

Esperance 2 (*ESP2 – Recherche subregion*)

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Subregional description and biodiversity values

Description and area

The Esperance bioregion is characterised by proteaceous scrub and mallee heaths on sandplain overlying Eocene sediments; rich in endemics. Herbfields and heaths (rich in endemics) on abrupt granite and quartzite ranges that rise from the plain. Eucalypt woodlands occur in gullies and alluvial foot-slopes. ESP2 Subregion has variable relief, comprising the Quaternary coastal sandplains and dunes overlying Proterozoic gneiss and granite as well as Eocene and more recent coastal limestones. Numerous granitic islands occur in the near shore area of this subregion. Vegetation comprises heath, coastal dune scrub, mallee, mallee-heath and granite heath. Vegetation types are diverse. The climate is Temperate Mediterranean, with 400-700 mm annual rainfall and total area is 1,606,517 ha.

Dominant land use

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

Continental Stress Class

ESP2 has a Continental Stress Class of 5

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

Near Shore Islands:

- The Recherche Archipelago incorporates some 105 islands totaling 9720 ha or 97.2 square kms in size, containing distinct land flora which incorporates representations of the nearby mainland flora plus species restricted to islands. New Zealand Fur Seals (*Arctocephalus forsteri*) and Australian Sea-lion (*Neophoca cinerea*) breeding on various islands of the Recherche. CWR mammals include Tammar (*Macropus eugenii derbianus*), Southern Brown Bandicoot (*Isodon obesulus*), Rock Wallabies (*Petrogale lateralis lateralis* & *Petrogale lateralis hacketti*), and reptiles include *Pseudonaja affinis tanneri* (on Cull Island), *Morelia spilota imbricata*. Avifauna include Cape Barren Geese (*Cereopsis novaehollandiae*), Flesh-footed shearwaters (*Puffinus carneipes*) (breeding). Woody Island

breeding area for Flesh-footed Shearwaters, and is a known haul out site for Australian Sea-lions and New Zealand Fur Seals. Recherche Archipelago Nature Reserve and Woody Island Nature Reserve contain breeding sites for the Little Penguins (*Eudyptula minor*).

- Investigator Island is breeding site for Australian Sea-lions and New Zealand Fur Seals.

Rare Ecosystems:

- Vegetation communities of *Eucalyptus megacornuta* on the Ravensthorpe Range (Bandalup Hill) - *Eucalyptus argyphaea* low forest on magnesite on ridgetops and upper slopes. Species include *Beyeria brevifolia*, *Eremophila latrobei*, *Lasiopetalum rosmarifolium*, *Leucopogon carinatus*, *Melaleuca striata* and *Scaevola densifolia*;
- Pink Lake - Stromatolite Community Number 3 of Coastal Hypersaline Lakes. Dominant species are *Dunaliella salina* and *Microcoleus vaginatus*, with *Charadrius rubricollis*;
- Esperance Sandplain - Scrub heath on deep sand with *Banksia* and *Lambertia*, and *Banksia* scrub heath on sandplain. Includes the dominants *Banksia speciosa*, and *Lambertia inermis* and priority taxa *Andersonia macranthera*, *Comesperma acerosum*, *Dampiera sericantha*;
- Mixed thicket complex of the Russell Range - includes dominants *Eucalyptus doratoxyylon*, *Adenanthos oreophilus*, *Dampiera parvifolia*, *Monaotoca oligarrhenoides*, DRF *Kennedia beckiana*, and priority taxa *Leucopogon apiculatus* and *Chorizema nervosum*.

Vulnerable and Specially Protected Fauna:

- Threatened birds e.g. Western Ground Parrot (*Pezoporus wallicus flaviventris*), Malleefowl (*Leipoa ocellata*), Recherche Cape Barren Goose (*Cereopsis novaehollandiae grisea*), Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Peregrine Falcon (*Falco peregrinus*) and Australasian Bittern (*Botaurus poiciloptilus*)
- Threatened mammals including the Chuditch (*Dasyurus geoffroi*), Red-tailed Phascogale (*Phascogale calura*), Black-footed Rock-wallaby (*Petrogale lateralis lateralis*), Recherche Black-footed Rock-wallaby (*Petrogale lateralis hacketti*), Heath Rat (*Pseudomys shortridgei*) and Dibbler (*Parantechinus apicalis*).
- Priority mammals such as Tammar (*Macropus eugenii derbianus*)

- Reptiles such as *Parasuta spectabilis bushi* and *Phyllodactylus* sp. Cape Le Grand, and Carpet Python (*Morelia spilota imbricata*).

Declared Rare Flora:

- DRF plants include: *Lambertia echinata echinata*, *Eucalyptus insularis*, *Anigozanthos bicolor minor*, *Conostylis lepidospermoides*, *Eremophila denticulata denticulata*, *Eucalyptus merrickiae*, *Marianthus villosus*.
- Priority plants include *Kunzea similis* (Bandalup Hill), which is currently under threat from mining.

Significant Geomorphological Features:

- Magnesite mounds west of Bandalup Hill are associated with an old depression and support at unique *Eucalyptus indurata* mallee community.
- Granite hills and outcrops at Cape Le Grand and Cape Arid.
- Extensive salt lakes
- Recherche Archipelago

Centres of Endemism: Include vegetation communities of the Ravensthorpe Range (Bandalup Hill), southern end of Russell Range (Brooke Park) and Esperance Sandplain. Details are listed above.

Refugia: Various islands of the Recherche provide refugia for CWR mammals (for example, Tammars & Rock Wallabies). Near coastal hills at Cape Le Grand and Mississippi Hill are refugia for DRF including *Lambertia echinata* subsp. *echinata*.

High Species or Ecosystem Diversity: Evident at Pink Lake, Russell Range (Brooke Park), Ravensthorpe Range

(Bandalup Hill) and Esperance Sandplain. Details are listed above.

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 South Coast (System 3) in the CTRC Green Book (Conservation Through Reserves Committee 1974). Some, but not all of these recommendations (with modification) were implemented over the following ten years. The subregion is covered by a CALM Regional Management Plan, that provides an overview of biota, addresses land and wildlife conservation issues, but is generalised in its attention to detail (Department of Conservation and Land Management 1992). The reviews and strategies therein (for reserve system development or management of weeds, fire, feral animals, mining, ecosystem rehabilitation & disease quarantine) do not address the specific needs of the subregion, or even the bioregion. Management plans exist for the Esperance Lakes (Department of Conservation and Land Management 1997), and Interim Management Guidelines are currently in place for Lake Shaster Nature Reserve (Department of Conservation and Land Management 1995b), Woody Island Nature Reserve (CALM 1996e), Helms Forestry Reserves (CALM 1998c), Stokes National Park (CALM 1998d), Cape Le Grand National Park (CALM 1999e), Cape Arid National Park (CALM 2000c), Recherche Archipelago Nature Reserve (CALM 2000d) and Nuytsland Nature Reserve (CALM 1997a) in ESP2. The South Coast Macro Corridor project identified corridors within ESP2 that have the potential to improve landscape connectivity for wildlife in the bioregion.

Wetlands

Wetlands of National significance (DIWA listings)

Name	Location	Description ¹	Condition ²	Trend ³	Reliability ⁴	Threatening Processes ⁵
Lake Warden System - includes Windabout, Woody, Wheatfield, Station, Mullet and Ewans lakes.	33° 49' S 121° 52' E 5 km N of Esperance	B7, B12	ii	iii	iii	i, ix, x, xi, xii (urban encroachment), vi (Bridal creeper), viii
Lake Gore System -includes lakes Carbul, Kubitch and Gidong and Quallilup lakes.	33° 47' S 121° 31' E 35 km W of Esperance	B7, B8, B12, B14	ii	iii	iii	i, ix, x, xi, vi (Bridal creeper)
Lake Mortjinup System – includes Namburup lake and Namburup west swamp	33° 48' S 121° 39' E 25 km W of Esperance	B7, B14, B10	iii	vi	ii	i, ix, x

Name	Location	Description ¹	Condition ²	Trend ³	Reliability ⁴	Threatening Processes ⁵
Pink Lake	33° 505' S 121° 495' E 5 km W of Esperance	B7	ii	iii	iii	i, ix (water salinity is changing – getting fresher), x (leaching of water from Lake Warden system), xi (nutrient enrichment & eutrophication), xii (salt mining; trampling), vi (Bridal Creeper, Victorian Teatree)

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

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

Name	Location	Description ¹	Special Values ²	Condition ³	Trend ⁴	Reliability ⁵	Threatening Processes ⁶
Bannitup Lake	33° 499' S 122° 037' E	B7	iii	ii	iii	i	i, ix, x, ix
Barkers Inlet	33° 486' S 121° 204' E	A6	iii	ii	iv	i	i, ix
Baylemup Swamp	33° 471' S 121° 418' E	B7	iii	ii	vi	i	i, ix, x
Beaumont Swamp	33° 383' S 122° 413' E	B7	iii	ii	iv	i - ii	i, ix, x
Benje Benjemup	33° 423' S 121° 54' E	B7	iii, v	ii	iii	i	i, ix, x, xi
Boolenup Lake	33° 51' S 122° 59' E	B7	iii	ii	iii	i	i, ix
Burdett Suite	426000/ 6288000	B11	ii	iii	vi	iii	iv, x
Cape Le Grand Suite	427000/ 6244000	B9	v, ii, iii	iv	iv	iii	iv
Coobidge Creek/Lower Coobidge Suite	360000/ 6279000	B7/B8	iii	ii	iii	i	ix, x
Coolinup Swamp	33° 467' S 122° 116' E	B7	iii	i	iii	i	i, ix, x
Coomalbidgup Swamp	33° 43' S 121° 225' E	B7	iii	i	ii	i - iii	i, ix, x, xi
Coujinup Swamp	260000/ 6285000	B12	ii	ii	iii	iii	i, iv
Dunns Swamp Suite	236800/ 6242500	A11/B10	iii	iii	iv	iii	xi
Ewarts Lake	33° 505' S 122° 523' E	B5	ii, iii, iv	iii	iv	i	i, viii, ix
Howick Suite	478000/ 6264000	B11	iii	iii	iv	iii	x
Jerdacuttup Lakes	33° 555' S 120° 12' E	B6, B8	iv, iii	ii	iii	i - ii	i, ix, x, xi
Lake Carbul	33° 46' S 121° 10' E	B7	v	ii	iii	i	i, ix, x
Lake Cubinup	33° 48' S 121° 10' E	B7	ii	ii	iv	i	i, ix, x
Lake Daringdell	33° 39' S 123° 48' E	B7	v	iv	iv	i	Unknown threatening processes
Lake Gidong	33° 466' S 121° 288' E	B7	v	ii	iii	i	i, ix, x
Lake Hillier (Middle Island)	33° 058' S 123° 12' E	A4	ii	iv	iv	i	xii (tourist boats; recreation)

Name	Location	Description ¹	Special Values ²	Condition ³	Trend ⁴	Reliability ⁵	Threatening Processes ⁶
Lake Kubitch	33° 465' S 121° 296' E	B7	v	ii	iii	i	i, ix, x
Lake Shaster	33° 521' S 120° 43' E	B7	i, iv, iii, v	ii	vi	i	i, ix, x
Mainberup Swamp	33° 47' S 121° 339' E	B7	iii	ii	iii	i	i, ix, x
Monjingup Lake suite	388500/ 6258700	B5/B9	iii	ii	iii	iii	v, ix, x, xi
Mortup Suite	488000/ 6255500	B7, B8/B9, B10	v, iii	iii	iii	iii	xi, xii (vehicles)
Munglinup River Suite		B2/B11/B12	ii	iii	iii	iii	i, iv, vi, x
Oceanview suite	476000/ 6253500	B8/B10	ii	iii	iii	iii	xii (vehicles)
Oldfield Estuary Suite	295000/ 6249500	A6	v, iii	iii	iii	iii	iv, xi
Oldfield Inlet	33° 527' S 120° 472' E	A6	iii	iii	iii	i	i, ix, x
Quallilup Lake	33° 49' S 121° 355' E	B7	iii	ii	iii	i	i, ix, x, xi
Shark Lake	33° 462' S 121° 515' E	B9	i, ii, iii, iv	iii	iii	i - ii	i, ix, x, xi
Single Winds Suite	305000/ 6265000	B8/b10	v, iii	iii	iii	iii	x
Stokes Inlet	33° 491' S 121° 096' E	A6	iii, iv	iii	iii	i - ii	i, ix, x, xi
Suite Sixteen	389000/ 6269000	B8	v, iii	iii	iv	iii	Unknown threatening processes
Thistle Lake	33° 598' S 122° 12' E	B5	ii	iv	iv	i	Unknown threatening processes
Torradup Lake	33° 51' S 121° 008' E	A6	iii	ii	iii	i	i, ix, x, xi
Tyrells Swamp	33° 475' S 122° 094' E	B7	iii	ii	iii	i	i, ix, x
Washpool Swamp	33° S 122° E	B10	iii	iii	iii	i	i, ix, x
Woodup Swamp	33° 507' S 122° 09' E	B10	iii	iv	iv	i	viii, ix, x

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

Riparian zone vegetation

In general, when rivers in ESP1 are inundated (particularly with summer rainfall), bank erosion, and uprooting/burial of native riparian vegetation occurs.

Weed plant species then invade and overrun riparian areas.

Name	Condition ¹	Trend ²	Reliability ³	Threatening Processes ⁴
Lort River	ii	iii	i-ii	i, ii, iv, v (foxes & rabbits), vi, ix, x (agricultural drainage), xi, xii (broad acre farming)
Young River	i	iii	i-ii	i, ii, iv, v (foxes & rabbits), ix, x, xi
Oldfield River	ii	iii	i-ii	i, ii, iv, v (foxes & rabbits), ix, x, xi
Dalyup River	i	iii	i-ii	i, ii, iv, v (foxes & rabbits), ix, x, xi
Coramup River	i	iii	i-ii	i, ii, iv, v (foxes & rabbits), ix, x, xi
Thomas River	unknown	vi	unknown	Unknown threatening processes
Jerdacuttup River	ii	iii	i-ii	i, ii, iv, v (foxes & rabbits), ix, x, xi

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

Ecosystems at risk

Threatened ecological communities (TECs)

In general, plant communities comprising of susceptible plant species are threatened by dieback (*Phytophthora cinnamomi*) and can be considered as ecosystems at risk.

These fungi eliminate numerous species of structurally and floristically dominant plant families such as the Proteaceae and Myrtaceae from ecosystems.

Beard Veg Assoc	Community	Status	NVIS ¹	Condition ²	Trend ³	Reliability ⁴	Threatening Processes ⁵
1047, 510, 514, 4048	Plant assemblages of mixed thicket complexes in the Russell Range System (Brooke Park)	V	29, 27	iv	iii	iii	vii, viii (potential)

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

Other ecosystems at risk

In general, plant communities comprising of susceptible plant species are threatened by dieback (*Phytophthora cinnamomi*) and can be considered as ecosystems at risk.

These fungi eliminate numerous species of structurally and floristically dominant plant families such as the Proteaceae and Myrtaceae from ecosystems.

Beard Veg Assoc	Community	Status ¹	NVIS ²	Condition ³	Trend ⁴	Reliability ⁴	Threatening Processes ⁵
59	Pink Lake (PINKLK01) - Stomatolite community Number 3 of Coastal Hypersaline Lakes	V	41	ii	iii	iii	i, ix (water salinity is changing – getting fresher), x (leaching of water from Lake Warden system), xi (nutrient enrichment & eutrophication), xii (salt mining; trampling), vi (Bridal Creeper, Victorian Teatree)
47	Ravensthorpe Range (ARG1 & ARG2) Pale grey sand low ridge Magnesite, 3.5 km SE of Bandalup Hill, 31km ESE Ravensthorpe.	V	27, 29	iii	iii	iii	viii (<i>Phytophthora</i> sp.), xii (mining activities), v (foxes & goats), vi (Bridal Creeper), xii (recreation activities – trail bikes)
24	Esperance Sandplain (HELMS1 & HELMS2) Scrub heath on Esperance Sandplain: Scrub heath on deep sand with Banksia and Lambertia, and Banksia Scrub heath on sandplain 16km NNW of Esperance, on the Coolgardie-Esperance Highway	V	28	ii	iii	iii	viii (<i>Phytophthora</i> sp. and other fungi), x (water quality and/or quantity), vi (Victorian Teatree, bridal creeper), i, ii, v (foxes, goats, deer, horses), xii (recreational activities)
N/A	Lake Warden System - naturally brackish/saline coastal lakes	V	38, 39, 41, 15, 30	ii	iii	iii	i, ix, x, xi, xii (urban encroachment), vi (Bridal Creeper, Victorian Teatree), vii, viii
N/A	Lake Gore System - saline coastal lakes of varied depth and salinity, which at time have extensive associated brackish saline marshes	V		ii	iii	ii	i, ix, x, xi, vi (Bridal Creeper, Victorian Teatree), viii, ii
	Unique mallee on magnesite ridges west of Bandalup Hill		27, 29	ii	iv (subject to no further mining)	ii	xii (mining activity)

Beard Veg Assoc	Community	Status ¹	NVIS ²	Condition ³	Trend ⁴	Reliability ⁴	Threatening Processes ⁵
512	Shrublands; mallee scrub, <i>Eucalyptus eremophila</i> & Forrest's marlock (<i>E. forrestiana</i>)		27, 29	ii	iii	iii	ix, x
929	Low forest; moort (<i>E. platypus</i>)		27	ii	iii	iii	ix, x

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> (translocated population)	V	iii	iv	iii	v (fox & cat), ii
<i>Pseudomys shortridgei</i>	V	unknown	vi	unknown	v (predators), viii
<i>Petrogale lateralis hacketti</i>	V	iii	iii-iv	iii	xii (small population size), vii
<i>Petrogale lateralis lateralis</i>	V	unknown	vi	ii	iv, viii, xii (small population size)
** <i>Eubalaena australis</i>	E	unknown	v	ii	xii (whale watching; ecotourism)
** <i>Balaenoptera musculus</i>	V	unknown	vi	unknown	xii (whale watching; ecotourism)
** <i>Megaptera novaeangliae</i>	V	unknown	vi	unknown	xii (whale watching; ecotourism)
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 2 (BIRDS)					
<i>Calyptorhynchus latirostris</i>	E	i-ii	iii	ii	i, ii, xii (competition with bees and other birds for nest sites)
<i>Pezoporus wallicus flaviventris</i>	E	i	ii	iii	vii, v (foxes & cats), viii (<i>Phytophthora cinnamomi</i> leading to loss of habitat)
<i>Cereopsis novaehollandiae grisea</i>	V	ii	iv	iii	xii (drought)
<i>Leipoa ocellata</i>	V	unknown	vi	unknown	v (foxes & cats), ii, xii (roads), vii
<i>Psophodes nigrogularis oberon</i>	V	ii	iv	iii	v (fox), viii, vii, xii (habitat may be subject to mining)
** <i>Diomedea amsterdamensis</i>	E	unknown	vi	unknown	xii (commercial fishing practice)
** <i>Diomedea exulans</i>	V	unknown	vi	unknown	xii (commercial fishing practice)
** <i>Diomedea gibsoni</i>	V	unknown	vi	unknown	xii (commercial fishing practice, shooters), xi
** <i>Halobaena caerulea</i>	V	unknown	vi	unknown	xii (predation)
** <i>Pterodroma mollis</i>	V	unknown	vi	unknown	Unknown threatening processes
** <i>Thalassarche cauta</i>	V	ii	v	iii	xii (commercial fishing practices)
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA. DIVISION 3 (REPTILES)					
<i>Morelia spilota imbricata</i>	SP	iii	vi	i	xii (decline in population of food source), vii
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 5 (FISH)					
** <i>Carcharodon carcharias</i>	V	unknown	vi	unknown	xii (incidental capture by fisheries; shark control activities such as targeted hunting and shark nets; removal of fins; ecotourism)
** <i>Carcharias Taurus</i>	V	unknown	vi	unknown	xii (commercial and recreational fisheries; shark control activities such as targeted hunting and shark nets; ecotourism)
Species	Status	Condition ¹	Trend ²	Reliability ³	Threatening Processes ⁴
OTHER SPECIES AT RISK WITHIN THE SUBREGION					
<i>Neophoca cinerea</i>	Near Threatened	i-ii	iii	iii	xii (small population size; commercial fisheries)
<i>Arctocephalus forsteri</i>	Conservation Dependant	iii	v	iii	No known threatening processes
<i>Charadrius rubricollis</i>		unknown	unknown	unknown	v (foxes and cats), x (inundation from water logging), xii (recreational vehicles on beaches)

Species marked with **asterisks indicate these species are occasional visitors to the subregion.

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

Declared rare and priority flora

In general, plant communities comprising of susceptible plant species are threatened by dieback (*Phytophthora cinnamomi*) and can be considered as ecosystems at risk. These fungi eliminate numerous species of structurally

and floristically dominant plant families such as the Proteaceae and Myrtaceae from ecosystems.

Species Name	Status	Condition ¹	Trend ²	Reliability ³	Threatening Processes ⁴
DECLARED RARE FLORA					
<i>Anigozanthos bicolor</i> subsp. <i>minor</i>	CR	unknown	iii	ii	ii, vii, i
<i>Lambertia echinata</i> subsp. <i>echinata</i>	CR	i	ii	iii	viii (<i>Phytophthora</i> sp.), xii (translocated plants have died)
<i>Adenanthos eyrei</i>	E	iii	iv	iii	vii, xii (population difficult to locate and naturally rare)
<i>Eucalyptus insularis</i>	E	iii	iv	ii	No known threatening processes
<i>Myoporum turbinatum</i>	E	iii	iv	iii	vii (post fire species), ii, ix, xii (roadworks)
<i>Rhizanthella gardneri</i>	E	ii	iii	iii	vii, ii, ix, i, iv, x, xii (very hard to locate)
<i>Ricinocarpus trichophorus</i>	E	iii	iv	iii	ii
<i>Conostylis lepidospermoides</i>	V	ii-iii	iv	ii	vi, vii, xii (roadworks), i, ii
<i>Eremophila denticulata</i> subsp. <i>denticulata</i>	V	ii	iv	ii	vii, xii (roadworks)
<i>Eucalyptus merrickiae</i>	V	ii-iii	iv	ii	ii, ix, xii (roadworks)
<i>Marianthus villosus</i>	V	unknown	iv	ii	xii (mining), ii, vii
<i>Pleurophascum occidentale</i>	V	iii	iv	iii	No known threatening processes
PRIORITY 1					
<i>Acacia diminuta</i>	1	unknown	vi	iii	Unknown threatening processes
<i>Acacia dorsenna</i>	1	ii	vi	iii	xii (small population size; known populations are on Main Roads Reserves), iv, ii
<i>Astartea</i> sp. Esperance (A Fairall 2431)	1	unknown	vi	unknown	Unknown threatening processes
<i>Astartea</i> sp. Jerdacuttup (A Strid 21898)	1	unknown	vi	unknown	Unknown threatening processes
<i>Baeckea crassifolia</i> var. <i>icosandra</i>	1	iii	vi	iii	Unknown threatening processes
<i>Boronia baeckeeacea</i> subsp. <i>patula</i>	1	unknown	vi	unknown	Unknown threatening processes
<i>Caladenia longifimbriata</i> ms	1	unknown	vi	unknown	Unknown threatening processes
<i>Chorizema circinale</i>	1	unknown	vi	unknown	Unknown threatening processes
<i>Coleanthera coelophylla</i>	1	ii	iii	iii	xii (no collections have been made for approx 60 years)
<i>Conostephium marchantiorum</i>	1	iii	iv	iii	No known threatening processes
<i>Dampiera sericantha</i>	1	ii	vi	iii	xii (appears to be disturbance opportunist)
<i>Darwinia</i> sp. Mt Baring (KR Newbey 9775)	1	iii	iv	iii	xii (small number of individuals); vii
<i>Dodonaea hexandra</i>	1	unknown	vi	iii	No known threatening processes, species is widely dispersed in Western Australia
<i>Dryandra longifolia</i> subsp. <i>calcicola</i>	1	ii	iii	iii	viii (<i>Phytophthora</i> sp.)
<i>Eremophila compressa</i>	1	iii	iv	iii	vii, xii (appears to be disturbance opportunist)
<i>Eucalyptus balanopelex</i>	1	unknown	vi	unknown	Unknown threatening processes
<i>Eucalyptus foliosa</i>	1	unknown	vi	unknown	Unknown threatening processes
Species Name	Status	Condition¹	Trend²	Reliability³	Threatening Processes⁴
<i>Eucalyptus varia</i> subsp. <i>salsuginosa</i>	1	unknown	vi	iii	Unknown threatening processes
<i>Goodenia</i> sp. Scaddan (CD Turley 41VM/1099)	1	unknown	vi	ii	Unknown threatening processes
<i>Hydatella australis</i>	1	iii	iv	ii	xii (rarely collected)
<i>Lepidium fasciculatum</i>	1	unknown	iv	ii	ix, ii, i, xii (species is very hard to locate)
<i>Melaleuca similis</i>	1	unknown	vi	unknown	Unknown threatening processes
<i>Myoporum velutinum</i> ms	1	unknown	vi	ii	ix, x, i
<i>Stachystemon</i> sp. Mt Baring (KR Newbey 9773)	1	iii	iv	iii	xii (small number of individuals); vii
PRIORITY 2					
<i>Acacia incanearpa</i>	2	iii	iv	iii	xii (small population size)
<i>Acacia kerryana</i>	2	unknown	vi	ii	Unknown threatening processes
<i>Acacia nitidula</i>	2	iii	iv	iii	Unknown threatening processes
<i>Acrotriche patula</i>	2	iii	iv	iii	xii (potential for mining in the area)
<i>Andersonia carinata</i>	2	unknown	vi	unknown	viii (<i>Phytophthora</i> sp.)
<i>Andersonia macranthera</i>	2	iii	iv	iii	viii (<i>Phytophthora</i> sp.), xii (species has been poorly collected)
<i>Angasomyrtus salina</i>	2	iii	iv	iii	vii, ix, x, ii
<i>Angianthus newbeyi</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Astartea</i> sp. Jyndabinbin Rocks (KR Newbey 7689)	2	unknown	vi	unknown	Unknown threatening processes

<i>Astroloma</i> sp. Fitzgerald (GJ Keighery 8376)	2	unknown	vi	unknown	Unknown threatening processes
<i>Banksia epica</i>	2	iii	iv	ii	No known threatening processes, potentially vii
<i>Boronia coriacea</i>	2	iii	iv	iii	xii (limited geographic range)
<i>Dampiera decurrens</i>	2	iii	iv	iii	xii (limited geographic range)
<i>Dampiera orchardii</i>	2	unknown	vi	ii	i, ii
<i>Daviesia newbeyi</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Daviesia pauciflora</i>	2	ii	iii	iii	iv, xii (road works; limited geographic range)
<i>Dryandra longifolia</i> subsp. <i>archeos</i>	2	iii	iv	ii	No known threatening processes, potentially viii
<i>Eucalyptus litorea</i>	2	ii-iii	iii	iii	iii, vii
<i>Eucalyptus preissiana</i> subsp. <i>lobata</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Eucalyptus stoataptera</i> x	2	unknown	vi	unknown	Unknown threatening processes
<i>Eucalyptus surgens</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Goodenia quadrilocularis</i>	2	iii	iv	iii	xii (limited geographic range)
<i>Goodenia scapigera</i> subsp. <i>graniticola</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Goodenia varia</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Grevillea plurijuga</i> subsp. <i>superba</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Lasiopetalum maxwellii</i>	2	iii	iv	iii	Unknown threatening processes
<i>Lepyrodia fortunata</i> ms	2	unknown	iv	ii	Unknown threatening processes
<i>Leucopogon compactus</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Leucopogon florulentus</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Leucopogon interruptus</i>	2	unknown	vi	ii	xii (island populations); vii
<i>Leucopogon multiflorus</i>	2	iii	iv	iii	No known threatening processes, response to fire is unknown
<i>Leucopogon pleurandroides</i>	2	ii-iii	iv	iii	vii
<i>Leucopogon</i> sp. Kau Rock (MA Burgman 1126) [aff. <i>allittii</i>]	2	unknown	vi	unknown	Unknown threatening processes
<i>Levenhookia pulcherrima</i>	2	unknown	iv	ii	Unknown threatening processes
<i>Melaleuca eximia</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Opercularia hirsuta</i>	2	ii-iii	vi	ii	xii (very difficult to distinguish from other species of same genus)
<i>Paracaleana</i> sp. Nuytsland (AP Brown s.n.)	2	unknown	vi	ii	xii (limited geographic range)
Species Name	Status	Condition¹	Trend²	Reliability³	Threatening Processes⁴
<i>Patersonia inaequalis</i>	2	iii	iv	iii	xii (small population size)
<i>Pomaderris paniculosa</i> subsp. <i>paralia</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Scaevola brookeana</i>	2	iii	iv	ii	xii (limited geographic range)
<i>Scaevola paludosa</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Spyridium mucronatum</i> subsp. <i>multiflorum</i>	2	ii-iii	iv	iii	xii (limited geographic range; poorly collected)
<i>Thysanotus brachiatus</i>	2	unknown	vi	unknown	Unknown threatening processes
<i>Thysanotus parviflorus</i>	2	unknown	iv	iii	Unknown threatening processes

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 Reserves	Non-IUCN Reserve	CALM Purchased Lease	Priority
16	Low forest: bushy yate (<i>E. cornuta</i>) & Bald Is. marlock (<i>E. lehmannii</i>)	X	X		
27	Low woodland: paperbark (<i>Melaleuca</i> sp.)		X		
41	Shrublands: teatree scrub	X			
42	Shrublands: mallee & acacia scrub on south coastal dunes	X			
47	Shrublands: tallerack mallee-heath	X			
48	Shrublands: scrub-heath	X			
125	Bare areas; salt lakes	X			
128	Bare areas; rock outcrops	X	X		
129	Bare areas; drift sand	X			
479	Shrublands: mallee-heath (Nuytsland)	X			
512	Shrublands: mallee scrub, <i>Eucalyptus eremophila</i> & Forrest's marlock (<i>E. forrestiana</i>)				

514	Shrublands; mallee scrub, white mallee (<i>Eucalyptus cooperiana</i>)	X			
515	Shrublands; mallee scrub, blue mallee (<i>Eucalyptus socialis</i>)				
516	Shrublands; mallee scrub, black marlock	X			
519	Shrublands; mallee scrub, <i>Eucalyptus eremophila</i>				
929	Low forest; moort (<i>E. platypus</i>)				
931	Medium woodland; yate	X			
934	Shrublands; mallee scrub <i>Eucalyptus nutans</i>				
1047	Shrublands; <i>Eucalyptus incrassata</i> mallee-heath	X			
1516	Shrublands; mallee scrub, black marlock & Forrest's marlock				
4048	Shrublands; scrub-heath in the Esperance Plains incl. Mt Ragged scrub-heath	X			
4801	Shrublands; heath with scattered <i>Nuytsia floribunda</i> on sandplain	X			
6048	Shrublands; banksia scrub-heath on sandplain in the Esperance Plains Region	X	X		
7048	Shrublands; banksia scrub-heath on coastal plain in the Esperance Plains Region	X			

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

Economic Constraints

Other: Finer scale biodiversity data and information on reserves

Limited Opportunity to Meet CAR Criteria: Large areas of some vegetation types have already been cleared.

Competing Land Uses: Such as agriculture and mining.

Bioregional and subregional priority for reserve consolidation

Reserve consolidation rank is 5 (see Appendix D) on the table provided, but the bioregion should have an overall rank of 4 (Appendix C, rank 4). ESP1 is ranked 5 due to the relatively high level of reservation in the subregion, but ESP2 is under significantly more threat from mining,

some vegetation associations have been extensively cleared and the reserve system is biased. Therefore, ESP2 should have a reserve consolidation rank of at least 3.

Reserve management standard

Most ESP 2 Conservation reserves are in good condition (see Appendix C, rank 5). *Phytophthora cinnamomi* has severely impacted upon Cape Le Grand National Park and near coastal section of Cape Arid National Park. Wildfire management facilities are limited by resources in the remote reserves, except for fire breaks and fire-access tracks which are installed and maintained. Prescribed burning is confined to Cape Arid National Park, Cape Le Grand National Park, and Stokes National Park. Feral herbivore grazing activities are widespread (e.g. rabbits). Goats are scattered but widespread, though currently in low numbers. Feral predator control systems are in place on Cape Arid National Park, Cape Le Grand National Park, Stokes National Park, and Lake Shaster Nature Reserve.

Class	Purpose	Reserve Number	Name	Category	Reserve Management Rank ¹
C	Conservation of Flora & Fauna	32339	Lake Shaster	Nature Reserve	i-ii
A	National Park	32590	Stokes	National Park	ii
C	Conservation of Flora & Fauna	31755	East Naernup	Nature Reserve	ii
A	Conservation of Flora & Fauna	32419	Lake Gore	Nature Reserve	i
A	Conservation of Flora & Fauna	35557	Lake Mortjijnup	Nature Reserve	i
A	Conservation of Flora & Fauna	15231	Woody Lakes	Nature Reserve	ii-iii
C	Reserve for Forestry	23527	Helms	Timber Reserve	ii
A	Conservation of Flora & Fauna	23825	Mullet Lake	Nature Reserve	ii-iii
A	Conservation of Flora & Fauna	32257	Lake Warden	Nature Reserve	ii-iii
C	Conservation of Flora & Fauna	24511	Pink Lake	Nature Reserve	ii
C	Conservation of Flora & Fauna	27888	Warrenup	Nature Reserve	ii
A	National Park	22795	Cape Le Grand	National Park	i
A	National Park	24047, 14234	Cape Arid	National Park	ii
A	Conservation of Flora & Fauna	22796	Recherche Archipelago	Nature Reserve	ii
A	Primitive Area for the Preservation and Study of Flora, Fauna, Geological and Anthropological Features	27632	Nuytsland	Nature Reserve	i-ii
C	Conservation of Flora & Fauna	27087	Unnamed	Nature Reserve	ii
A	Conservation of Flora & Fauna	32128	Part Beaumont Group	Nature Reserve	ii
C	Conservation of Flora & Fauna	19628	Dalyup	Nature Reserve	ii
C	Conservation of Flora & Fauna	43060	Scarlet Pear Gum	Nature Reserve	ii
A	Conservation of Flora & Fauna	40156	Jerdacuttup Lakes	Nature Reserve	ii
C	Conservation of Flora & Fauna	28168	Springdale	Nature Reserve	ii
C	Conservation of Flora & Fauna	26410	Munglinup	Nature Reserve	ii
C	Conservation of Flora & Fauna	26885	West of Lake Gore	Nature Reserve	ii
A	Conservation of Flora & Fauna	36183	Edwards Road	Nature Reserve	ii
C	Conservation of Flora & Fauna	25958	Speddingup	Nature Reserve	ii

Class	Purpose	Reserve Number	Name	Category	Reserve Management Rank ¹
A	Conservation of Flora & Fauna	31313	Unnamed	Nature Reserve	ii
C	Conservation of Flora & Fauna	24953	Unnamed	Nature Reserve	ii
A	Conservation of Flora & Fauna	31197	Shark Lake	Nature Reserve	ii-iii
A	Conservation of Flora & Fauna	39435	Woody Island	Nature Reserve	ii
A	Conservation of Flora & Fauna	36056	Investigator Island	Nature Reserve	ii
A	Conservation of Flora & Fauna	26885	Unnamed	Nature Reserve	ii
A	Conservation of Flora & Fauna	27354	Coolinup	Nature Reserve	ii
A	Conservation of Flora & Fauna	27388	Burdett	Nature Reserve	ii
C	Conservation of Flora & Fauna	27086	Alexander	Nature Reserve	ii
A	Conservation of Flora & Fauna	31799	Part Muntz Group	Nature Reserve	ii
A	Conservation of Flora & Fauna	32800	Bebenorin	Nature Reserve	ii

¹Appendix C, rank 5

Off reserve conservation

Priority Species or Groups and Existing Recovery Plans

Beard Veg Assoc	Species/Ecosystem	Specific Recovery Plan	General Recovery Plan	Prioritise for Subregion ¹
50	<i>Anigozanthos bicolor</i> subsp. <i>minor</i>	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii
47	<i>Conostylis lepidospermoides</i>	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii
929, 931	<i>Eremophila denticulata</i> subsp. <i>denticulata</i>	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii
995	<i>Eucalyptus insularis</i>	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iv
125, 519	<i>Eucalyptus merrickiae</i>	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii
47	<i>Marianthus villosus</i>	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii
1413	<i>Rhizanthella gardneri</i>	No	Declared Rare and Poorly Known Flora of the Esperance District; South Coast Regional Management Plan.	iii

¹Appendix C, rank 6

Appropriate recovery actions

Beard Veg Assoc	Species/Ecosystem	Species Recovery Actions ¹	Recovery Descriptions
50	<i>Anigozanthos bicolor</i> subsp. <i>minor</i>	ii, iii, ix	Habitat protection on private lands and on other state lands; Fire management.
47	<i>Conostylis lepidospermoides</i>	ii, iii, xiv	Habitat protection on private lands and on other state lands; Other - roadside markers.
929, 931	<i>Eremophila denticulata</i> subsp. <i>denticulata</i>	iii, ix, xiv	Habitat protection on other state lands; Fire management; Other - roadside markers.
995	<i>Eucalyptus insularis</i>	i, ix	Habitat retention through reserves; Fire management.
125, 519	<i>Eucalyptus merrickiae</i>	iii, ii, ix, xiv, xi	Habitat protection on other state lands and on private lands; Fire management; Other - roadside markers; Reinstatement of hydrology.
47	<i>Marianthus villosus</i>	iii, ix	Habitat protection on other state lands; Fire management.
1413	<i>Rhizanthella gardneri</i>	i, ii, iii, ix, vii	Habitat retention and protection through reserves, on private lands and on other state lands; Fire management; Feral animal control.

¹Appendix B, key h

All terrestrial mammals and most of the birds listed as being species at risk in this subregion are found within current Department of CALM estate and there are few if any recent records outside reserves. However, many of

these species do have relevant recovery or interim recovery plans:

- Chuditch (*Dasyurus geoffroii*) (Orell and Morris 1994)

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (Cale 2000a draft)
- Western Ground Parrot (*Pezoporus wallicus flaviventris*) (Burbidge *et al.* 1997)
- Malleefowl (*Leipoa ocellata*) (Benshemesh 2000)
- Hooded Plover (*Charadrius rubricollis*) (Raines 2002)
- Prickly Honeysuckle (*Lambertia echinata* subsp. *echinata*) (Monks *et al.* 2001)
- Grey Nurse Shark (*Carcharias taurus*) (Environment Australia 2002a)
- Great White Shark (*Carcharodon carcharias*) (Environment Australia 2002b)

In addition to these recovery or interim recovery that apply in to individual species, there are a number of action plans that are applicable for birds (Garnett and Crowley 2000), marsupials and monotremes (Maxwell *et al.* 1996), reptiles (Cogger *et al.* 1993), rodents (Lee 1995), seals (Shaugnessy 1999), albatrosses and petrels (Environment Australia 2001) and Declared Rare and poorly known flora of the Esperance region (Craig and Coates 2001).

Ecosystems, existing recovery plans, and appropriate recovery actions

No off-park conservation actions or recovery plans have been identified for species at risk. The TEC Plant assemblages of mixed thicket complexes in the Russell Range System (Brooke Park) does not have a recovery plan and is found within CALM reserve (Cape Arid National Park). The Department's South Coast Regional Management Plan (1992) is relevant to ecosystems and species at risk in the subregion.

Subregion priority for off reserve conservation

The overall rank for ESP2 is (iv) - limited off park measures required (see Appendix C, rank 6).

Conservation actions as an integral part of NRM

Existing NRM actions

Legislation: Including legislation relating to Declared Rare Flora; Clearing; Soil and Land Conservation; Mining Act; Bushfire Act; Local Government rulings

Threat Abatement Planning: e.g. vegetation management plans and pest management plans – Western Shield fox control programme effective in enhancing fauna populations particularly in baited areas; Fire management; Recovery Catchment Plans; River Action Plan (for Jerdacuttup and Dalyup Rivers and Oldfield Estuary); Park Management Plans; Recovery and Interim Recovery Plans.

Industry Codes of Practice: in relation to agricultural, agroforestry mining and fisheries activities.

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

Other Planning Opportunities: Including local government planning and National Action Plan for Water Quality and Salinity – Salinity Action Plan (no scalar measurement available on the effectiveness of this programme); SCRIPT (South Coast Regional Integrated Planning Team); Southern Prospects; Coastal Management (Southern Shores).

Integration with Property Management Planning, Catchment Planning and Land Care: Land Care and South Coast Regional Integrated Planning Team revegetation of catchments and damaged land variably effective in addressing salinity and erosion problems.

Other: On ground management of reserves by CALM staff; Education and awareness raising in the community (SCRIPT).

Feasible opportunities for NRM

Threat Abatement Planning: Research is necessary to identify threats and to develop appropriate management plans particularly in relation to environmental weeds and feral animals.

Legislation: A review of some existing legislation is necessary to provide the legal capacity to effectively address current issues and problems of biodiversity protection.

Threat Abatement Planning: Further research is necessary into the extent of potential impacts of environmental weeds and their management greater resourcing of pest management is required.

Capacity Building: In place with community, landholders, industry and institutions – need for greater level of coordination of planning and land management issues between agencies and the community and recognition of differing stakeholder objectives. In addition, there is further scope for the Macro Corridor project is used as a tool to be used to identify strategic landscape level connectivity.

Other: Complete the reserve proposals set out in the South Coast Management Plan.

Valuing Ecosystems & Tradable Rights: Social benefit values, e.g. rural land purchases.

Impediments or constraints to opportunities

There is a paucity of suitable and motivated people to effectively promote the conservation message to various interest groups in the community, further, there is a reducing base of funding for conservation particularly for off-park issues which need to be addressed if initiatives are to succeed. Outdated legislation represents an impediment to biodiversity conservation, as do operational constraints arising from limited financial and human resources available for many ideas, initiatives and public education programs. The Macro Corridor concept is a useful tool to raise awareness of biodiversity issues,

however, existing land use conflicts have implication for natural land management. In general there is a lack of appreciation of complex biodiversity issues by the community. The terms of Native Title agreements (and future settlements) are likely to have profound implications for NRM actions in the future and the legal and administration issues are likely to be complex.

Subregions where specific NRM actions are a priority to pursue

The NRM rank is (iv) (see Appendix C, rank 7) indicating some NRM instruments are in place with some achieved biodiversity outcomes, however a greater achievement is possible with increased public awareness of conservation issues, particularly in relation to agricultural production systems.

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 vegetation map resolution is 1:250 000 at best.

Systematic Fauna Survey: Some fauna survey work has been done for vertebrates in Stokes National Park, Oldfield River, Cape Le Grand and Bandalup Hill. Other data has been collected for the bird atlas, specific threatened bird distributions and three western shield monitoring sites for mammals. No funding for ongoing monitoring of stratified set of LTERM quadrats currently being sampled across the subregion as part of the Macro Corridor project. Most reserves don't have long-term survey data on species presence/absence even for vertebrates.

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

Ecological and Life History Data: There is little data on habitat requirements of virtually all invertebrate species, most ephemeral plants (except some DRF), persisting CWR mammals (except Dibbler, Chuditch, Tammar), persisting E/V birds (except Western Ground Parrots, Western Whipbird, Malleefowl), and uncommon vertebrate- and plant-species. There are no data to provide a regional context on life-history (including population-trend) of most species.

Other Priority Data Gaps Include:

- No quantitative data on the affect of *Phytophthora*, exotic predators, weed colonisation, fragmentation & farm clean-up, fire, and affect of mining

(exploration) on greenstone communities in Ravensthorpe Range.

- Effect of rising water table on species composition of communities remaining within the agricultural landscape.

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802	Environment Australia	(2002).	Recovery Plan for the Grey Nurse Shark, <i>Carcharias taurus</i> , in Australia	Environment Australia, Canberra	O
803	Environment Australia	(2002).	White Shark (<i>Carcharodon carcharias</i>) Recovery Plan	Environment Australia, Canberra.	O
790	Environment Australia in consultation with the Albatross and Giant-Petrel Recovery Team	(2001).	Recovery Plan for Albatrosses and Giant Petrels	Environment Australia, Canberra.	O
298	Garnett, S.T. and Crowley, G.M.	(2000).	The Action Plan for Australian Birds.	Environment Australia, Canberra.	R
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R = Report; J = Journal article; O = Other.

Other relevant publications

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363, 367, 368, 370, 371, 375, 426, 427, 441, 529, 580, 587, 590, 598, 599, 608, 609, 610, 611, 642, 644, 666, 667, 675, 690, 691, 696 and 697 in Appendix A.