii, xi

[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]
Banksia attenuata woodland over species rich dense shrublands	E	30	iii-iv	iii	iii	i, ii, iii, vi, viii, xii (trampling by recreational users; occurrences nearly all less than 5 ha in area)
Heath dominated by one or more of *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on slopes and ridges of chert hills of the Coomberdale Floristic Region (Griffin 1992)	E	30	ii	iii	iii	iv, v (goats, rabbits), vii

[1]Appendix B, key f; [2]Appendix C, rank 2; [3]Appendix C, rank 3; [4]Appendix C, rank 1; [5]Appendix B, key e

Other ecosystems at risk

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Diatomite Lakes of the Dandaragan Plateau (E. Griffin & M. Freeman pers. comm.)	V	32	iii	iii	iii	xi, ix, xii (mining), x
Plant assemblages of the Wannamal Lake system (R. Shepherd pers. comm.)	V	32	ii	iii	iii	iv, v (goats, rabbits), vii
Critical Weight Range mammals (extant species include *Trichosurus vulpecula hypoleucus, Dasyurus geoffroii;* subregionally extinct species, includes *Bettongia penicillata, Bettongia lesueur, Myrmecobius fasciatus*).	V	NA	i	ii	iii	v (foxes, cats), ii

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

[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					
Chamelaucium sp. Gingin (N Marchant s.n. 4.11.88) *[aff. pauciflorum]*	E	iii	iv	iii	i, ii, iv, v, vi, vii, viii, x, xii (road, rail, firebreak maintenance). Recent acquisition of two properties has contributes to a reduction of threats.
Darwinia acerosa	E	iii	iv	iii	i, ii, iv, vi, vii
Drakaea elastica	E	iii	iv	iii	i, ii, iv, vi, vii, xii (road, rail, firebreak maintenance)
Dryandra mimica	E	ii	iv	iii	i, ii, vi, vii, viii, xii (road, rail, firebreak maintenance)
Eucalyptus dolorosa	E	iii	iv	iii	i, ii, vii, xii (one, small population)
Eucalyptus impensa	E	iii	iv	iii	i, ii, vii, viii, xii (sand mining)
Eucalyptus pruiniramis	E	iii	iv	iii	i, ii, vii, viii, xii (road, rail, firebreak maintenance)
Grevillea althoferorum	E	ii	iv	iii	i, ii, vi, vii, viii, xii (road, rail, firebreak maintenance, small population size)
Synaphea quartzitica	E	i	ii	iii	i, ii
Thelymitra stellata	E	iii	iv	iii	i, ii, vi, vii, xii (gravel extraction and recreation use)
Verticordia plumosa var. *pleiobotrya*	E	ii	iii	iii	i, ii, iv, v, vi, vii, x, xii (road, rail, firebreak maintenance, exploitation, urbanisation)
Acacia anomala	V	ii	iii	iii	i, ii, iii, vi, vii, viii, xii (road, rail, firebreak maintenance, recreation use)
Acacia forrestiana	V	iii	iv	iii	i, vii, viii
Daviesia dielsii	V	iii	iv	iii	i, ii, vi, xii (road, rail, firebreak maintenance)
Eleocharis keigheryi	V	iii	iv	iii	i, ii, iv, v, vi, ix, x, xii (mowing)
Ptychosema pusillum	V	Unknown	Unknown	ii	i, ii, vi, vii, xii (road, rail, firebreak maintenance, restricted, small population)
PRIORITY 1					
Dampiera tephrea	1	iii	iv	ii	i, ii, vi, xii (road, rail, firebreak maintenance, limited knowledge)
Eucalyptus annuliformis	1	iii	iv	ii	i, ii, vii, xii (limited knowledge)
Synaphea panhesya	1	iii	iv	ii	i, ii, vi, viii, xii (road, rail, firebreak maintenance, recreational use)
Verticordia huegelii var. *tridens*	1	iii	iv	ii	i, ii, vi, xii (road, rail, firebreak maintenance)

[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	Vegetation Association Description	IUCN I -IV	IUCN V-VI	CALM Purchased Lease	Priority
3	Medium forest; jarrah-marri				L
4	Medium woodland; marri & wandoo	X	X		L

7	Medium woodland; York gum (*E. loxophleba*) & wandoo				H
31	Shrublands; *Melaleuca thyoides* thicket with scattered York gum	X			M
37	Shrublands; teatree thicket	X			M
352	Medium woodland; York gum				H
125	Bare areas; salt lakes				L
142	Medium woodland; York gum & salmon gum				H
949	Low woodland; banksia	X			M
952	Shrublands; dryandra heath				H
988	Succulent steppe with thicket; *Melaleuca thyoides* over samphire				M
999	Medium woodland; marri	X			H
1015	Mosaic: Shrublands; scrub-heath on the Swan Coastal Plain 1 Shrublands; dryandra heath	X			H
1017	Medium open woodland; jarrah & marri, with low woodland; banksia	X			H
1019	Medium sparse woodland; jarrah & marri				H
1020	Mosaic: Medium forest; jarrah-marri 1 Medium woodland; marri-wandoo	X			H
1027	Mosaic: Medium open woodland; jarrah & marri, with low woodland; banksia 1 Medium sparse woodland; jarrah & marri	X			M
1030	Low woodland; *Banksia attenuata & B. menziesii*	X			M
1031	Mosaic: Shrublands; hakea scrub-heath 1 Shrublands; dryandra heath	X			M
1035	Mosaic: Medium open woodland; marri 1 Shrublands; dryandra heath				H
1036	Low woodland; *Banksia prionotes*	X			H
1038	Medium open woodland; eucalypts (e2?), with low woodland; *Banksia attenuata & B. menziesii*				H
1039	Shrublands; mallee with scattered York gum	X			L
1040	Medium woodland; York gum & *Casuarina obesa*	X			H
	Banksia attenuata woodland over species rich dense shrublands				H
	Heath dominated by one or more of *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on slopes and ridges of chert hills of the Coomberdale Floristic Region (Griffin 1992)				
	Diatomite Lakes of the Dandaragan Plateau (E. Griffin & M. Freeman pers. comm.)	X			H
	Plant assemblages of the Wannamal Lake system (R. Shepherd pers. comm.)	X			H
	Critical Weight Range mammals (extant species include *Trichosurus vulpecula hypoleucus, Dasyurus geoffroii;* subregionally extinct species, includes *Bettongia penicillata, Bettongia lesueur, Myrmecobius fasciatus*).				H

While mapping and vegetation information is available at a smaller scale in the Swan bioregion than the 1:250,000 of John Beard's vegetation mapping, consistency has to be maintained with that which is available across the rest of Western Australia. However the inherent difficulties with this approach are recognised. Beard Vegetation mapping is problematic in the Swan Coastal Plain because it is both very diverse and often intensively studied. In many cases the Beard Vegetation Associations show considerable variation within the same unit and conversely density of cover dominant species may describe the same unit in several different ways.

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

Competing Land Use: The primary issue in that agriculture occupies more than 92% of the subregion.

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

Other: Difficulties in identifying biodiversity values in some areas due to lack of resolution of data.

Bioregional and subregional priority for reserve consolidation

SWA is reservation Class 4 (see Appendix D, and Appendix C, rank 4) because 10 - 15% of its area reserved (any tenure). SWA1 has 6.78% of the subregion in conservation
reserves. SWA2 has 10.74% of the subregion in conservation reserves. SWA1 has been extensively cleared for agricultural purposes leaving a biased reserve system and salinity problems are ubiquitous so Class 1 is more appropriate. One reserve in the northern extremity and one in the southern extremity of SWA1 make the vast majority of the conservation estate.

Reserve management standard

Many SWA reserves are becoming saline or are threatened by rising water tables. Wildfire management facilities are somewhat limited. Fire breaks and fire-access tracks are installed and maintained on reserves greater than 200 ha. Feral herbivore grazing activities now widespread (e.g. Callicivirus hasn't made an observable difference to rabbit numbers), and kangaroo grazing is significant in some areas. No feral predator control systems are in place except on Wannamal Nature Reserve. Therefore, the reserve management rank is (ii) (see Appendix C, rank 5).

Off reserve conservation

Priority species or groups

Species	Specific Recovery Plan	General Recovery Plan
Falco peregrinus	No	Action Plan for Australian Birds
Leipoa ocellata	Yes - Malleefowl Preservation Society have current Action Plan and ongoing research	Action Plan for Australian Birds
Calyptorhynchus latirostris	Yes – draft RP	Action Plan for Australian Birds
Calyptorhynchus baudinii	No	Action Plan for Australian Birds
Dasyurus geoffroii	Yes - RP	Action Plan for Australian Marsupials and Monotremes
Morelia spilota imbricata	No	Action Plan for Australian Reptiles
Acacia anomala	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Acacia forrestiana	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Anigozanthos humilis subsp. *chrysanthus*	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Chamelaucium sp. Gingin (N Marchant s.n. 4.11.88) *[aff. pauciflorum]*	Yes - IRP	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Dampiera tephrea	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Darwinia acerosa	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Daviesia dielsii	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan

Species	Specific Recovery Plan	General Recovery Plan
Drakaea elastica	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Dryandra mimica	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Eleocharis keigheryi	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Eucalyptus annuliformis	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Eucalyptus dolorosa	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Eucalyptus impensa	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Eucalyptus pruiniramis	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Grevillea althoferorum	Yes - IRP	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Ptychosema pusillum	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Synaphea panhesya	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Thelymitra stellata	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Verticordia huegelii var. *tridens*	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan
Verticordia plumosa var. *pleiobotrya*	No	Declared Rare and Poorly Known Flora in the Moora District; Draft Swan Region Threatened Flora Management Plan

Appropriate species recovery actions

Species	Recovery Actions[1]	Recovery Descriptions
Falco peregrinus	i, ii, iii	Habitat retention through reserves or on other State lands or on private lands.
Leipoa ocellata	i, ii, iii, vii	Habitat retention through reserves or on other State lands or on private lands. Control of foxes and cats. Reduction in habitat degradation through grazing pressure.
Calyptorhynchus latirostris	i, ii, iii, vii	Habitat retention through reserves or on other State lands or on private lands. Control of foxes and cats. Reduction in habitat degradation through grazing pressure.
Calyptorhynchus baudinii	i, ii, iii, vii	Habitat retention through reserves or on other State lands or on private lands. Control of foxes and cats. Reduction in habitat degradation through grazing pressure.
Dasyurus geoffroii	i, ii, iii, vii	Habitat retention through reserves or on other State lands or on private lands. Control of foxes and cats. Reduction in habitat degradation through grazing pressure.
Morelia spilota imbricata	x, vii, xii, i	Control of feral predators such as foxes and cats. Research into threatening processes other than ferals (e.g. fire regime). Habitat retention through reserves or on other State lands or on private lands.
Acacia anomala	i, ii, iii, v, vii, xii	Habitat retention through reserves or on other State lands or on private lands. Fire management required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Species	Recovery Actions[1]	Recovery Descriptions
Acacia forrestiana	i, ii, iii, v, vii, xii	Habitat retention through reserves or on other State lands or on private lands. Fire management required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Anigozanthos humilis subsp. *chrysanthus*	i, ii, iii, vi, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Chamelaucium sp. Gingin (N Marchant s.n. 4.11.88) *[aff. pauciflorum]*	i, ii, iii, vi, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research. Control of feral herbivores, rabbits in particular.
Dampiera tephrea	i, ii, iii, vi, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research. Protection from road maintenance activities.
Darwinia acerosa	i, ii, iii, vi, vii, xii	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research. Control of feral herbivores, rabbits in particular.
Daviesia dielsii	i, ii, iii, vi, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research. Protection from road maintenance activities.
Drakaea elastica	i, ii, iii, vi, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research. Protection from road maintenance activities and grazing.
Dryandra mimica	i, ii, iii, vi	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Protection from road maintenance activities.
Eleocharis keigheryi	i, ii, iii, vi, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control

		of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research. Protection from road maintenance activities and grazing.
Eucalyptus annuliformis	i, ii, ix, xii	Habitat retention through reserves or on other State lands or on private lands. Management of fire regime required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Eucalyptus dolorosa	i, ii, iii, ix, vi, xii	Habitat retention through reserves or on other State lands or on private lands. Management of fire regime required. Control of various weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Eucalyptus impensa	i, ii, iii, ix, vi, xii, xiv	Habitat retention through reserves or on other State lands or on private lands. Management of fire regime required. Pathogen control required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Eucalyptus pruiniramis	i, ii, iii, ix, vi, xii, xiv	Habitat retention through reserves or on other State lands or on private lands. Management of fire regime required. Pathogen control required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Grevillea althoferorum	v, vii, xiii	Habitat retention through reserves or on other State lands or on private lands. Fencing to protect populations from rabbits, chemical overspray and track maintenance activities. Understanding of life history requirements for ail rare flora very limited and needs additional research. Education of community.
Ptychosema pusillum	i, ii, iii, ix, vi, xii	Habitat retention through reserves or on other State lands or on private lands. Management of fire regime required. Control of various weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research.
Synaphea panhesya	i, ii, iii, ix, vi, xii	Habitat retention through reserves or on other State lands or on private lands. Management of fire regime required. Control of various weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research.

Species	Recovery Actions[1]	Recovery Descriptions
Thelymitra stellata	v, vii, xiii	Habitat retention through reserves or on other State lands or on private lands. Fencing to protect populations from rabbits and track maintenance activities. Understanding of life history requirements for all rare flora very limited and needs additional research. Education of community.
Verticordia huegelii var. *tridens*	i, ii, iii, vi, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research. Protection from road maintenance activities and grazing.
Verticordia plumosa var. *pleiobotrya*	i, ii, iii, vi, vii, xii, xiii	Habitat retention through reserves or on other State lands or on private lands. Control of weeds required. Understanding of life history requirements for all rare flora very limited and needs additional research. Protection from road maintenance activities, wildflower picking and grazing.

[1]Appendix B, key h.

Ecosystems and existing recovery plans

Ecosystem	Specific Recovery Plan	General Recovery Plan
Banksia attenuata woodland over species rich dense shrublands	No	No
Heath dominated by one or more of *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on slopes and ridges of chert hills of the Coomberdale Floristic Region (Griffin 1992)	Yes - IRP	No
Diatomite Lakes of the Dandaragan Plateau (E. Griffin & M. Freeman pers. comm.)	No	No
Plant assemblages of the Wannamal Lake system (R. Shepherd pers. comm.)	No	No
Critical Weight Range mammals (extant species include *Trichosurus vulpecula hypoleucus, Dasyurus geoffroii*; subregionally extinct species includes *Bettongia penicillata, Bettongia lesueur.*	Yes – RPs for Chuditch and Woylie	Action Plan for Australian Marsupials and Monotremes

Appropriate ecosystem recovery actions

Ecosystem	Recovery Actions[1]	Recovery Descriptions
Banksia attenuata woodland over species rich dense shrublands	i, ii, iii, vi, viii, ix, xii	Habitat protection on private lands, through reserves and on other state lands; Weed control; Revegetation; Fire management; Research.
Heath dominated by one or more of *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on slopes and ridges of chert hills of the Coomberdale Floristic Region (Griffin 1992)	ii, i, iii, xiii, v, vi, xiv, ix, xii, viii	Habitat protection on private lands, through reserves and on other state lands; Capacity building with landholders, Water Corporation; Fencing; Weed control; Other - survey and monitoring; Fire management; Research; Revegetation.

Ecosystem	Recovery Actions[1]	Recovery Descriptions
Diatomite Lakes of the Dandaragan Plateau (E. Griffin & M. Freeman pers. comm.)	i, iii, ii, v, vi, vii, ix	Habitat protection through reserves, greater reservation needed of high priority areas. Habitat protection on state lands (UCL). Habitat protection on private lands. Fencing of sensitive areas where there are heavy goat and/or rabbit numbers (as exclosures). Weed control for critical habitats. Feral animal control. Mainly rabbits, goats and foxes. Fire management, especially of species with generations greater than 5-8 years.
Plant assemblages of the Wannamal Lake system (R. Shepherd pers. comm.)	i, iii, ii, v, vi, vii, ix	Habitat protection through reserves, greater reservation needed of high priority areas. Habitat protection on state lands (UCL). Habitat protection on private lands. Fencing of sensitive areas where there are heavy goat and/or rabbit numbers (as exclosures). Weed control for critical habitats. Feral animal control. Mainly rabbits, goats and foxes. Fire management, especially of species with generations greater than 5-8 years.
Critical Weight Range mammals (extant species include *Trichosurus vulpecula hypoleucus, Dasyurus geoffroii*; subregionally extinct species includes *Bettongia penicillata, Bettongia lesueur*.	i, iii, ii, v, vi, vii, ix	Habitat protection through reserves, greater reservation needed of high priority areas. Habitat protection on state lands (UCL). Habitat protection on private lands. Fencing of sensitive areas where there are heavy goat and/or rabbit numbers (as exclosures). Weed control for critical habitats. Feral animal control. Mainly rabbits, goats and foxes. Fire management, especially of species with generations greater than 5-8 years.

[1]Appendix B key h.

Subregion priority for off reserve conservation

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

Conservation actions as an integral part of NRM

Existing NRM actions

NRM Action[1]	Description	Effectiveness
Legislation	Soil conservation and land clearing legislation	Low. Not rigorously enforced, penalties ineffective.
Capacity Building	Bushcare Programme, leadership training for volunteer organizations.	Uptake low.
Other	Local Government strategies for controlling development and assessing proposals	Low to moderate. Frequently discussion of NRM is minimal.
Integration with Property Management Planning, etc.	Number of Land Conservation District Committees (e.g. Moore Catchment Council) and the Northern Agricultural Integrated Management Strategy (NAIMS) Regional NRM group (mixed Government, landholders and community representation) on enterprise activities. Moore Catchment Council showing good understanding of NRM. NAIMS is poorly representative and with limited capacity currently.	Low to moderate. Land Conservation District Committees largely inactive or focused

[1]Appendix B, key i

Feasible opportunities for NRM

Legislation Including Duty of Care for Leasehold and Other Lands: Requires more rigorous control.

Institutional Reform: Rural reconstruction, industry reconstruction, new tenure and management arrangements.

Valuing Ecosystem Services and Tradable Rights: Carbon credits would provide impetus to new revegetation efforts.

Other Planning Opportunities: Including local government planning and national action plan for water quality and salinity.

Integration With Property Management Planning, Catchment Planning and Landcare: Increasing the role of NRM in all agricultural activities.

Impediments or constraints to opportunities

A number of impediments and constraints exist including:

- The current role of Government Departments in NRM and policing of activities such as land clearing is fragmented and unclear. Departments who have responsibility for resource exploitation may also have resource protection roles.
- Penalties for undertaking activities such as land clearing are comparatively minor and do not have the support of the greater rural community.
- There is a need to increase awareness of conservation values through education of various

industries (mining, agricultural) and the public in general.
- Limited financial resources are also a major constraint.

Subregions where specific NRM actions are a priority to pursue

The NRM priority for SWA1 is (i) (see Appendix C, rank 7), which indicates that there are major constraints to achieve significant NRM outcomes. The subregion is in a similar situation to AW1 & MAL2.

Data gaps

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

Vegetation and Regional Ecosystem Mapping: No regolith mapping available for entire subregion. Vegetation map resolution is 1:250 000 at best.

Systematic Fauna Survey: Data is confined to vertebrates (except birds) and selected invertebrate taxa. Data is sparse (ca. 30 terrestrial quadrats and 10 wetland quadrats across subregion), quadrats were only positioned on 10 of the most widespread surface-types, and only 2 - 3 quadrats per surface-type, few quadrats have been sampled on more than two occasions. Most reserves don't have long-term survey data on species presence or absence, even for vertebrates.

Floristic Data: Although regional survey of flora has been completed, it is based on very sparse sampling (about 70 quadrats across subregion), and the quadrats were positioned on 10 most widespread surface-types.

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

Other Priority Data Gaps Include:
- No quantitative data on the affect of exotic predators, weed colonisation, fragmentation & farm clean-up, fire, and mineral-extraction on gypsum surfaces.
- No monitoring of the effect of salinity on species composition of communities is in place, although 10 bench-mark quadrats are now established.

Sources

References cited

No.	Author	Date	Title	Publication Details	Pub. Type
090	Benshemesh, J.	(2000).	National Recovery Plan for Malleefowl.	Department of Environment and Heritage, South Australia.	R
142	Cale, B.	(2000a).	Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*). Draft Recovery Plan Recovery Plan No. //.	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
225	Department of Conservation and Land Management	(1994a).	Forest Management Plan 1994 - 2003.	Department of Conservation and Land Management	R
275	Environmental Protection Authority	(1983)	Conservation Reserves for Western Australia as recommended by the Environmental Protection Authority - 1983: the Darling System - system 6, Report 13.	Department of Conservation and the Environment, Perth.	R
271	Environmental Protection Authority	(1974).	Conservation Reserves in Western Australia - Report of the Conservation through Reserves Committee to the Environmental Protection Authority "CTRC Green Book".	Environmental Protection Authority, Perth.	R
283	Evans, R.	(in prep).	Swan Region Threatened Flora Management Plan.	Department of Conservation and Land Management	R
766	Evans, R. and English, V.	(1999).	Gingin wax (*Chamelaucium* sp. Gingin) Interim Recovery Plan 1999-2002 (IRP No 27)	Department of Conservation and Land Management	O
298	Garnett, S.T. and Crowley, G.M.	(2000).	The Action Plan for Australian Birds.	Environment Australia, Canberra.	R
757	Hamilton-Brown, S.	(2000).	Heath dominated by one or more of *Regelia megacephala*, *Kunzea praestans* and *Allocasuarina campestris* on ridges and slopes of the chert hills of the Coomberdale floristic region: Interim Recovery Plan 2000-2003 (IRP No 65)	Department of Conservation and Land Management	O
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	Environment Australia, Canberra.	R

			Project Number 50.		
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
538	Patrick, S.J. and Brown, A.P.	(2001).	Declared rare and poorly known flora in the Moora District (Western Australian Wildlife Management Program ; 28).	Conservation & Land Management, Perth.	R
621	Start, A.N., Burbidge, A.A. and Armstrong, D.	(1994).	Woylie Recovery Plan Second Edition 1994-1995. WA Wildlife Management Program No. 15.	Department of Conservation and Land Management, Perth.	R

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

Other relevant publications

See reference numbers 026, 075, 094, 101, 118, 241, 267, 268, 270, 273, 276, 277, 309, 323, 324, 325, 335, 341, 369, 371, 387, 406, 412, 419, 429, 451, 459, 476, 526, 562, 578, 584, 685, 686 and 767 in Appendix A.