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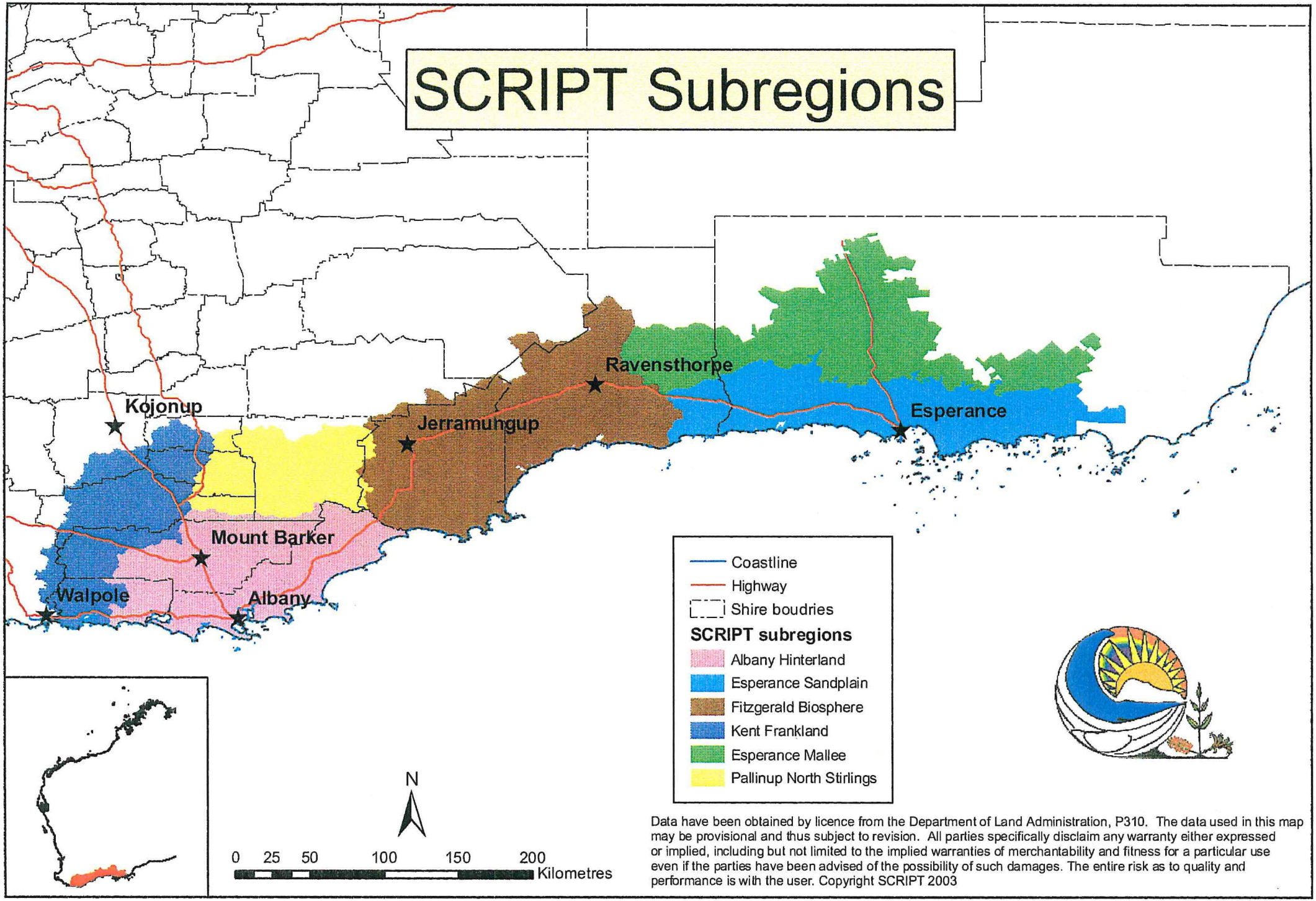
South Coast Regional Initiative Planning Team (SCRIPT)

Science Forum – Developing the South Coast Regional Strategy

Monet's Function Room, Albany
Monday 21 July – Tuesday 22 July 2003

SCRIPT Subregions



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South Coast Regional Strategy for Natural Resources Management – Planning for Biodiversity

The South Coast Region – an overview

The South Coast Region (see map 1) covers an area of more than 5.4million hectares and includes the catchments of all the southerly-flowing rivers from Walpole in the west to beyond Cape Arid in the east, as well as some internally drained areas north east of Albany and north of Esperance.

The region is renowned for its spectacular landscapes, including tall forest areas in the west, the southern coastline and many offshore islands, all of South Western Australia's mountain peaks, and many inlets, estuaries, waterways and wetlands. It is also renowned for its extremely high levels of biodiversity, with more than 20% of the State's floristic diversity within the region.

There are 14 National Parks within or adjacent to the region, including two (the Fitzgerald River and Stirling Range National Parks) which each contain nearly 10% of Australia's flora species as well as significant numbers of fauna species. In addition, there are a number of nature reserves and large areas of unalienated land in the Ravensthorpe Range and the mallee areas north of Esperance.

The Fitzgerald River National Park also forms the core of the Fitzgerald Biosphere Reserve, and a proposal for another Biosphere Reserve in the west of the region (including the Irwin, Parrys, Wilson and Torbay inlet catchments) is currently under discussion.

The region also contains large areas of agricultural landscapes, and there is a strong economic reliance within the regional community on agricultural production and related service industries. Increasingly, areas of plantation and farm forestry are changing parts of the landscape and there are some strong trends in parts of the region to increase the diversity and resilience of land management systems.

Physical and biological threats to the terrestrial biodiversity of the region include rising groundwater and salinisation, plant diseases especially *Phytophthora cinnamomi*, weeds and feral animals, altered fire regimes, continued habitat disturbance and fragmentation of populations, and climate change. Some of the perceived social and economic threats include an increasing reliance on a decreasing number of volunteers for on-ground actions, withdrawal of government resources (skills and funds) and institutional, legislative and market arrangements that either undervalue or actively degrade biodiversity.

At the same time, there are opportunities on the South Coast that give good grounds for optimism. These include support for native plant based industries that can provide both ecological and economic outcomes; an increasing recognition of the role of Noongar people in sustainable land management; the development or trial of various market based instruments to encourage conservation or restoration of biodiversity; and the Gondwana Link project that is using many of these approaches and accessing private investment for an ambitious collaborative effort to restore functional landscapes.

Most of all, the region is home to many people who are passionate about this area and who have a wealth of knowledge, skills, experience and ideas to contribute to the development of an ecologically, socially and economically sustainable region.

South Coast Regional NRM Strategy

A regional strategy for NRM (natural resources management) was first developed within the South Coast Region in 1996/7 and was used extensively to guide project priorities under the first Natural Heritage Trust (NHT) program. A revised draft strategy was prepared in 2000, but subsequent changes to the NHT program and the development of the National Action Plan for Salinity and Water Quality (NAPSWQ) have lead to yet a further iteration of the strategy - the work now in progress.

SCRIPT are leading the development of the strategy, but are working with a number of other organisations or groups as either formal or informal partners. This includes a number of government agencies (eg CALM, Department of Environment, Dept of Agriculture, Forest Products Commission) and non-government groups (eg Greening Australia WA, Gondwana Link, and a number of subregional community-based groups).

While the NHT and NAP programs are funding the development of the strategy and have some specific accreditation criteria that need to be met for future funding under those programs, SCRIPT wants the strategy to be more robust than a 5 year government funding program. The strategy must be relevant as a guide to future directions and investments, regardless of the source of those investments. To do this, it needs to be strongly community-owned, and be clear, rational, justifiable and transparent.

The accreditation criteria are for the most part strongly aligned with the community needs as defined in feedback on the earlier strategies:

- Scientific justification for priorities and objectives
- Measurable and achievable targets and indicators built into a clear monitoring and evaluation process
- Management actions and strategies assessed for their feasibility, effectiveness and socio-economic impacts
- Assessment of and strategies for developing our ability to manage natural resources more sustainably into the future
- Strong community participation in the development, implementation and evaluation of strategies.

Our aim

Previous extensive consultation and engagement of stakeholders identified a number of overarching objectives, related to conservation and sustainable use of natural resources, coordination and integration of planning and management, participative approaches to planning and management, and the maintenance of strong and capable communities.

A proposed "vision" for the strategy (based on the previous work) is:

The South Coast Region is recognised locally, nationally and internationally for its outstanding biodiversity and landscapes, its sustainable production practices, and its strong communities.

- *The South Coast's distinctive landscapes and their terrestrial, aquatic and marine biodiversity will be valued and protected into the future.*
- *The South Coast's land- and water-based industries will be ecologically sustainable, diverse and profitable.*
- *The South Coast's communities – including urban and rural residents, indigenous and non-indigenous - will have the experience, skills, information and*

economic resources to be active participants in the management of the region's natural resources.

- *There will be cooperation, coordination and opportunities for participation at all levels of decision-making, planning and management of the South Coast's natural resources resulting in genuine integration of environmental, social and economic outcomes.*

What the strategy covers

The strategy includes consideration of the land, biota and water, including coastal and marine areas (to 3 nautical miles). It also covers socio-economic issues, including community capacity, as they relate to natural resources and their management.

In developing the regional strategy, SCRIPT has had input from the Dept of Agriculture (analysis at regional scale of land degradation risks including groundwater rise and salinity, as well as analysis on an industry basis of impacts on natural resources) and from the Water and Rivers Commission (collation and analysis of a range of state and regional data sets for waterways, estuaries, wetlands and aquifers). CALM has been developing a GIS-analysis of its data sets at state level and are also assisting through their Marine Branch with the development of priorities for management of marine areas and threats.

It will be SCRIPT's responsibility to bring the various themes and approaches together and integrate with input from other government agencies, Development Commissions, local governments, indigenous people, industry groups and other community members.

There are also a number of State-scale assessments in progress using for example the Salinity Investment Framework. SCRIPT will draw from these approaches where they are appropriate but we see that the regional strategy must be a more dynamic and adventurous document than any Statewide approach is likely to encourage, simply because we see that the South Coast has more opportunities for positive and innovative approaches.

Site Conservation Planning Approach – a framework for regional biodiversity planning

The Site Conservation Planning (SCP) is simply a planning framework developed by The Nature Conservancy and used at hundreds of its conservation areas at either *site* or at *landscape* scales. It is based on a "Five-S" framework:

- *Systems* – the conservation targets at a landscape and the natural processes that maintain them
- *Stresses* – the types of destruction, degradation or impairment afflicting each of the conservation targets in the landscape
- *Sources* – the agents generating the stresses
- *Strategies* – the types of activities deployed to abate the sources of stress (threat abatement) or enhance or restore the system (restoration)
- *Success* – measures of biodiversity health and threat abatement in the landscape.

The SCP is supported by a decision support system developed as an Excel spreadsheet that is underpinned by clear relationships to ecological principles. SCRIPT decided to apply the framework at a regional scale for a number of reasons:

- It encourages the users to look at the whole landscape – regardless of tenure – and therefore to examine the functional viability of that landscape and the conservation targets within it.
- It requires the users to identify their assumptions and/or document the basis for their decisions.

- It requires the identification of targets and indicators and, for us, has generated considerable debate on how we choose indicators.
- It is strongly based in the development of community-based strategies for threat abatement and target restoration, and so very applicable to the NHT/NAP program requirements.
- We worked through it with the Gondwana-Link people and we liked what we saw!

Landscape planning units:

A number of different planning units and scales were considered for application of the SCP approach, including SCRIPT subregions, catchments, IBRA subregions and soil-landform units. Units based on geology were adopted as these were considered to be most suited to the regional scale of planning. The map (following) shows the units currently being used for planning purposes. (Note however that these are subject to further change and that the recommendations arising from the planning exercise may be presented within other boundaries – local authority, catchments, etc - as appropriate).

Summary of SCP process to date:

The SCP process has been used in five small group workshops to date and preliminary proposals have been made for targets, indicators and stresses for five of the planning units. (See summary tables attached). The western areas are still under development. Working groups have included a number of people from within the region with direct knowledge and experience of the vegetation, flora or fauna of the planning areas.

At each of our planning sessions, we have identified a number of issues that require further consideration, and this forum is intended to address some of them.

Questions to be addressed during the forum:

- **Vegetation, floristics and defining priority systems for regional planning.**
  - Are vegetation associations the most appropriate conservation targets at a regional scale? Do they adequately cover other components and processes within the ecological systems or are there other more appropriate targets to use?
  - Do we have enough information about characteristic structures and diversity within communities to know what to aim for?
  - What are the most appropriate indicators of *condition* and how can/should these be used at a regional scale? What is the best indicator of condition over time that accounts for successional stages?
  - What is the significance of floral diversity, local and regional endemism, convergence communities, species at their range extent, and how do we incorporate the significance into regional scale targets?

- **Connectivity and fragmentation, "adequate" areas, patches and mosaics.**
  - Are criteria based on % of original cover appropriate for regional planning or are they only part of the story?
  - Do we have sufficient knowledge to be able to estimate minimum dynamic size to maintain systems, communities, species at a reasonable level of risk?
  - Are there "positive" aspects to fragmentation that can lead to greater genetic diversity and re resilience in some circumstances (eg granite communities)? Is this significant at a regional scale?
  - What are the ideal patch and pattern size for the various vegetation and community mosaics that make up the South Coast's natural biodiversity?

- Is size of remnants a primary determinant of viability in all systems or are other factors more significant in some systems (eg fire regime in mallet/moort communities)?
- What are the relative significance of connectivity and fragmentation in woodland systems?

- **Fauna: special management needs, role of fauna in ecological functions, the "forgotten" fauna**
  - Is management for maintenance of a full suite of vegetation substantially different from management for the maintenance of a full suite of fauna? What are the additional needs and how are they best addressed as regional priorities?
  - How good is our knowledge of fauna as part of ecological processes, including nutrient and water processes? How can/should that be reflected in our regional priorities?
  - What are the fauna species and communities that require specific attention at a regional scale?
  - Is the concept of keystone species a useful one for regional planning? If so, why and how should this be incorporated in biodiversity planning?
  - How do we best deal with migratory and large range species within regional priorities?

- **Fire regimes that maintain or enhance natural biodiversity.**
  - Do we have adequate knowledge of the fire regime requirements for South Coast systems? Where is our knowledge best? poorest?
  - Do we have the knowledge but not the ability or willingness to apply the regimes?
  - Do we adequately understand the risks (to biodiversity) of current practices?
  - What are the indicators that we should be using to monitor long term impacts of fire regimes on different systems?
  - What are the regional priorities for improving knowledge, policy or management?

- **Disease and other disturbances.**
  - What is the state of our knowledge on occurrence, risks and impacts of *Phytophthora* on species and communities within the South Coast Region?
  - What other risks are there (other diseases etc)?
  - Is our management adequate for what we currently know? Are there other approaches we need?
  - What are the immediate and longer term priorities for managing disturbance, including by disease?

- **Measuring success – targets and indicators**
  - What are the key targets and indicators that we should be using at a regional scale? What is needed at other scales?
  - What current data sets or other information might provide a sound basis for regional targets and monitoring?
  - How can we make sure we have useable information that doesn't require a project officer to spend another year finding it the next time a strategy is in preparation???

Next steps in developing the regional strategy

The SCP approach and the outcomes from this forum are being combined with other information and approaches as mentioned earlier. SCRIPT will then be taking the resulting *proposed* priority objectives, targets and indicators to wider community consultation within the region. The community consultation will also involve further development of social and economic priorities.

At the same time, the development of strategies and actions to achieve the objectives will commence. The regional strategy will encompass a range of approaches, including:

- Improving knowledge and information
- On-ground works and activities
- Building community and regional capacity (eg skills, employment, technical and other support, communications, etc)
- Promoting opportunities for diversification and integration (eg through specific actions to support native plant based production)
- Institutional, legislative and policy approaches

It is anticipated that the strategy will be completed in early 2004.

The continued involvement of any of the participants at this forum is welcomed and encouraged.

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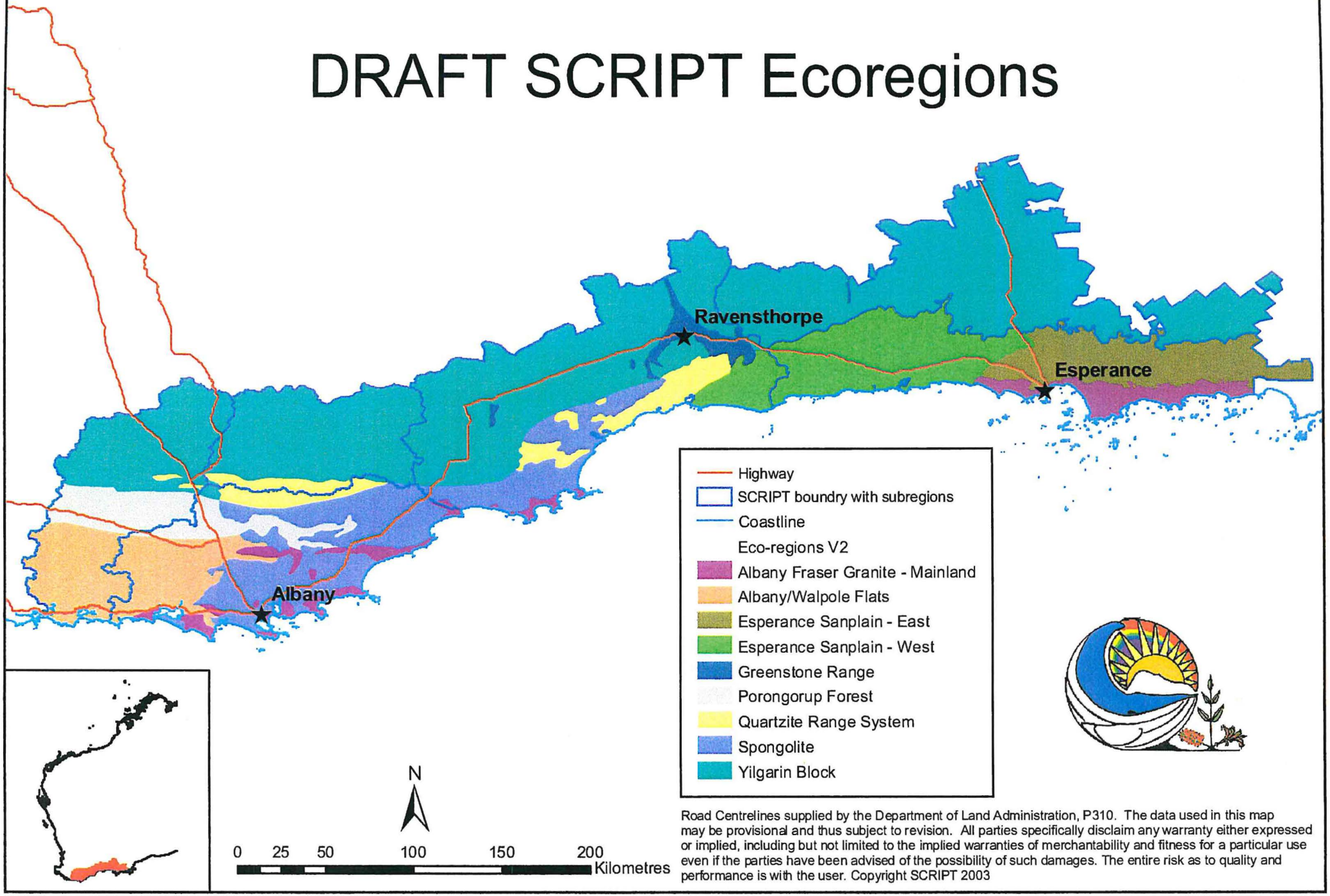

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Old Marine Plain

Focal conservation target	Nested targets	Key ecological attributes	Indicator	Viability
Waterway systems	(Individual waterways - separate	Aquatic Fauna	Species diversity	Fair
		Riparian vegetation	% Intact	Fair
		Water Quality	Level of modification	Good
threatened & priority fauna				
wetland suites		Water Regime	Level of modification	Poor
		Aquatic Fauna	Species diversity	Fair
		Water Quality	Level of modification	Fair
		Riparian vegetation	% Intact	Fair
Mallet & moort communities		Fire Intervals/intensity regime	Age of mallet/moort communities (% of patches younger than 10 years)	
		Fire Intervals/intensity regime	structure of mallet/moort communities (% of patches with characteristic spp - as both mallet and moort are single stemmed spp, presence/absence determines both structure and composition)	
		Keystone Functional Groups/Guilds	Presence/mix of appropriate species (TBD)	Fair
		Area of mallet within spongolite region	% of original extent	Fair
Kwongan on laterised soils		Fire intervals and intensity	(density of vegetation?) ratio of suckers to seeders (TBD)	Fair
		mix of climatic & edaphic conditions	extent of post fire mosaics	Poor
		Undisturbed with minimal edge impacts	perimeter/area ratios and presence of invasives	
		Range of variation retained across 15km intervals	% of at regular intervals	Fair
mallee shrubland		Fire intervals and intensity	(density of vegetation?) ratio of suckers to seeders (TBD)	Fair
		Undisturbed with minimal edge impacts	size/area ratios and presence of invasives	Good
		Range of variation retained across 15km intervals	% of original extent at regular intervals	Fair

Flat topped yate woodland		Hydrological regime	duration and frequency of inundation and/or distance (time) from watertable	Fair
		Characteristic Ecological Communities and Seral Stages	range of ages	Good
		Disturbance	range of ages	Good
		Vigour	degree of insect "attack"	
Banksia sand ridge communities				

Issues: Need to bear in mind that mallet/moort occurs as scattered patches of extremely variable size (down to just a few trees) and that viability is (probably) not size driven but fire regime dependant

Need to determine% of orignal extent remaining

Indicator ratings have been selected on the basis that we cannot aim to achive 100% of original; What are the relative significance of connectivity and fragmentation in maintaining particular woodland types and their "special features"?

Old Marine Plain

	Active Threats Across Systems	Waterway systems	threatened & priority fauna	wetland suites	Mallet & moort communities	Kwongan on laterised soils	mallee shrubland	Flat topped yate woodland	Banksia sand ridge communities	Overall Threat Rank	Total Score
1	Farming systems practices including grazing	-	-	-	-	-	-	Very High	-	High	3.00
2	Fire suppression	-	-	-	-	High	High	Low	-	High	2.03
3	grazing practices	High	-	Low	Medium	-	-	-	-	Medium	1.22
4	operation of discharge, drainage or diversion systems	High	-	-	-	-	-	Medium	-	Medium	1.20
5	Development of roads or utilities	-	-	-	-	Medium	Medium	-	-	Medium	0.40
6	fire mngt priorities incompatible with biodiversity	-	-	-	Medium	-	-	-	-	Low	0.20
7	climate change	-	-	-	Medium	-	-	-	-	Low	0.20
8	Continuing spread of dieback species	-	-	-	-	Medium	-	-	-	Low	0.20
9	Imbalance in native flora/fauna such as lerps	-	-	-	-	-	-	Medium	-	Low	0.20
10	Lack of understanding of natural processes	-	-	-	-	Low	Low	Low	-	Low	0.09
11	cropping practices (pest, fert)	-	-	Low	-	-	-	-	-	Low	0.03
12	lack of knowledge of appropriate fire regimes	-	-	-	Low	-	-	-	-	Low	0.03
13	clearing of native vegetation	-	-	-	-	-	-	Low	-	Low	0.03
14	Invasive weed species	-	-	-	-	Low	-	-	-	Low	0.03
15	Invasive/alien species (weeds and rabbits?)	-	-	-	-	-	-	Low	-	Low	0.03

Threat Status for Targets	High	-	Low	Medium	Medium	Medium	High	-	High	

Historical Sources Across Systems		Waterway systems	threatened & priority fauna	wetland suites	Mallet & moort communities	Kwongan on laterised soils	mallee shrubland	Flat topped yate woodland	Banksia sand ridge communities	Overall Threat Rank	Total Score
1	clearing of native vegetation	-	-	Very Hig	Medium	High	High	Very High	-	Very High	5.60
2	excessive surface water withdrawal	-	-	High	-	-	-	-	-	Medium	1.00
3	Farming systems practices (weed dispersal)	-	-	-	-	-	-	Low	-	Low	0.03
		-	-	-	-	-	-	-	-	-	-
Historical Source Status for		-	-	High	Low	Medium	Medium	High	-	High	

Albany Fraser Mainland

Focal conservation target	Nested targets	Key ecological attributes	Indicator	Viability
Icon threatened species	Not yet identified	Climatic regime	variation from average long-term rainfall and temperature	Poor
		Fire regime	fire interval	Fair
		habitat connectivity	movement of individuals into new territory	Fair
		canopy/understories	number of home ranges with suitable habitiat	Fair
		reproduction/ recruitment	numbers of new territories	Fair
		Abundance	Number of individuals	
		Patch size	Number of patches	
		Patch size	Patch area	
Relictual invertebrates		Moist refugia climatic regime	Humidity levels	
		Long unburnt refugia	% of areas unburnt	
Jarrah-Marri-Hakea-Dryandra scrub		Climatic regime	variation from average long-term rainfall and temperature	Poor
		Fire Regime	Fire interval	Fair
		Characteristic species	Dominant species present	Good
South Coast Galaxid		Climatic regime	Variation from average long-term rainfall	Poor
		Surface and groundwater hydrology	Variation from long-term average flow	
		Surface and groundwater quality	Macro invertebrate diversity	
		Reproduction/ recruitment	Number of individuals	
Heath communities (Gardner sands and duplex)		Climatic regime	variation from average long-term rainfall and temperature	Poor
		Fire Regime	Fire interval	Fair
		Characteristic species	Dominant species present	Good
		Extent		
Green Range and Sisters systems		Climatic regime	variation from average long-term rainfall and temperature	Poor
		Fire Regime	Fire interval	Fair
		Characteristic species	Dominant species present	Good
		Extent	% of original extent	Good
Granite rock communities		Climatic regime	variation from average long-term rainfall and temperature	Poor
		Fire Regime	Fire interval	Fair
		Surface and groundwater hydrology	Variation from long-term average flow	Good
		Characteristic species	Dominant species present	Good
		extent	% of original extent	Good

Coastal dune veg systems		Climatic regime	variation from average long-term rainfall and temperature	Poor
		Fire Regime	Fire interval	
		natural disturbance	dune movement	
		Characteristic species	Dominant species present	
		patch types /patterns		
		Extent	% of original extent	
Issues: Special management needs species need identification - nest under target 1. Climatic regime - some debate over value of inclusion here (are micro-climate measures related to management of systems more useful?). Fire regimes - only fire frequency has been identified, what about intensity, seasonality? Condition indicators only dominant species - what indicators could give better system condition rating? Size attributes: extent c.f. original vs patch size/pattern - what's most relevant for different systems?				

Albany Fraser Mainland

Active Threats Across Systems		Icon threatened species	Relictual invertebrates	Jarrah-Marri-Hakea-Dryandra scrub	South coast Galaxid	Heath communities (Gardner sands and duplex)	Green Range and Sisters systems	Granite rock communities	Coastal dune veg systems	Overall Threat Rank	Total Score
1	Climate Change	Very High	Very High	High	-	-	-	-	-	Very High	5.00
2	Inappropriate fire management practices	Very High	Very High	High	-	-	-	-	-	Very High	5.00
3	Introduced predators	Very High	-	-	-	-	-	-	-	High	3.00
4	Plant pathogens	High	High	Medium	-	-	-	-	-	High	2.20
5	Recreation	Medium	High	Low	-	-	-	-	-	Medium	1.22
		-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-
Threat Status for Targets and Site		Very High	Very High	High	-	-	-	-	-	Very High	

Historical Sources Across Systems		Icon threatened species	Relictual invertebrates	Jarrah-Marri-Hakea-Dryandra scrub	South coast Galaxid	Heath communities (Gardner sands and duplex)	Green Range and Sisters systems	Granite rock communities	Coastal dune veg systems	Overall Threat Rank	Total Score
1	Vegetation clearing for agriculture	Very High	-	Medium	-	-	-	-	-	High	3.10
		-	-	-	-	-	-	-	-	-	-
Historical Source Status for Targets and Site		High	-	Low	-	-	-	-	-	Medium	

Greenstone Ranges

Focal conservation target	Nested targets	Key ecological attributes	Indicator	Viability
Ravensthorpe Range landform		Suite of dramatic low hills	Physical integrity	Good
		Landscape integrity	Intact vegetation systems	Good
		Range extent	Area	Very good
R Range vegetation and flora mosaic	Structural complexity; endemics; disjuncts; range extremities; rare and threatened taxa and communities	Natural disturbance regimes	Age class and structural mosaic and community simplification	Fair
		Unique convergence of vegetation associations	Convergence definition and its presence/absence	Fair
		"Sustainable extent"	Percentage of existing system?	Fair
		Individual patch dynamic	Spatial and temporal variety (TBD?)	
Ravensthorpe lerista	Mallee; mallet	habitat (Long unburnt vegetation)	depth and extent of litter	Fair
		Characteristic Species	Area, condition of mallet and tall mallee woodlands	Fair
		Deep litter under mallets	Lerista abundance	Good
Shortridge's native mouse	Mallee; Proteaceous	Kwongan and shrubland	Area of kwongan and shrubland	Good
		Vegetation age mosaic	Ratio of habitat/forage mosaic	Fair
		Habitat area?	Area +/- 30,000 ha	Fair
		Min viable population TBD	TBD	Good
Salmon gum		Natural disturbance regimes	Age class and structure (shown by recruitment?)	Fair
		Age structure of characteristic sp	Recruitment cf deaths over time	Fair
		Current extent	Percentage of original cover	Fair

Issues: Where are the local endemics? What's the relative significance of them? What (any?) special management, monitoring other than for system? Significance of convergence communities - how do we define, measure, manage? Vegetation mosaic - do we know what the "ideal" mosaic looks like? Patch size, distribution etc. Habitat (minimum size for resilience) for Rav lerista and Shortridge's Native Mouse? Are these the key spp with special mgmt needs? How do we characterise (and measure) condition over time and account for successional stages? Spp vs area curves? Age vs area? Fire management needs - all veg types and special species need

Greenstone Ranges

Active Threats Across Systems		Ravensthorpe Range landform	R Range vegetation and flora mosaic	Ravensthorpe lerista	Shortridge's native mouse	Salmon gum	Overall Threat Rank	Total Score
1	Lack of fire ecology knowledge	-	High	High	Very High	-	High	4.00
2	Incompatible fire management practices	-	Medium	Very High	High	Medium	High	3.70
3	Mining practices	High	-	High	-	-	High	2.00
4	Townsite development	-	High	High	-	-	High	2.00
5	Development of roads, firebreaks and utilities	-	High	Medium	-	-	Medium	1.20
6	Vegetation removal	Low	-	-	High	-	Medium	1.03
7	Mineral exploration	-	High	-	-	-	Medium	1.00
8	Incompatible farming practices	-	-	Medium	-	Low	Low	0.23
9	Gravel extraction	Medium	-	-	-	-	Low	0.20
10	Conversion to agriculture	-	-	-	-	Medium	Low	0.20
Threat Status for Targets and Site		Medium	High	Very High	High	Medium	Very High	

Historical Sources Across Systems		Ravensthorpe Range landform	R Range vegetation and flora mosaic	Ravensthorpe lerista	Shortridge's native mouse	Salmon gum	Overall Threat Rank	Total Score
1	Agricultural clearing	High	Very High	Very High	-	Medium	Very High	5.10
		-	-	-	-	-	-	-
Historical Source Status for Targets and Site		Medium	High	High	-	Low	High	
		-	-	-	-	-	-	-

Yilgarn East

Focal conservation target	Nested targets	Key ecological attributes	Indicator	Viability
special mngt/threatened spp.				
waterways, wetlands	Natural saline systems - flora; Threatened and priority flora	Hydrology	depth to groundwater; surface flow volumes and quality	Poor
		catchment vegetation	% of perennial vegetation in catchment	Poor
		fringing vegetation	health of veg	Poor
		buffer	width of fringing veg	Poor
salmon gum swamps	threatened and priority flora (2spp); Species producing nesting hollows	SLIP	SLIP area undisturbed (area, condition)	Fair
		age structure of characteristic spp	recruitment/deaths over time	Fair
		extent	% of original cover	Fair
laterite upland communities	threatened and priority flora	fragmentation	Density analysis?	Fair
		characteristic spp and structure	TBD (define from Beard's, soils, and surface geology; bushland assessment)	Fair
		geomorphic processes	% cover on soil type	Fair
moort and forrestiana	spp producing nesting hollows	disturbance regime	age class and structural mosaic	Poor
		characteristic spp and structure	bushland survey ratings	Fair
		geomorphic processes	% cover on soil type	Poor
granite communites	threatened and priority flora; Species producing nesting hollows	Fragmentation	width of buffer	Fair
		characteristic spp and structure	TBD (see note)	Fair
		Patch types/pattern	number of defined communities within each patch	?
		geomorphic processes	% cover on soil type	Good
lunette vegetation	spp producing nesting hollows	Surface and groundwater hydrology	depth to water table	Fair
		characteristic spp and structure	bushland survey ratings	Fair
		Fragmentation	width of buffer	Fair

Issues: NB Characteristic spp for laterite upland communities includes E. pleurocarpa, tetraptera, tumida, M.uncinata, Dryandra spp, Banksia spp. Eg Mt Burnett. Is fragmentation a characteristic that supports genetic diversity? If so, what sort of indicator of genetic diversity condition? Granite communities: what is a healthy community diversity and structure? How can it be characterised and what indicators? Other issues - as for Esperance Granite Coastal Plain (fire, condition, size)

Yilgarn East

	Active Threats Across Systems	special mngt/threatened spp.	waterways, wetlands	salmon gum swamps	laterite upland communities	moort and forrestiana	granite communites	lunette vegetation	-	Overall Threat Rank	Total Score
1	Inadequate knowledge of ecology of the area - survey efforts, spp, community requirements	-	Medium	High	Very High	Very High	Very High	Medium	-	Very High	6.70
2	Climate change	-	-	High	-	High	Very High	Medium	-	High	4.10
3	Crop production practices	-	-	High	High	Medium	High	Medium	-	High	3.20
4	Fire suppression practices	-	-	Medium	High	-	High	-	-	High	2.20
5	Inadequate knowledge of fire management requirements	-	-	Medium	Medium	Medium	High	-	-	Medium	1.60
6	Grazing practices	-	-	Medium	-	High	Medium	Low	-	Medium	1.42
7	Development of roads or utilities	-	-	High	-	Medium	-	-	-	Medium	1.20
8	Mining practices	-	-	-	Medium	-	-	-	-	Low	0.20
9	Invasive/alien species	-	-	-	-	-	Medium	-	-	Low	0.20
10	Lack of understanding of ecologically sustainable fire management	-	Low	-	-	-	-	-	-	Low	0.03
11	Introduced species	-	Low	-	-	-	-	-	-	Low	0.03
12	Recreational use	-	-	-	-	-	Low	-	-	Low	0.03
13	Invasive/alien species: Plants	-	-	-	-	-	-	Low	-	Low	0.03
	Threat Status for Targets and Site	-	Low	High	High	High	Very High	Medium	-	Very High	

	Historical Sources Across Systems	special mngt/threatened spp.	waterways, wetlands	salmon gum swamps	laterite upland communities	moort and forrestiana	granite communites	lunette vegetation	-	Overall Threat Rank	Total Score
1	Catchment clearing and hydrological modification	-	-	High	Very High	High	High	Medium	-	Very High	4.60
	Historical Source Status for Targets and Site	-	-	Medium	High	Medium	Medium	Low	-	High	

Esperance Sandplain West

Focal conservation target	Nested targets	Key ecological attributes	Indicator	Viability
Special management/ threatened spp	JAMBA, CAMBA species			
Wetlands (incl L Gore catchment)		Hydrology	depth to groundwater; surface flow volumes and quality	Poor
		catchment vegetation	% of perennial vegetation in catchment	Poor
		fringing vegetation	health of veg	Poor
		buffer	width of fringing veg	Poor
Sandplain heath mosaic		disturbance regime	fire frequency and extent	Poor
		composition	representative taxa present over defined time	Fair
		structure	canopy cover	Fair
		extent	area/edge ratio	Fair
Northern transition vegetation		disturbance regime	TBD	Fair
		connectivity/fragmentation	TBD	Good
		extent	area/edge ratio	Fair
Saline vegetation systems		surface & gw hydrology	EC/ depth to water table/ duration	Poor
		composition/zonation	representative taxa present over defined time, area	Poor
		cover	% cover	Poor
		total extent (incl buffer)	area / edge ratio	Poor
Brackish-freshwater systems		surface & gw hydrology	EC/ depth to water table/ duration	Poor
		composition/zonation	representative taxa present over defined time, area	Poor
		cover	% cover	Poor
		total extent (incl buffer)	area / edge ratio	Poor
Issues: Similar to Esperance Granite Coastal Plain				

Esperance Sandplain West

Active Threats Across Systems		Special management/threatened species	Wetlands (including L Gore catchment)	Sandplain heath mosaic	Northern transition vegetation	Saline vegetation systems	Brackish-freshwater veg systems	Overall Threat Rank	Total Score
1	Climate change	Very High	Very High	Very High	Very High	Very High	Very High	Very High	10.00
2	Crop production practices	High	Very High	High	High	Very High	Very High	Very High	7.50
3	Catchment clearing and hydrological modification	-	Very High	High	-	-	Very High	Very High	5.00
4	Inadequate knowledge of fire management requirements	High	High	High	High	High	High	Very High	4.50
5	Fire suppression practices	High	High	-	High	High	High	High	4.00
6	Invasive/alien species: Plants	High	Medium	High	High	Medium	High	High	3.70
7	Development of roads or utilities	Medium	High	-	Medium	High	High	High	3.20
8	Livestock production practices	Low	High	Low	Low	Medium	High	High	2.25
9	Recreational use	Low	High	Low	Low	Low	Medium	Medium	1.26
10	Cats, foxes	-	High	Low	-	-	-	Medium	1.03
11	Fire management practices	-	-	High	-	-	-	Medium	1.00
12	Development and management of roads	-	-	Medium	-	-	-	Low	0.20
13	cats, foxes	Low	-	-	Low	Low	Low	Low	0.12
Threat Status for Targets and Site		Very High	Very High	Very High	Very High	Very High	Very High	Very High	

Historical Sources Across Systems		Special management/threatened species	Wetlands (including L Gore catchment)	Sandplain heath mosaic	Northern transition vegetation	Saline vegetation systems	Brackish-freshwater veg systems	Overall Threat Rank	Total Score
1	Catchment clearing and hydrological modification	Very High	-	-	Very High	Very High	-	Very High	6.00
2	Catchment clearing	-	-	Very High	-	-	-	High	3.00
		-	-	-	-	-	-	-	-
Historical Source Status for Targets and Site		High	-	High	High	High	-	Very High	

Esperance Sandplain East

Focal conservation target	Nested targets	Key ecological attributes	Indicator	Viability
Special management/threatened spp	JAMBA, CAMBA species			
Wetlands (incl L Warden catchment and Lake Mortijinup)		Hydrology	depth to groundwater; surface flow volumes and quality	Poor
		catchment vegetation	% of perennial vegetation in catchment	Poor
		fringing vegetation	health of veg	Poor
		buffer	width of fringing veg	Poor
Sandplain heath mosaic		disturbance regime	fire frequency and extent	Poor
		composition	representative taxa present over defined time	Poor
		structure	canopy cover	Poor
		extent	area/edge ratio	Poor
Northern transition vegetation		disturbance regime	TBD	Fair
		connectivity/fragmentation	TBD	Good
		extent	area/edge ratio	Fair
Saline vegetation systems		surface & gw hydrology	EC/ depth to water table/ duration	Poor
		composition/zonation	representative taxa present over defined time, area	Poor
		cover	% cover	Poor
		total extent (incl buffer)	area / edge ratio	Poor
Brackish-freshwater systems		surface & gw hydrology	EC/ depth to water table/ duration	Poor
		composition/zonation	representative taxa present over defined time, area	Poor
		cover	% cover	Poor
		total extent (incl buffer)	area / edge ratio	Poor

Issues: Similar to Esperance Granite Coastal Plain

Esperance Sandplain East

Active Threats Across Systems		Special management/threatened spp	Wetlands (incl L Warden catchment and Lake Mortijinup)	Sandplain heath mosaic	Northern transition vegetation	Saline vegetation systems	Brackish-freshwater systems	Overall Threat Rank	Total Score
1	Climate change	Very High	Very High	Very High	Very High	Very High	Very High	Very High	10.00
2	Crop production practices	High	Very High	High	High	Very High	Very High	Very High	7.50
3	Catchment clearing and hydrological modification	-	-	-	-	Very High	Very High	Very High	4.50
4	Inadequate knowledge of fire management requirements	High	High	High	High	High	High	Very High	4.50
5	Fire suppression practices	High	High	High	High	High	High	Very High	4.50
6	Invasive/alien species: Plants	High	Medium	High	High	Medium	High	High	3.70
7	Development of roads or utilities	Medium	High	Medium	Medium	High	High	High	3.30
8	Livestock production practices	Low	High	Low	Low	Medium	Medium	Medium	1.45
9	Recreational use	Low	High	Low	Low	Low	Medium	Medium	1.26
10	cats, foxes	Low	High	-	Low	Low	Low	Medium	1.12
		-	-	-	-	-	-	-	-
Threat Status for Targets and Site		Very High	Very High	Very High	Very High	Very High	Very High	Very High	

Historical Sources Across Systems		Special management/threatened spp	Wetlands (incl L Warden catchment and Lake Mortijinup)	Sandplain heath mosaic	Northern transition vegetation	Saline vegetation systems	Brackish-freshwater systems	Overall Threat Rank	Total Score
1	Catchment clearing and hydrological modification	Very High	Very High	Very High	Very High	-	-	Very High	7.50
		-	-	-	-	-	-	-	-
Historical Source Status for Targets and Site		High	High	High	High	-	-	Very High	

Esperance Granite Coastal Plain

Focal conservation target	Nested targets	Key ecological attributes	Indicator	Viability
Special Mgmt, threatened spp				
Granite mosaic	endemic, threatened and priority flora; Endemic, threatened and priority fauna; Critical weight range fauna eg quenda, chudditch	natural disturbance regime	age, class and structural mosaic and community simplification	Fair
		structure and composition	representative taxa present over defined time, area	Fair
		sustainable extent	corridor width (and composition within it)	Poor
Coastal heath mosaic	critical weight range fauna eg quenda, chudditch; Western Ground Parrot	disturbance regime	fire frequency and extent	Poor
		composition	representative taxa present over defined time	Poor
		structure	canopy cover	Poor
		extent	area/edge ratio	Poor
Coastal dune vegetation	critical weight range fauna eg quenda, chudditch	disturbance regime	TBD	Fair
		connectivity/ fragmentation	TBD	Good
		extent	area/edge ratio	Fair
Saline ephemeral systems	Includes coastal inlets; JAMBA, CAMBA spp	surface & gw hydrology	EC/ depth to water table/ duration	Poor
		composition/zonation	representative taxa present over defined time, area	Poor
		cover	% cover	Poor
		total extent (incl buffer)	area / edge ratio	Poor
Brackish freshwater systems	endemic copapod; JAMBA, CAMBA spp	surface & gw hydrology	EC/ depth to water table/ duration	Poor
		composition/zonation	representative taxa present over defined time, area	Poor
		cover	% cover	Poor
		total extent (incl buffer)	area / edge ratio	Poor
Limestone vegetation mosaic		natural disturbance regime	age, class and structural mosaic and community simplification	Fair
		structure and composition	representative taxa present over defined time, area	Fair
		sustainable extent	corridor width (and composition within it)	Poor

Issues: Inadequate knowledge of this part of the region - survey; inventory; ecological processes. Poor access to information. CALM GIS analysis of limited value - survey effort; limited data sets. Health condition indicators for vegetation: remnant veg priorities (Shepherd etc) bias towards proximity to CALM or IUCN reserves - don't reflect condition of remant or of reserve (many "leftover" land); Need for more precise information on incidence and threat from Phytophthora; What if any special species needs? What is the best fire regime for long term maintenance of the various systems? What are the best indicators to monitor this? How do we characterise (and measure) condition over time and account for successional stages? Spp v. area curves?

Esperance Granite Coastal Plain

Active Threats Across Systems		Special mgmt, threatened spp	Granite mosaic	Coastal heath mosaic	Coastal dune vegetation	Saline ephemeral systems	Brackish freshwater systems	Limestone vegetation mosaic	Overall Threat Rank	Total Score
1	Climate change	Very High	High	Very High	High	High	High	Very High	Very High	8.00
2	Catchment clearing and hydrological modification	-	-	Very High	Very High	-	High	Very High	Very High	6.50
3	Fire suppression practices	High	High	Very High	High	High	High	High	Very High	6.00
4	cats, foxes	Low	High	Very High	High	Low	High	High	Very High	5.03
5	Recreational use	Low	High	Very High	High	Medium	Low	High	Very High	4.63
6	Inadequate knowledge of fire management requirements	High	High	High	Medium	High	High	High	Very High	4.60
7	Development of roads or utilities	Medium	High	Very High	Medium	Low	Low	Medium	High	3.83
8	Crop production practices	High	Medium	High	Medium	Medium	Medium	High	High	3.40
9	Invasive/alien species: Plants	High	Medium	High	Medium	Medium	Medium	High	High	3.40
10	Livestock production practices	Low	Low	Medium	Low	Low	Medium	Low	Medium	0.55
Threat Status for Targets and Site		Very High	Very High	Very High	Very High	High	High	Very High	Very High	

Historical Sources Across Systems		Special Mgmt, threatened spp	Granite mosaic	Coastal heath mosaic	Coastal dune vegetation	Saline ephemeral systems	Brackish freshwater systems	Limestone vegetation mosaic	Overall Threat Rank	Total Score
1	Catchment clearing and hydrological modification	Medium	Very High	-	-	High	-	-	High	3.60
Historical Source Status for Targets and Site		Low	High	-	-	Medium	-	-	High	