

# Themes and Databases

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*Melaleuca halmaturorum*  
Photographed by Ron Sandercock



Yankalilla River Estuary  
Photographed by Mary Crawford



*Melaleuca halmaturorum*  
Photographed by Ron Sandercock

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## 2 DESCRIPTION OF THEMES AND DATABASES

Representation of themes and databases

[This section draws heavily on 'Description of themes and databases' by Nerissa Haby, in Caton et al 2006, and the careful records of the processes used, kept by Matthew Royal]

A variety of data was used to describe conservation values and threats in the Southern Fleurieu coastal region. 41 datasets were assembled, and these are listed below.

### Conservation Layers

1. Communities & Species with Threatened Status
  - 1A. Priority of vegetation species based on the status of the community (threatened status) (Coastal Dune and Clifftop)
  - 1B. Priority of vegetation assemblage based on the rarity of the community in SA (those with <20 records within SA) (Coastal Dune and Clifftop – Species & Floristic).
  - 1C. Priority of sites with threatened flora (threatened status).
  - 1D. Priority of sites with threatened fauna (threatened status).
  - 1E. Priority of sites based on total number of threatened species (total number of threatened species).
2. Endemic Species and Communities; Biodiversity
  - 2A. Priority of vegetation assemblage based on the distribution of endemic plant communities (>50 % of records within the Southern Fleurieu) Coastal Dune and Clifftop –Species & Floristic.
  - 2B. Priority of vegetation assemblage based on the distribution of endemic habitat (>50 % of habitat within the Southern Fleurieu) Saltmarsh.
  - 2C. Priority of vegetation assemblage based on the proportion present within coastal units (Floristic Vegetation).
  - 2D. Priority of sites based on species richness (total number of species).
3. Significant Bird Habitat on the Fleurieu Peninsula
  - 3A. Priority of sites based on the threatened status of the significant birds in Southern Fleurieu region.
4. Significant Reptiles and Amphibian Habitats in Southern Fleurieu
  - 4A. Priority of vegetation assemblage as habitat for reptiles and amphibians (Conservation Status).
  - 4B. Priority of vegetation assemblage as habitat for reptiles and amphibians (Regional Abundance).
  - 4C. Priority of vegetation assemblage as habitat for reptiles and amphibians (Regional Coastal Distribution).
  - 4D. Priority of vegetation assemblage as habitat for reptiles and amphibians (Coastal Dependency).
5. Significant Butterfly Habitats in Southern Fleurieu
  - 5A. Priority of vegetation assemblage as habitat for butterflies.
6. Focal Species within the Southern Fleurieu
  - 6A. Priority of location (vegetation remnant / coastal unit) based on the distribution of the Hooded Plover (Focal Species).
7. Vegetation Patch Metrics
  - 7A. Priority of remnant vegetation based on patch size.
  - 7B. Priority of vegetation assemblage based on connectivity (minimum distance to nearest patch).
  - 7C. Priority of vegetation assemblage based on the presence of remnant vegetation (<1ha).
  - 7D. Priority of vegetation assemblage based on patch Edge to Interior ratio.

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## 8. Heritage

- 8A. Aboriginal sites.
- 8B. European Heritage sites.
- 8C. Natural Heritage.
- 8D. Geological Heritage 1 (Geological Monuments).
- 8E. Geological Heritage 2 (Coast Protection Board Report).

### Threatening Processes Layers

- a) Acid Sulphate Soils (actual & probable from saltmarsh habitats)
- b) Campsites: Formal & Informal
- c) Development Zoning
- d) Dumps & Wastewater Treatment Plants
- e) Dune Stability
- f) Cliff Stability
- g) Land Ownership
- h) Land Use
- i) Mining Activities
- j) Vegetation Isolation (lack of connectivity between vegetation patches)
- k) Vegetation Degradation
- l) Vegetation Shape (shapes allowing increased invasion)
- m) Vegetation Patch Size (smaller patches allowing increased invasion)
- n) Viewshed Analysis (increased threat due to sea views)
- o) Viewscape Analysis (increasing threat due to aesthetics of the coastal zone)
- p) Distribution of known environmental weeds

These datasets were selected from what was available at the time in state and museum databases. Although considerable processing of information was done, only two new sets of data were systematically collected: campsites and cliff stability. However, local expert knowledge was generously provided, and used to greatly improve the report.

Data was categorised into low to high importance and assigned scores 0 to 9: the way in which this categorisation was done is detailed for each dataset, and is set out below.

The analysis of the data using GIS software is described in 2.3; listing of ownership of datasets is in 1.1 and limitations of the data and the methodology are outlined in 2.5.

The South Australian Biological Survey provided the core data for the analysis. This data was collected systematically using a sampling system (Heard & Channon, 1997). Two assumptions were made to enhance the representation of data within the analysis:

- a) Flora and fauna recorded at survey points were assumed to occur throughout the vegetation patch, unless there was evidence to the contrary. The Floristic Vegetation dataset derived from aerial photograph analysis, was frequently used to enhance the information available from the survey point data. See listing in 1.1.
- b) Fauna recorded within the coastal boundary was assumed to be likely to be found in nearby suitable habitat, whether recorded by survey within the vegetation patch or not. This was particularly significant in the distribution of reptiles, 3.3.

## 2.1 Conservation Layers

### 2.1.1 Communities and Species with Threatened Status

#### 1A. Priority of Vegetation Species based on the status of the community (Coastal Dune and Clifftop communities)

The floristic field survey of the South Australian Coastal Dune and Clifftop Survey, Opperman 1999, (CDCS below) provides the most extensive distribution of flora survey sites throughout the Fleurieu coastal zone. This survey applied a standard and systematic method (Heard & Channon, 1997), leading to the collection of consistent data that may be used, for instance, to assess the distribution of threatened, endemic and rare communities. Vegetation communities

identified as nationally, state or regionally threatened in the CDCS were rated (0 – 9), as below.

*Prioritisation within theme:*

### 1A.1. National Status (Appendix 10)

N:	U:	Q:	K:	R:	V:	E:
0	0	2	3	5	7	9

Where: N: Not significant, U: Uncommon, Q: Possible Significance, K: Possibly threatened, R: Rare, V: Vulnerable, E: Endangered

### 1A.2. SA Status (Appendix 10)

N:	U:	Q:	K:	R:	V:	E:
0	0	2	3	5	7	9

Where: N: Not significant, U: Uncommon, Q: Possible Significance, K: Possibly threatened, R: Rare, V: Vulnerable, E: Endangered

### 1A.3. Regional Status (Appendix 10)

N:	U:	Q:	K:	R:	V:	E:
0	0	2	3	5	7	9

Where: N: Not significant, U: Uncommon, Q: Possible Significance, K: Possibly threatened, R: Rare, V: Vulnerable, E: Endangered

## 1B. Priority of vegetation assemblage based on the rarity of the community within SA (those with <20 records within SA; Coastal Dune and Clifftop communities)

The CDCS was used to identify those communities considered rare within coastal South Australia, i.e. less than 20 records within the whole state.

*Prioritisation within theme:*

No Priority	16-20 records in SA	11-15 records in SA	6-10 records in SA	1-5 records in SA
0	6	7	8	9

## 1C. Priority of sites with threatened flora (threatened status)

This drew on existing databases containing the National, State and Regional status of species of flora. However, additional data was collated, which is included, such as species lists supplied by Ron Taylor. As a result some 180 species of nationally, state and regionally threatened species of flora were identified within the Southern Fleurieu coastal region.

*Prioritisation within theme:*

### 1C.1. National status (EPBC Act Status Code)

N:	U:	Q:	K:	T:	R:	V:	E:
0	0	2	3	5	5	7	9

Where: N: Not significant, U: Uncommon, Q: Possibly significant, K: Possibly threatened, T: Threatened, R: Rare, V: Vulnerable, E: Endangered

### 1C.2. SA status (NPWSA Act Status Code)

N:	U:	Q:	K:	T:	R:	V:	E:
0	0	2	3	5	5	7	9

Where: N: Not significant, U: Uncommon, Q: Possibly significant, K: Possibly threatened, T: Threatened, R: Rare, V: Vulnerable, E: Endangered

### 1C.3. Regional status (BSG Regional Rating & R. Taylor's Regional ratings for plants found on Fleurieu Peninsula.)

N:	U:	Q:	K:	T:	R:	V:	E:
0	0	2	3	5	5	7	9

Where: N: Not significant, U: Uncommon, Q: Possibly significant, K: Possibly threatened, T: Threatened, R: Rare, V: Vulnerable, E: Endangered

### 1D. Priority of sites with threatened fauna (threatened status)

This has been obtained from existing databases containing National, State and Local status of species of fauna, together with data added from expert contributions from R Grund, G Carpenter and A Milne. Values obtained from these ratings were combined to produce a single layer for analysis.

*Prioritisation within theme:*

#### 1D.1 National Status (EPBC Act Status Code)

Item	Criterion	Category	
		Vulnerable	Endangered
1	It has undergone, is suspected to have undergone or is likely to undergo in the immediate future:	a substantial reduction in numbers	a severe reduction in numbers
2	Its geographic distribution is precarious for the survival of the species and is:	limited	restricted
3	The estimated total number of mature individuals is:	limited	low
and	(a) evidence suggests that the number will continue to decline at:	a substantial rate	a high rate
or	(b) the number is likely to continue to decline and its geographic distribution is:	precarious for its survival	precarious for its survival
4	The estimated total number of mature individuals is:	low	very low
5	The probability of its extinction in the wild is at least:	10% in the medium-term future	20% in the near future
	<b>Priority</b>	<b>5</b>	<b>9</b>

#### 1D.2. SA status (Review of the Status of Threatened Species 2003)

N:	U:	Q:	K:	R:	V:	E:
0	0	2	3	5	7	9

Item	Criterion	Category		
		Rare (TSSA)	Vulnerable (IUCN)	Endangered (IUCN)
1	It has undergone a population reduction in the form of an observed, estimated, inferred or suspected reduction of at least:	>50% loss abundance and / or area occupied	20% over 10 years or 3 generations	50% over 10 years or 3 generations
2	Extent of occurrence estimated to be limited:	20 000 km <sup>2</sup> OR 2000 and highly fragmented	20 000 km <sup>2</sup>	5000 km <sup>2</sup>
and	Fragmented to a limited number of locations, continuing decline and extreme fluctuations		< 10 populations	< 5 populations
3	Population size estimated to be limited:	<3000 mature indiv.	< 10 000 mature indiv.	< 2500 mature indiv.
and	Continuing a rate of decline		>10% / 10 yrs or 3 generations	>20% / 5 yrs or 2 generations
4	Population estimated to be limited		< 1000 mature indiv.	250 mature indiv.
5	Quantitative analysis predicts extinction in the wild		>10% within 100 yrs	>20% within 20 years or 5 generations
	<b>Priority</b>	<b>1</b>	<b>5</b>	<b>9</b>

**1D.3. Regional status (Birds – Graham Carpenter & BSG Regional Ratings for remaining fauna)**

Category					
Common (C)/ Not Significant (N)	Uncommon (U)	Indeterminate (K)	Rare (R)/ Threatened (T)	Vulnerable (V)	Endangered (E)
Considered widespread throughout most of its known distribution and under no immediate threat.	Although not an IUCN category, the term uncommon has been introduced to indicate plants, animals or vegetation types that are inadequately conserved or declining but are not yet threatened.	Likely to be Rare or Vulnerable but current information on populations are grossly inadequate to provide a better estimate of its conservation significance.	Considered to be at risk due to the low numbers of individuals even though no or little decline has been detected.	Considered likely to become endangered in the immediate future given current trends in populations and reasons for decline.	Considered to be in danger of becoming extinct in the wild in the immediate future given current trends in populations and reasons for decline.
0	1	3	5	7	9

**1E. Priority of sites based on total number of threatened species (total no. threatened species)**

The total numbers of flora and fauna species were summarised for each remnant vegetation patch, using a combination of the data on which layers 1C and 1D are based.

*Prioritisation within theme:*

No Priority	13-37 threatened species of plant / animal	37-59 threatened species of plant / animal	59-92 threatened species of plant / animal	>92 threatened species of plant / animal
0	2	4	6	9

Where “threatened” incorporates both flora and fauna and up to 5 categories, K: Possibly threatened, T: Threatened, R: Rare, V: Vulnerable, E: Endangered, for each.

**2.1.2 Endemic Species and Communities; Biodiversity**

**2A. Priority of vegetation assemblage based on the distribution of endemic plant communities (>50 % of records within Southern Fleurieu), Coastal Dune and Clifftop communities.**

The statewide coverage of the CDCS survey was used to compare Southern Fleurieu with other coastal regions of South Australia: if more than 50% of records of a plant community were found within the Southern Fleurieu coastal boundary, it was rated, as in the table below. This rating thus reflected the degree of endemism to the coast of the Southern Fleurieu.

*Prioritisation within theme:*

No priority	50.1-60 % records in SA	60.1-70 % records in SA	70.1-80 % records in SA	80.1 + 100% records in SA
0	3	5	7	9

**2B. Priority of vegetation assemblage based on the distribution of endemic Habitat (>50 % of habitat within Southern Fleurieu) (Saltmarsh communities)**

Coastal saltmarsh and mangrove mapping undertaken systematically around the state by the Coast Protection Branch, Department for Environment and Heritage SA, provides an endemism rating for saltmarsh plants areas within the Southern Fleurieu coast. However, only 2.3% of the coastal area is saltmarsh, recorded entirely within cells 1 and 2, (near the Murray Mouth).

*Prioritisation within theme:*

No priority	50.1-60% records in SA	60.1-70% records in SA	70.1-80% records in SA	80.1 + % records in SA
0	6	7	8	9

**2C. Priority of vegetation assemblage based on the proportion of vegetation within coastal cells/ SA (Floristic Vegetation)**

This layer was based on data from the national inventory of vegetation associations: a further reflection of the degree of endemism of associations within the Southern Fleurieu coast.

*Prioritisation within theme:*

No priority	50.1-60% records in SA	60.1-70 % records in SA	70.1-80 % records in SA	80.1 + % records in SA
0	6	7	8	9

**2D. Priority of sites based on species richness, total number of flora and fauna species**

This layer is based on a total number of plant and animal species recorded within each vegetation patch (>1 ha.). This rating reflected something of the value of large vegetation remnants to conservation priority.

*Prioritisation within theme:*

No Priority	63-102 species per patch	102-137 species per patch	137-183 species per patch	183-247 species per patch	247-333 species per patch	333-384 species per patch	>384 species per patch
0	3	4	5	6	7	8	9

**2.1.3 Significant Bird Habitats of the Fleurieu Peninsula**

**3A. Priority of sites based on the threatened status of the significant birds in Southern Fleurieu region.**

Bird lists for cells within the Southern Fleurieu were obtained from published records; these data were culled by Graham Carpenter, Department of Land Water & Biodiversity, to select significant species. National and State ratings were available from existing databases; updated regional ratings were obtained from Graham Carpenter.

*Prioritisation within theme:*

**3A.1 National Status (EPBC Act)**

Item	Criterion	Category	
		Vulnerable	Endangered
1	It has undergone, is suspected to have undergone or is likely to undergo in the immediate future:	a substantial reduction in numbers	a severe reduction in numbers
2	Its geographic distribution is precarious for the survival of the species and is:	limited	restricted
3	The estimated total number of mature individuals is:	limited	low
and or	(a) evidence suggests that the number will continue to decline at:	a substantial rate	a high rate
	(b) the number is likely to continue to decline and its geographic distribution is:	precarious for its survival	precarious for its survival
4	The estimated total number of mature individuals is:	low	very low
5	The probability of its extinction in the wild is at least:	10% in the medium-term future	20% in the near future
<b>Priority</b>		<b>5</b>	<b>9</b>

### 3A.2 SA status (Review of the Status of Threatened Species 2003)

Item	Criterion	Category		
		Rare (TSSA)	Vulnerable (IUCN)	Endangered (IUCN)
1	It has undergone a population reduction in the form of an observed, estimated, inferred or suspected reduction of at least:	>50% loss abundance and / or area occupied	20% over 10 years or 3 generations	50% over 10 years or 3 generations
2	Extent of occurrence estimated to be limited:	20 000 km <sup>2</sup> OR 2000 and highly fragmented	20 000 km <sup>2</sup>	5000 km <sup>2</sup>
and	Fragmented to a limited number of locations, continuing decline and extreme fluctuations		< 10 populations	< 5 populations
3	Population size estimated to be limited:	<3000 mature indiv.	< 10 000 mature indiv.	< 2500 mature indiv.
and	Continuing a rate of decline		>10% / 10 years or 3 generations	>20% / 5 yrs or 2 generations
4	Population estimated to be limited		< 1000 mature indiv.	250 mature indiv.
5	Quantitative analysis predicts extinction in the wild		>10 % within 100 years	>20 % within 20 years or 5 generations
	<b>Priority</b>	<b>1</b>	<b>5</b>	<b>9</b>

### 3A.3 Regional status (Birds – Graham Carpenter)

Common (C)/ Not Significant (N)	Uncommon (U)	Indeterminate (K)	Rare (R)/ Threatened (T)	Category	
				Vulnerable (V)	Endangered (E)
Considered widespread throughout most of its known distribution and under no immediate threat.	Although not an IUCN category, the term uncommon has been introduced to indicate plants, animals or vegetation types that are inadequately conserved or declining but are not yet threatened.	Likely to be Rare or Vulnerable but current information on populations are grossly inadequate to provide a better estimate of its conservation significance.	Considered to be at risk due to the low numbers of individuals even though no or little decline has been detected.	Considered likely to become endangered in the immediate future given current trends in populations and reasons for decline.	Considered to be in danger of becoming extinct in the wild in the immediate future given current trends in populations and reasons for decline.
<b>0</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>7</b>	<b>9</b>

#### 2.1.4 Significant Reptiles and Amphibian Habitats in Southern Fleurieu

##### 4A. Priority of Habitat for Reptile and Amphibians (based on the conservation status)

State Biological Survey records for reptiles and amphibians at locations within the coastal boundary were supplemented by expert input from Tim Milne. This was then linked to national and state ratings for species, as follows.

*Prioritisation within theme:*

#### 4A.1. National Status (EPBC Act)

Item	Criterion	Category	
		Vulnerable	Endangered
1	It has undergone, is suspected to have undergone or is likely to undergo in the immediate future:	a substantial reduction in numbers	a severe reduction in numbers
2	Its geographic distribution is precarious for the survival of the species and is:	limited	restricted
3	The estimated total number of mature individuals is:	limited	low
and	(a) evidence suggests that the number will continue to decline at:	a substantial rate	a high rate
or	(b) the number is likely to continue to decline and its geographic distribution is:	precarious for its survival	precarious for its survival
4	The estimated total number of mature individuals is:	low	very low
5	The probability of its extinction in the wild is at least:	10% in the medium-term future	20% in the near future
	<b>Priority</b>	<b>5</b>	<b>9</b>

#### 4A.2. SA status (Review of the Status of Threatened Species 2003)

Item	Criterion	Category		
		Rare (TSSA)	Vulnerable (IUCN)	Endangered (IUCN)
1	It has undergone a population reduction in the form of an observed, estimated, inferred or suspected reduction of at least:	>50% loss abundance and / or area occupied	20% over 10 years or 3 generations	50% over 10 years or 3 generations
2	Extent of occurrence estimated to be limited:	20 000 km <sup>2</sup> OR 2000 and highly fragmented	20 000 km <sup>2</sup>	5000 km <sup>2</sup>
and	Fragmented to a limited number of locations, continuing decline and extreme fluctuations		< 10 populations	< 5 populations
3	Population size estimated to be limited:	<3000 mature indiv.	< 10 000 mature indiv.	< 2500 mature indiv.
and	Continuing a rate of decline		>10% / 10 yrs or 3 generations	>20% / 5 yrs or 2 generations
4	Population estimated to be limited		< 1000 mature indiv.	250 mature indiv.
5	Quantitative analysis predicts extinction in the wild		>10% within 100 yrs	>20% within 20 years or 5 generations
	<b>Priority</b>	<b>1</b>	<b>5</b>	<b>9</b>

#### 4B. Priority of Habitat for Reptile and Amphibians (based on Regional Abundance)

Species found in surveys (Biological Survey Group) have been supplemented by expert knowledge of reptiles in the area from Tim Milne, to include species that have a high likelihood of being present in the area.

*Prioritisation within theme:*

Common	Uncommon	Rare
1	5	9

#### 4C. Priority of Habitat for Reptile and Amphibians (based on Regional Coastal Distribution)

Species found in surveys (Biological Survey Group) have been supplemented by expert knowledge of reptiles in the area from Tim Milne, to include species that have a high likelihood of being present in the area.

Prioritisation within theme:

Widespread	Restricted
1	9

#### 4D. Priority of Habitat for Reptile and Amphibians (Coastal Dependency)

Species found in surveys (Biological Survey Group) have been supplemented by expert knowledge of reptiles in the area from Tim Milne, to include species that have a high dependency on the coast as habitat.

Prioritisation within theme:

No dependence on coastal habitat	Partial Dependence	Dependent
1	5	9

### 2.1.5 Significant Butterfly Habitats of the Southern Fleurieu

#### 5A. Priority of vegetation assemblage as habitat for butterflies

Based on the work of R. Grund (1997 & pers. comm. 2006) showing those areas identified as priority habitats for butterfly larvae. This habitat can be both remnant vegetation and landscape based.

Prioritisation within theme:

Not significant	Habitat with potential for threatened species following considerable restoration.	Habitat, with significant patches, with possible potential for threatened species.	Significant habitat in mixed to poor condition, but with considerable potential for threatened species.	Highly significant, extensive butterfly habitat, suffering degradation; suitable for revegetation and/or re-introduction of rare species.	Highly significant, extensive butterfly habitat, suitable for additional revegetation with foodplants.	Unique, extensive butterfly habitat (rare foodplants or breeding habitat); containing rare or locally significant butterfly species.
0	1	3	5	7	8	9

### 2.1.6 Focal Species Within the Southern Fleurieu

#### 6A. Priority of location (vegetation remnant / coastal unit) based on the distribution of Hooded Plover (Focal Species)

Nineteen of the twenty-seven coastal cells of the Southern Fleurieu have published records of Hooded Plover, *Thinornis rubricollis*.

This layer is based on communication with the Science and Conservation Directorate of DEH, where a Hooded Plover recovery plan is under construction. Emma Stephens has provided input on recent sightings and nesting locations. The national status of the species under the EPBC Act is under review, but it appears likely to be listed as endangered; the Hooded Plover is listed as endangered in South Australia.

Prioritisation within theme:

Absent	Previously Recorded Site	Key Nesting Location
0	5	9

## 2.1.7 Fragmentation and Isolation of Remnant Vegetation Communities

Vegetation patch metrics in this section are derived from current mapping of remnant vegetation. The methodology used here was developed by Nerissa Haby and Matthew Royal for the conservation priorities study of the Northern Yorke NRM region, (Caton et al 2006, section 2).

### 7A. Priority of remnant vegetation based on patch size

Details of remnant vegetation patch size are readily available from current mapped data.

*Prioritisation within theme:*

< 1 ha	1-5 ha	5-30 ha	30-100 ha	100-500 ha	500-1500 ha	>1500 ha
0	4	5	6	7	8	9

### 7B. Priority of vegetation assemblage based on connectivity (minimum distance to nearest patch)

The minimum distance between a patch and its nearest neighbour is used in this study to indicate the degree of connectivity. A series of categories were determined to indicate the value of the patch based on classifying minimum distance between patches. The priority values were applied to whole vegetation blocks.

*Prioritisation within theme:*

>10 km	5-10 km	2-5 km	1-2 km	75-1000 m	501-750 m	251-500 m	101-250 m	0-100 m
1	2	3	4	5	6	7	8	9

Where the priority of vegetation communities is identified through its distance to the nearest patch.

### 7C. Priority of remnant vegetation based on presence

This layer provides the opportunity to value patches of remnant vegetation < 1 ha that were excluded from other themes used in the analysis. Small patches provide refuge and resources throughout the landscape, thus this layer was created to include this value in the analysis.

*Prioritisation within theme:*

Absent	Present
0	9

### 7D. Priority of vegetation assemblage based on patch shape: Edge to Interior ratio

The clearance of native vegetation for development has left many patches with irregular shapes. Along the coast many remnants are linear in form; however this shape leaves them vulnerable to increased risk of invasion by exotic plants and by predators. Vegetation patch shapes with large rounded (less degraded) habitat will withstand invasion and further degradation better than elongated or irregular patches, where more edge perimeter will allow easier invasion etc. Some animals prefer areas away from patch edges, and thus shape is relevant to habitat.

A simple method to express the degree of edge effect was applied to each of the vegetation blocks within the Southern Fleurieu coastal boundary:

$$\text{Relative edge effect} = \text{perimeter (m)} / \text{area (ha)}$$

Patches containing a high proportion of interior habitat will have a relatively small perimeter and large area; the relative edge effect will have a small value, hence a large priority score in the table below.

*Prioritisation within theme:*

No Priority	E / I >600	E / I 501-600	E / I 401-500	E / I 301-400	E / I 201-300	E / I 101-200	E / I 0.1-100
0	3	4	5	6	7	8	9

## 2.1.8 Heritage

### 8A. Aboriginal Heritage sites

Locations of registered sites obtained from the Department for Premier and Cabinet to be shown as a presence/ absence layer.

*Prioritisation within theme:*

Not significant	Significant sites
0	9

Where the presence and absence of significant sites are identified as significant (category 1) or insignificant (category 0) within the Southern Fleurieu boundary.

### 8B. European Heritage Sites

This layer identifies sites designated as 'European Heritage' on the State Heritage Register, or the Register of the National Estate.

The priority value for European Heritage sites was based on the proportion of European Heritage site area within the Coastal Cells.

*Prioritisation within theme:*

Not significant	Significant sites
0	9

Where the presence and absence of significant sites are identified as significant (category 1) or insignificant (category 0) within the Southern Fleurieu boundary.

### 8C. Natural Heritage sites

This layer identifies sites designated 'natural heritage' on the State Heritage Register, or the Register of the National Estate.

*Prioritisation within theme:*

Not significant	Significant sites
0	9

Where the presence and absence of significant sites are identified as significant (category 1) or insignificant (category 0) within the Southern Fleurieu boundary.

### 8D. Geological monuments

Geological monuments are defined by the Geological Society of Australia, South Australian Branch and the data is held by Primary Industry, Mines Department (Wayne Cowley). Layers locating geological monuments are readily available from PIRSA and are also held by DEH.

*Prioritisation within theme:*

Not significant	Significant sites
0	9

Where the presence and absence of significant sites are identified as significant (category 1) or insignificant (category 0) within the Southern Fleurieu boundary.

## 2.2 Threatening Processes Layers

### 2.2.1 Acid Sulphate Soils

The priority of the saltmarsh habitats is dependent on the potential for that area to develop Acid Sulphate Soil (ASS) conditions; based on the classification developed by the CSIRO and the CPB (see Coast Protection Board, 2003).

*Prioritisation within theme:*

No Saltmarsh / Calc Areas	Marine/ Sand	Potential ASS (S)	Potential ASS (l)	Potential ASS (d)	Potential ASS (m)	Actual ASS
0	1	3	5	5	7	9

### 2.2.2 Campsites

These have been obtained from local knowledge (A. Eaton), aerial photography and land use data. The category 'formal camping' below, includes Council camping and caravan sites and National Parks campsites. Informal sites are those identified as informal sites that are regularly, but sometimes infrequently, used.

*Prioritisation within theme:*

No Campsites	Formal Camping	Informal Camping
0	5	9

### 2.2.3 Development Potential

Currently available in existing layers. Planning SA development zones which are termed Developed / Allowing Further Development, are considered a threat. Where development is not allowed there is no threat potential.

*Prioritisation within theme:*

Not Developed/ No Development Allowed	Developed/ Allowing Development
0	9

### 2.2.4 Dump and Wastewater Processing Sites

Currently available in existing layers (E.I.A Branch: refer to GIS layer used in assessing the "SA Coastal Land Development Suitability").

*Prioritisation within theme:*

No dump/ wastewater processing site	Dump/ wastewater processing site present
0	9

### 2.2.5 Dune Stability

This layer was created from aerial photographic data (February 2005) by the Coast Protection Branch DEH, and checked for this project (September 2006). All coastal dunes were categorised as having potential dune hazard; unvegetated dunes were classed as 'actual dune hazard'.

*Prioritisation within theme:*

No Dunes	Potential Drift Hazard	Actual Drift Hazard
0	5	9

### 2.2.6 Cliff Stability

This layer was created for this project in May 2006, from oblique aerial photography (May 2003) and checked on vertical aerial photography. The data refers to coastal cliffs and steep slopes adjacent to river mouths and estuaries.

*Prioritisation within theme:*

Cliff Stable	<50m & Potential Instability	>50m & Potential Instability	<50m & Actual Instability	>50m & Actual Instability
0	3	5	7	9

### 2.2.7 Land Ownership

Currently available in existing layers (E.I.A Branch: refer to GIS layer used in assessing the "SA Coastal Land Development Suitability").

*Prioritisation within theme*

Private Properties	SA Water Reserves	Crownland Areas	Forestry SA Reserves	Road & Railway Reserves	Heritage Agreement Properties	NPWSA Reserves
9	4	4	4	4	1	0

### 2.2.8 Land Use

Land use is derived from a Planning SA Land use layer recorded in 2005. Land use was rated for this project according to its threat potential to conservation values.

*Prioritisation within theme:*

Residential/ Commercial/ Public Inst/ Util & Industy/ Roads	Golf/ Recreation/ Education/ Retail/ Vacant_Res	Agriculture/ Horticulture/ Livestock/ Rural Residential	Vacant Land - Rural	NPWSA Reserves/ Areas not covered by Land-use codes
9	9	7	7	0

### 2.2.9 Mining Activities

Exploration leases and mining tenements are regulated by PIRSA Mining, and recorded publicly on the PIRSA website. Mining is rated according to its potential for impact on conservation values, without regard to rehabilitation potential.

*Prioritisation within theme:*

No threat from Mining Activities	Exploration Lease Application	Exploration` Lease	Actual Mining Tenement
0	5	7	9

## 2.2.10 Vegetation Isolation

Currently created layers as part of 2.1.7 Fragmentation and Isolation of Remnant Vegetation Communities. The opposite of the vegetation connectivity layer, as part of the conservation layers.

*Prioritisation within theme:*

Reversed from the patch connectivity layer created as part of the conservation layers

>10 km	5-10 km	2-5 km	1-2 km	751-1000 m	501-750 m	251-500 m	101-250 m	0-100 m
9	8	7	6	5	4	3	2	1

## 2.2.11 Vegetation Degradation

Information for this theme may be available from data collected during existing surveys. For simplicity and consistency it can be necessary to interpret the degradation of a community through the number of exotic plant species recorded.

*Prioritisation within theme:*

>20% of vegetation community comprised of introduced species	16-20% of vegetation community comprised of introduced species	10-15% of vegetation community comprised of introduced species	6-10% of vegetation community comprised of introduced species	<5% of vegetation community comprised of introduced species	0% of vegetation community comprised of introduced species
9	7	5	3	1	0

Where the priority of vegetation communities is based on the proportion of introduced species within it.

## 2.2.12 Vegetation Patch Shape

Currently created layers as part of 2.1.7 Fragmentation and Isolation of Remnant Vegetation Communities. They are used as a measure of possible invasion of threatening species due to shape. Vegetation patch shapes with large rounded (less degraded) habitat will withstand invasion and further degradation better than elongated or irregular patches, where more edge perimeter will allow easier invasion. Some animals prefer areas away from patch edges, and thus shape is relevant to habitat.

*Prioritisation within theme:*

No Vegetation	E / I >600	E / I 501-600	E / I 401-500	E / I 301-400	E / I 201-300	E / I 101-200	E / I 0.1-100
0	9	7	6	5	4	3	2

Where the priority of vegetation communities is based on the proportion of introduced species within it.

## 2.2.13 Vegetation Patch Size

Currently created layers as part of 2.1.7 Fragmentation and Isolation of Remnant Vegetation Communities. The opposite of the vegetation connectivity layer. Easily calculated for Patch ID in existing layers (E.I.A Branch). Suggests that those patches with a larger size have a reduced threat of being lost or overrun with non-indigenous species as they are more robust and likely to remain in their current "natural state".

*Prioritisation within theme:*

< 1 ha	1-5 ha	5-30 ha	30-100 ha	100-500 ha	500-1500 ha	>1500 ha
9	7	6	5	4	2	1

## 2.2.14 Viewshed Analysis

This layer is used to highlight the increased pressure that a coastal vista /sea-view places on that area of land.

*Prioritisation within theme:*

No sea view	Sea views
0	9

Where the presence and absence of significant sites are identified as significant (category 1) or insignificant (category 0) within the Southern Fleurieu boundary.

### **2.2.15 Viewscape Analysis**

This layer uses the study that Andrew Lothian carried out throughout the state to score areas for scenic value. As such those areas with a higher scenic value will contribute to a higher threat value in this layer due to their increased desirability for development and the like.

*Prioritisation within theme:*

No viewscape value	3 – 3.9 value	4 – 4.9 value	5 – 5.9 value	6 – 6.9 value	7 – 7.9 value	8 – 8.9 value
0	4	5	6	7	8	9

The higher the viewscape number the more Aesthetically pleasing the area of coast is seen in Andrew Lothian's study therefore an inherent increased desirability.

(Lothian, A, 2005)

### **2.2.16 Distribution of known environmental weeds**

This layer has been developed in the Coast and Marine Protection Branch and Urban Biodiversity section of DEH (Sandercock and Petherick). See 4.3 and Appendix 11.

## **2.3 Method Of Rating Priority**

By M Royal

### **2.3.1 Using Desktop GIS Analysis to Highlight Conservation Priorities Within This Study**

One feature of the Southern Fleurieu Coastal Study is the aim to highlight areas of conservation priority within the coastal zone using desktop GIS techniques. Moreover it aims to allow comparison of areas of high conservation priority to those areas with perceived threat processes operating to pinpoint areas in need of more protection or management. To do so, data from numerous databases, not often drawn upon together, was combined to add as much up-to-date information from as many sources as possible. The numerous data sources utilised and created as part of the project are listed in 2.3.

The analysis undertaken within this study can be separated into two components: analysis of conservation priorities and analysis of threat processes, both following a similar workflow. In general the analysis commenced using data in its original base GIS state, whether the layers currently existed in databases or were created from additional data sources specifically obtained for the project.

Features within each GIS layer were categorised from low importance to high importance using priority values (scaled 0 to 9), established for each data theme by the working group, depending on what characteristics the features of each GIS layer possessed. A more detailed explanation of these priority values and how they were applied to the data is discussed in section 2, Description of Themes and Databases.

Once each GIS layer was characterised using conservation priority or threat process values each data theme was rasterised as a geo-referenced 25 x 25m grid layer. These raster layers, covering the entire Southern Fleurieu coastal boundary, used priority values assigned to the features within each base GIS layer to provide grid values. The conversion of base GIS layers to raster grids allows the vast amount of spatial data used to be quickly and effectively summarised and analysed using the raster layers' coincident grid nature.

Having successfully rasterised each of the conservation priority and threat process data layers, the next step was to combine those numerous layers into two raster layers. One raster layer focused on the combined conservation priority areas and the other on the combined threatening process areas. The resulting 'detailed

conservation priority raster analysis layer' and the 'detailed threatening processes raster analysis layer' form the basis for many of the GIS conclusions drawn in the project. These layers allow areas of high conservation priority and contrasting high threat, from numerous coincident conservation and threat types, to be pinpointed at the base grid level of 25 x 25m. While easily highlighting small portions of the landscape with higher conservation or threat levels, a need to generalise this at a manageable scale to identify areas of higher priority resulted in the 'conservation priority analysis coastal cell summary' and the 'threatening processes analysis coastal cell summary'.

Both of the final summary layers are the result of statistical analysis carried out on each of the individual conservation priority and threat process raster layers. Each raster layer was statistically summarised by calculating the mean of all grid cell values within each coastal cell. Having summarised each raster analysis layer the mean of each coastal cell would provide the priority value for the entire coastal cell. Furthermore, by combining the raster analysis layer summaries together (finding the total sum of the means for all themes within the coastal cells) a combined 'conservation priority analysis coastal cell summary' and a combined 'threatening processes analysis coastal cell summary' were created.

These combined coastal cell summary layers form the basis of a number of conclusions drawn within this study. The higher the mean value is, the greater the proportion of the area within that coastal cell, which achieves a high value for the combined conservation priority and threatening processes. The ability to determine those coastal cells with a high combined conservation priority due to higher conservation priorities within a number of the layers is a matter of working out those coastal cells with the highest combined conservation priority value. This process quickly yields which of the coastal cells requires more attention than others. Furthermore by carrying out the same process on the combined threatening process layer, coastal cells influenced by a number of significant threatening processes can be quickly determined. The determination of high conservation priorities and threatening processes at a coastal cell level will serve as a pointer to specific areas within these coastal cells requiring conservation management by reverting back to the detailed 25x25m raster analysis layers created earlier.

The GIS analysis undertaken provided an effective means of pinpointing areas within the Southern Fleurieu coastal zone that have high conservation value due to a reinforcement of a variety of conservation priorities in some areas and not others. Specifically the ability to interrogate numerous sources of data within multiple data themes makes it a comprehensive and reliable desktop analysis using the most up-to-date information available. Additionally, the analysis layers are quickly updated if additional detailed or current information becomes available.

## 2.4 GIS Datasets Table

GIS Datasets used in the Southern Fleurieu Coastal Management Plan					
Existing GIS Datasets used within the Southern Fleurieu Coastal Conservation Plan:					
GIS Dataset	Mapping Scale	Positional Accuracy	Custodian/ Source	Currency Date	Description
<b>Natural Features</b>					
Coastal Hazard Mapping	1:50000	0 - 50m	DEH - Coastal Protection	Feb-05	Coastal hazard mapping - mapping of sand dunes & storm surge areas.
Coastal Wetlands	1:50000	0 - 50m	DEH - Coastal Protection	Dec-04	Location of coastal wetlands as identified in the Australian Wetlands Database.
Floristic Vegetation	Varied	0 - 250m	DEH - Environmental Information	Sep-06	Location of Floristic Vegetation types.
Geological Monuments	Varied	0 - 150m	PIRSA	Feb-05	Location of Geological Monuments registered with the Geological Society of Australia.
National Estate Register - Natural	Varied	0 - 150m	Australian Heritage Commission	Feb-05	Natural locations of significance within the Australian Heritage Commission (AHC) Statutory Register of the National Estate (RNE).
Native Vegetation - Cover	Varied	0 - 250m	DEH - Environmental Information	Sep-06	Mapping of the presence / absence of native vegetation.
New Zealand Fur Seal Colonies	1:50000	0 - 500m	DEH - Bio. Survey & Monitoring	Jul-04	Significant NZ Fur Seal breeding and haul out sites for habitat conservation purposes.

Planted Vegetation	Varied	0 - 250m	DEH - Environmental Information	Aug-03	Location of Vegetation Plantations.
SA Coastline	1:10000	0 - 25m	DEH - Environmental Information	Dec-05	Location of mean sea level.
Seabird Colonies	1:50000	0 - 500m	DEH - Bio. Survey & Monitoring	Jul-04	Significant seabird habitat sites within SA.
Tidal Saltmarsh and Mangrove Habitat Mapping	1:10000	0 - 50m	DEH - Coastal Protection	Jun-06	Tidal saltmarsh and mangrove habitat mapping.
Viewshed Raster	25x25m Grid	0 - 50m	DEH - Coastal Protection	Jun-05	Viewshed grid covering the southern Fleurieu Coastal Boundary.
<b>Administrative / Regional Boundaries</b>					
Aquatic Reserves	1:50000	0 - 100m	PIRSA - SARDI	Sep-06	Aquatic Reserves ( <i>Fisheries Act 1982</i> ).
Built-Up Areas	1:50000	0 - 25m	DEH - Environmental Information	Jun-05	Location of Built-up areas.
Council/ LGA Boundaries	Various	0 - 30m	DEH - Environmental Information	Sep-06	Location of Local Government Areas / Councils extents.
Digital Cadastre Database Land Parcels	Varied	0 - 30m	DEH - Environmental Information	Sep-06	Legal land parcel boundaries within the state.
EPA Licence Sites	Cadastre Based	0 - 30m	EPA	May-05	Location of EPA licence sites.
Geomorphic Regions	1:50000	0 - 50m	DEH - Coastal Protection	Sep-06	Coastal Protection Branch Geomorphic Region boundaries.
Herbarium Regions	1:50000	0 - 500m	DEH - Bio. Survey & Monitoring	Sep-06	Regions of South Australia adopted by the State Herbarium.
Land Development Zones	Cadastre Based	0 - 30m	Planning SA	Sep-06	Planning zones and policy areas derived from council development plans.
Land Use Boundaries	Cadastre Based	0 - 30m	Planning SA	Sep-06	Land use.
Mineral Exploration Licence Applications	Varied	0 - 150m	PIRSA	Sep-06	Location of Mineral Exploration Licence Applications ( <i>Mining Act 1971</i> ).
Mineral Exploration Licences	Varied	0 - 150m	PIRSA	Sep-06	Location of Mineral Exploration Licences ( <i>Mining Act 1971</i> ).
Mining Tenements	Varied	0 - 150m	PIRSA	Sep-06	Location of Mineral Production Tenements ( <i>Mining Act 1971</i> ).
National Estate Register - Aboriginal	Varied	0 - 150m	Australian Heritage Commission	Feb-05	Aboriginal locations of significance in the Australian Heritage Commission (AHC) Statutory Register of the National Estate (RNE).
National Estate Register - European	Varied	0 - 150m	Australian Heritage Commission	Feb-05	European locations of significance in the Australian Heritage Commission (AHC) Statutory Register of the National Estate (RNE).
Native Vegetation Heritage Agreements	Cadastre Based	0 - 30m	DEH - Environmental Information	Sep-06	Native vegetation Heritage Agreement area boundaries ( <i>Native Vegetation Act 1991</i> ).
Natural Resource Management Regions	Cadastre Based	0 - 30m	DLWBC	Sep-06	Natural Resource Management Region boundaries ( <i>NRM Act 2004</i> ).
Petroleum Exploration Licence Applications	Varied	0 - 150m	PIRSA	Sep-06	Location of Petroleum Exploration Licence / Permit Applications ( <i>Petroleum Act 2000</i> , <i>Petroleum (Submerged Lands) Act, 1982</i> , or <i>Petroleum (Submerged Lands) Act 1967</i> ).

Petroleum Exploration Licences	Varied	0 - 150m	PIRSA	Sep-06	Location of Petroleum Exploration Licences / Permits ( <i>Petroleum Act 2000, Petroleum (Submerged Lands) Act 1982, or Petroleum (Submerged Lands) Act 1967</i> ).
Petroleum Production Tenements	Varied	0 - 150m	PIRSA	Sep-06	Location of Petroleum Production Licences ( <i>Petroleum Act 2000, Petroleum (Submerged Lands) Act 1982, or Petroleum (Submerged Lands) Act 1967</i> ).
Protected Areas - NPWS and Conservation Reserve Boundaries	Cadastral Based	0 - 30m	DEH - Bio. Survey & Monitoring	Dec-04	NPWS Reserve boundaries ( <i>NPW Act 1972</i> ) & NPWS conservation reserve boundaries ( <i>Crown Lands Act 1929</i> ).
Quarries	1:50000	0 - 50m	DEH - Environmental Information	Sep-06	Location of Quarries.
Roads	1:50000	0 - 50m	DEH - Environmental Information	Sep-06	Location of road centrelines.
Railways	1:50000	0 - 50m	DEH - Environmental Information	Sep-06	Location of railways.
SA Water Land	Cadastral Based	0 - 30m	SA Water	Jan-05	Location of SA Water lands.
Statewide Crown Land	Cadastral Based	0 - 30m	DEH - Crownlands SA	Feb-06	Legal land parcel boundaries within the state held under the control of the Crown.
<b>Survey Records</b>					
Biological Survey Database - Vegetation	Varied	0 - 1000m	DEH - Bio. Survey & Monitoring	Sep-06	Vegetation survey sites completed by the Biological Survey of SA.
Biological Survey Database - Vertebrates	Varied	0 - 1000m	DEH - Bio. Survey & Monitoring	Sep-06	Vertebrate fauna survey sites completed by the Biological Survey of SA.
Bird Atlas: Birds Australia	Varied	0 - 5000m	Birds Australia	Oct-01	Opportunistic bird survey sites collected by field ecologists associated with Birds Australia.
Coastal Dune and Clifftop Vegetation Survey Sites (CDCS Survey Sites)	Varied	0 - 1000m	DEH - Coastal Protection	Feb-05	Vegetation survey sites taken from the biological databases highlighting Coastal Dune and Clifftop specific communities from Oppermann's 1999 Coastal Dune and Clifftop Vegetation Survey (CDCS).
Opportunistic Survey Database – Vegetation	Varied	0 - 5000m	DEH - Bio. Survey & Monitoring	Sep-06	Opportunistically collected vegetation data - collected by various sources.
Opportunistic Survey Database – Vertebrates	Varied	0 - 5000m	DEH - Bio. Survey & Monitoring	Sep-06	Opportunistically collected vertebrate fauna data - collected by various sources.
Rare and Threatened Plant Populations	Varied	0 - 1000m	DEH - Bio. Survey & Monitoring	Sep-06	Vegetation sites corresponding to DEH's Rare and Threatened Plant Population database.
Reserve Survey Database - Vegetation	Varied	0 - 1000m	DEH - Bio. Survey & Monitoring	Sep-06	Vegetation data collected within reserves by various sources.
Reserve Survey Database - Vertebrates	Varied	0 - 1000m	DEH - Bio. Survey & Monitoring	Sep-06	Vertebrate fauna data collected within reserves by various sources.

**GIS Datasets created for the Southern Fleurieu Coastal Conservation Project:**

GIS Dataset	Mapping Scale	Positional Accuracy	Custodian/ Source	Currency Date	Description
Natural/ Administrative/ Regional Features & Boundaries					
Butterfly Habitats	1:50000	0 - 250m	Rodger Grund	Sep-06	Significant butterfly locations within the coastal boundary obtained from DEH butterfly expert Rodger Grund
Campsites	1:10000	0 - 50m	DEH - Coastal Protection	Sep-06	Location of known sites used for camping within the Southern Fleurieu Coastal Boundary.
Cliff Hazard Mapping	1:50000	0 - 50m	DEH - Coastal Protection	Sep-06	Cliff hazard mapping - Location of various erosional states of the Southern Fleurieu Cliffs.
Coastal Boundary	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	The study area used within the Southern Fleurieu project to determine the coastal region. An area outlined by the mean sea-level and the furthest landward edge of either saltmarsh & mangrove habitats, sand dune complexes, native vegetation blocks considered coastal or a 500m buffer from the coastline.
Coastal Cell Boundaries	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Using the Coastal Boundary as a basis, it was divided into 'Cells' of similar coastal features, wave / fetch exposure & type.
Hooded Plover Areas	1:50000	1 - 50m	DEH - Science & Conservation	Sep-06	Significant Hooded Plover locations found within the Southern Fleurieu coastal study area.
Reptile Habitats	Varied	1 - 250m	DEH - Urban Forests	Sep-06	Reptile habitat locations as described by reptile experts Tim Milne & Clare Petherick at Urban Forests.
State Heritage Register	Varied	0 - 50m	DEH - Heritage SA	Sep-06	Locations of Coastal Use, Natural, European & Aboriginal Heritage noted in the State Heritage Register Database.
Study Vegetation Blocks	Varied	0 - 250m	DEH - Coastal Protection	Sep-06	Uniquely identifies all the native vegetation blocks within the coastal boundary.
Local Vegetation Survey	1:50000	0 - 1000m	Ron Taylor	Sep-06	Vegetation species locations within coastal cells obtained from local expert Ron Taylor.

Survey Records (Points created from tables)					
<b>Raster Analysis Layers Created From GIS Datasets Listed Above:</b>					
GIS Dataset/ Raster Layer	Resolution	Positional Accuracy	Custodian/ Source	Currency Date	Description
Conservation Priority Raster Layers					
1A - CDCS Threatened Communities conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblages based on the status of the Coastal Dune and Cliff-top vegetation communities (threatened status).
1B - Southern Fleurieu CDCS rare plant communities conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblages based on the rarity of Coastal Dune and Cliff-top vegetation communities (those with <20 records within the state).
1C - Threatened flora conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of sites with threatened Flora (threatened status).
1D - Threatened fauna conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of sites with threatened Fauna (threatened status).
1E - Total threatened species conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of sites based on total number of threatened species (total no. threatened species).
2A - Southern Fleurieu CDCS endemic plant communities conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblages based on the distribution of endemic Coastal Dune and Cliff-top vegetation communities (> 50% of records within Southern Fleurieu area of interest).

2B - Endemic Saltmarsh and Mangrove Habitat communities conservation priority layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblages based on the distribution of endemic Saltmarsh and Mangrove Habitat communities (> 50% of records within Southern Fleurieu area of interest).
2C - Endemic Floristic communities conservation priority layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblages based on the distribution of endemic Saltmarsh and Mangrove Habitat communities (> 50% of records within Southern Fleurieu area of interest).
2D - Species richness conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of sites based on species richness (total no. species).
3 - Significant bird habitats conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblages as habitat for birds.
4A - Significant reptile and amphibian habitats (conservation status) conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblage as habitat for reptiles and amphibians based on conservation status.
4B - Significant reptile and amphibian habitats (regional abundance) conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblage as habitat for reptiles and amphibians based on regional abundance.
4C - Significant reptile and amphibian habitats (regional coastal distribution) conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblage as habitat for reptiles and amphibians based on regional coastal distribution.
4D - Significant reptile and amphibian habitats (coastal dependency) conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblage as habitat for reptiles and amphibians based on coastal dependency.
5 - Significant butterfly habitats conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblage as habitat for butterflies.
6 - Hooded Plover (focal species) habitat conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of location (vegetation remnant/ coastal unit) based on the distribution of the Hooded Plover (focal species).
7A - Vegetation patch size conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of remnant vegetation based on patch size.
7B - Vegetation patch connectivity conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of remnant vegetation based on connectivity (minimum distance to nearest patch).
7C - Presence of vegetation patch <1ha conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblages based on the presence of remnant vegetation <1ha.
7D - Vegetation patch shape conservation priority layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Conservation priority of vegetation assemblages based on patch Edge to Interior Ratio or Relative Edge Effect (REE). Where REE = Perimeter (m) / Area (ha).
Indigenous Heritage Sites conservation priority layer	25 x 25m Grid	Up to 5 Grid Cells (0 - 150m)	DEH - Coastal Protection	Sep-06	Conservation priority of significant Indigenous Heritage Sites.
European Heritage Sites conservation priority layer	25 x 25m Grid	Up to 5 Grid Cells (0 - 150m)	DEH - Coastal Protection	Sep-06	Conservation priority of significant European Heritage Sites.
Natural Heritage Sites conservation priority layer	25 x 25m Grid	Up to 5 Grid Cells (0 - 150m)	DEH - Coastal Protection	Sep-06	Conservation priority of significant Natural Heritage Sites.
Geological Monuments conservation priority layer	25 x 25m Grid	Up to 5 Grid Cells (0 - 150m)	DEH - Coastal Protection	Sep-06	Conservation priority of significant geological monuments.
Detailed 25 x 25m Conservation Priority Analysis Layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	The final combined conservation priority analysis layer - created by summing all the individual conservation priority layers (listed above) together into one layer - the highest priority areas being the result of numerous conservation priorities having an influence on that location.
<b>Threatening Processes Raster Layers</b>					
Acid Sulphate Soils threat layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the presence of Acid Sulphate soils.
Campsite threat layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the increased activity associated with campgrounds of an informal (high threat) or formal (medium threat) type.

Development Zoning threat layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the ability through zoning regulations to develop the land.
Dump & Wastewater Treatment Plant threat layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the presence of waste dumps / infills / storage facilities and treatment plants.
Dune Stability threat layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the presence of dunes and their likelihood to shift when disturbed.
Cliff Stability threat layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the presence of cliff and their vulnerability to erosion.
Land ownership threat layer	25 x 25m Grid	Up to 2 Grid Cells (0 - 50m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the type of land ownership present and the threat that that type of ownership creates.
Land use threat layer	25 x 25m Grid	Up to 5 Grid Cells (0 - 150m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the type of land use present and the threat that that land use creates.
Mining activity threat layer	25 x 25m Grid	Up to 5 Grid Cells (0 - 150m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the level of mining activity possible (from no activity, through possible exploration to extractive processes) and the threat that that activity creates.
Vegetation Isolation threat layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from a lack of connectivity between vegetation patches.
Vegetation degradation threat layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the degradation level of the vegetation patches.
Vegetation patch shape threat layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the shape of the vegetation patches.
Vegetation patch size threat layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from the size of the vegetation patches.
Viewshed threat layer	25 x 25m Grid	Up to 5 Grid Cells (0 - 150m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from that area having a favourable outlook on the sea and an ability to develop on that area.
Viewscape threat layer	25 x 25m Grid	Up to 5 Grid Cells (0 - 150m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat due to increased aesthetics of coastal areas - based on previous work carried out by DEH.
Weed threat layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	Priority of locations based on the threat from weed species within the vegetation patches.
Detailed 25 x 25m Threatening Processes Analysis Layer	25 x 25m Grid	Up to 10 Grid Cells (0 - 250m)	DEH - Coastal Protection	Sep-06	The final combined threat analysis layer - created by summing all the individual threatening processes layers listed above into one layer - the highest priority areas being the result of numerous threatening processes having an influence on that location.

<b>Analysis Coastal Cell Summary Layers Created From Analysis Raster Layers Listed Above:</b>					
<b>GIS Dataset</b>	<b>Mapping Scale</b>	<b>Positional Accuracy</b>	<b>Custodian/Source</b>	<b>Currency Date</b>	<b>Description</b>
<b>Summarised Coastal Cell Conservation Priority Layers</b>					
1A - CDCS Threatened Communities conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for vegetation assemblages based on the status of the Coastal Dune and Clifftop vegetation communities (threatened status).
1B - Southern Fleurieu CDCS rare plant communities conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for vegetation assemblages based on the rarity of Coastal Dune and Clifftop vegetation communities (those with <20 records within the state).
1C - Threatened flora conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for sites with threatened flora (threatened status).
1D - Threatened fauna conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for sites with threatened fauna (threatened status).
1E - Total threatened species conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for sites based on total number of threatened species (total no. threatened species).

2A - Southern Fleurieu CDCS endemic plant communities conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for vegetation assemblages based on the distribution of endemic Coastal Dune and Cliff-top vegetation communities (> 50% of records within Southern Fleurieu area of interest).
2B - Endemic Saltmarsh and Mangrove Habitat communities conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for vegetation assemblages based on the distribution of endemic Saltmarsh and Mangrove Habitat communities (> 50% of records within Southern Fleurieu area of interest).
2C - Endemic Floristic communities conservation priority coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for vegetation assemblages based on the distribution of endemic Saltmarsh and Mangrove Habitat communities (> 50% of records within Southern Fleurieu area of interest).
2D - Species richness conservation priority coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for of sites based on species richness (total no. species).
3 - Significant bird habitats conservation priority coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for of vegetation assemblages as habitat for birds.
4A - Significant reptile and amphibian habitats (conservation status) conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for of vegetation assemblage as habitat for reptiles and amphibians based on conservation status.
4B - Significant reptile and amphibian habitats (regional abundance) conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for of vegetation assemblage as habitat for reptiles and amphibians based on regional abundance.
4C - Significant reptile and amphibian habitats(regional coastal distribution) conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for vegetation assemblage as habitat for reptiles and amphibians based on regional coastal distribution.
4D - Significant reptile and amphibian habitats(coastal dependency) conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for vegetation assemblage as habitat for reptiles and amphibians based on coastal dependency.
5 - Significant butterfly habitats conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for of vegetation assemblage as habitat for butterflies.
6 - Hooded Plover (focal species) habitat conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for location (vegetation remnant/ coastal unit) based on the distribution of the Hooded Plover (focal species).
7A - Vegetation patch size conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for remnant vegetation based on patch size.
7B - Vegetation patch connectivity conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for remnant vegetation based on connectivity (Minimum distance to nearest patch).
7C - Presence of vegetation patch <1ha conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for vegetation assemblages based on the presence of remnant vegetation <1ha.
7D - Vegetation patch shape conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for of vegetation assemblages based on patch Edge to Interior Ratio or Relative Edge Effect (REE). Where REE = Perimeter (m) / Area (ha).
Indigenous Heritage Sites conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for significant Indigenous Heritage Sites.
European Heritage Sites conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for significant European Heritage Sites.
Natural Heritage Sites conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for significant Natural Heritage Sites.

Geological Monuments conservation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the conservation priority for significant geological monuments.
Detailed summarised conservation priority coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	The final coastal cell summary of the combined conservation priority analysis layer - created by summing all the individual conservation priority layers (listed above) together into one layer. The highest priority areas being the result of numerous conservation priorities having an influence on that location.
Summarised Coastal Cell Threatening Processes Layers					
Acid Sulphate Soils coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the presence of Acid Sulphate soils.
Campsite coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the increased activity associated with campgrounds of an informal (high threat) or formal (medium threat) type.
Development zoning coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the ability through zoning regulations to develop the land.
Dump & wastewater treatment plant coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the presence of waste dumps / infills/ storage facilities and treatment plants.
Dune Stability coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the presence of dunes and likelihood to shift when disturbed.
Cliff Stability coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the presence of cliff and their vulnerability to erosion.
Land ownership coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the type of land ownership present and the threat that that type of ownership creates.
Land use coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the type of land use present and the threat that the land use creates.
Mining activity coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the level of mining activity possible (from no activity through possible exploration to extractive processes) and the threat that the activity creates.
Vegetation connectivity coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from a lack of connectivity between vegetation patches.
Vegetation degradation coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the degradation levels of the vegetation patches.
Vegetation patch shape coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the shape of vegetation patches.
Vegetation patch size coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from the size of the vegetation patches.
Viewshed coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from that area having a favourable outlook of the sea and an ability to develop on that area.
Viewscape coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary of the priority of locations based on the threat due to increased aesthetics of coastal areas - based on previous work carried out by DEH.
Weeds coastal cell threat summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	Coastal cell summary for the priority of locations based on the threat from weed species within the vegetation patches.
Threatening processes analysis coastal cell summary layer	1:50000	0 - 250m	DEH - Coastal Protection	Sep-06	The coastal cell summary for the final combined threat analysis layer was created by summing all the individual threatening processes layers listed above into one layer. The highest priority areas were the result of numerous threatening processes having an influence on that location.

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## 2.5 Variation of Data Coverage Between Coastal Cells

By Brian Caton

The GIS based conservation and threat analyses used in this project employed data sets from many different sources, as is detailed in 1.1 above. These data sets were originally assembled for a variety of different purposes, and their differing character results in variable coverage between areas within the Southern Fleurieu coastal boundary. Some data sets by their nature give a complete coverage within the region: for example, development plan zoning covers the entire study area, since the Development Act requires councils to zone their areas. Some data sets appear to give complete coverage, but on examination show limitations: for instance, sites of significant indigenous heritage (in a buffered form) are represented in all cells, as presence or absence. However, since many sites of significance are not represented on the state register, this variable may be under represented within the analysis. The geological heritage layer raises another kind of issue: all defined Geological Monuments are shown on this layer; however, there may be locations of great geological significance not seen or described because they are covered by superficial deposits.

Other data layers are the results of differing kinds of sampling or recording, and these various methodologies give rise to a variety of issues. Most data within this project relates to remnant vegetation, significance or diversity of flora and fauna. Work by the state Biological Survey Group is a core part of these data sets, and is undertaken by systematic sampling and descriptive procedures (Heard & Channon, 1997). Sample points however, are irregularly distributed and are chosen to represent the larger remnant patches. Figure 3, below gives an indication of the variation in coverage between cells for the layers that relied on these data.

While the map below identifies cells with no sample points, it does not show the cells with several sample points. Haby (in Caton et al 2005) points out a number of issues in the use of vegetation survey data in the Northern Yorke NRM region, which also apply in the Southern Fleurieu:

- Lack of fine scale mapping suitable for the interpretation of vegetation communities along the coastal zone;
- Lack of habitat mapping including the diversity of vegetation communities within a remnant patch and the extent of those communities;
- Possible lack of ground-truthing of smaller remnants during vegetation community mapping;
- Difficulty in interpreting the extent of vegetation communities due to a lack of consistent vegetation descriptions;
- The indirect production of inland vegetation community fragments during the creation of the NY coastal boundary; and
- Lack of habitat mapping leading to the assumption that remnant vegetation patches are homogeneous and species detected at a survey site will occur throughout the patch.

The latter point is a very significant one in this project. In the case of reptile and butterfly layers, it was necessary to identify areas where the presence of various species was likely from the habitat (since direct evidence was not available). However, in rating priority, these areas received a lower score than those where direct positive evidence was available.

The Conservation Analysis used in this project required identifying the total sum of means from a number of themes. Themes represented the condition of remnant vegetation communities (14 themes), significant or a diversity of flora and fauna (8 themes), sites of heritage significance (3 themes) and sites of geological and geomorphic significance (3 themes). Some cells within the Southern Fleurieu coast, however, did not contain data for particular layers; leaving areas deficient in data for the analysis (see Figure 3, below).

# Southern Fleurieu Coastal Conservation Analysis Biological Survey Group Surveys - Data Gaps

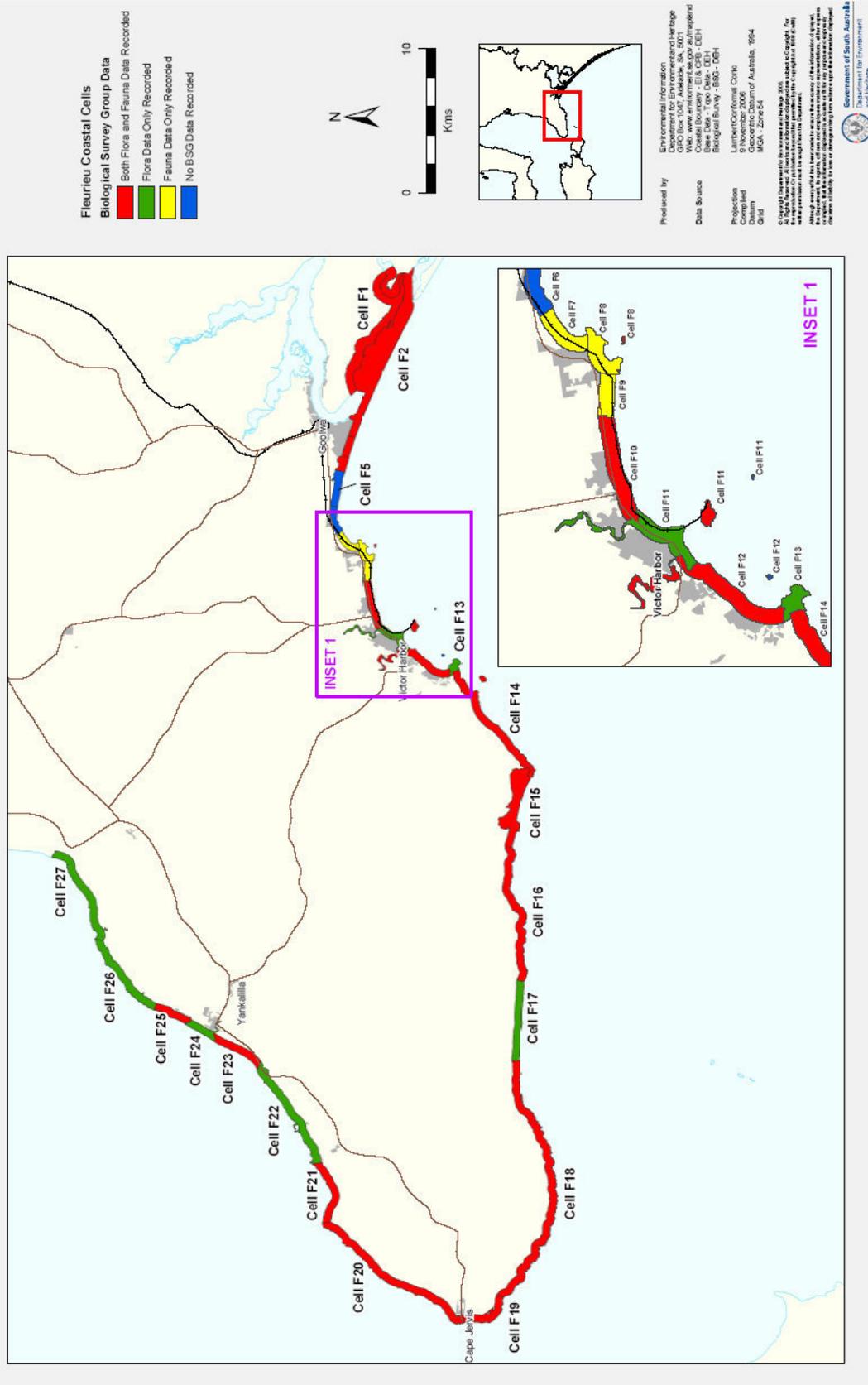


Figure 3. Variation in flora and fauna sampling from the BSG systematic survey

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Limitations were also experienced in using available fauna and flora data. These generally reflected issues experienced with the design and implementation of surveys:

- The restrictive nature of surveys to larger and intact remnant patches. For example bias occurs where vegetation survey sites are usually selected in “good” remnants of native vegetation and introduced species are consequently under-represented;
- The inability to thoroughly survey the Southern Fleurieu coastal zone during past surveys (especially for fauna);
- The inability to determine the accurate distribution of threatened species during general biological surveys, and;
- Collection of species localities outside of preferred habitat types.

Animals can be hard to locate and move with seasons to search for food or visit breeding grounds. For example, the White-bellied Sea-eagle has been sighted in excess of 50 km away from known nesting locations. Additional factors leading to a change in the distribution and abundance of species at known sites may include long-term seasonal change, which may result in the alteration of movement patterns of some migratory species (Kendall et al. 2004). This may lead to the identification of a species at an uncommon locality within the databases used in this analysis.

Some capacity was available to manipulate data for the analysis. For example, data correlating with vegetation communities or coastal cells were represented at the scale of patch or cell, respectively. However, records of flora, fauna and significant sites occurring outside of a remnant patch and not considered to occur throughout the entire coastal cell, were under-represented in the analysis by comparison.