Background Paper **Five**

Southern
Prospects
2004 - 2009

The South Coast Regional Strategy For Natural Resource Management

The Natural Assets, Threats and Management Targets of the South Coast Region's Coastal Zone

A report commissioned by SCRIPT

Southern Prospects 2004 - 2009
South Coast Regional Strategy
For Natural Resource Management

Background Paper 5

The Natural Assets, Threats and Management Targets of the South Coast Region's Coastal Zone

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For the South Coast Regional Initiatives Planning Team (SCRIPT)
January 2004

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Scope of Paper

This paper provides a brief overview of the coastal environment of the South Coast Region. A general description of major terrestrial geophysical and associated biodiversity values of the coastal environment is presented. Major threats to biodiversity values and some current management practices dealing with these threats are considered. A threat-value matrix is presented for identifying high priority geographical areas, and possible future NRM actions for management of natural coastal assets are outlined.

Much of the information contained in this paper has been drawn from the regional management strategy for the South Coast coastal environs: *Southern Shores: 2001-2021,* and from the supporting documents to this strategy. Further supporting information and policy direction has been drawn from CALM biodiversity databases, local and regional coastal zone NRM strategies, and regional and national coastal zone management policies.

Vision

The South Coast Region has diverse, healthy and sustainable coastal ecosystems. The Region's coast is managed co-operatively by local government, state agencies and community through an integrated approach to coastal zone planning and management that: ***conserves and enhances natural values, while ensuring sustainable use, health and recognition of communities' stewardship and spiritual links.***

1. Introduction

1.1 The coastal zone of the South Coast Region:

The coastal zone of the South Coast Region is integral to the social and economic livelihoods of its people and population, and has been so ever since the first Aboriginals and settlers arrived in the area. The South Coast Region encompasses some 900km of coastline, along which the coastal settlements of Albany, Esperance, Denmark, Bremer Bay, Hopetoun and Walpole support 75% of the Region's population. The coastal population is growing annually, whilst inland areas are experiencing declining populations (GSDC 1996). Annually, more than 500,000 tourists visit its inlets, beaches, national parks and coastal facilities for recreation, the spectacular coastal scenery being the key factor in their choice of the Great Southern as their tourist destination (SCRIPT 2000). The South Coast's coastal and marine environments also contain much of the Region's most environmentally intact ecosystems, unique wildlands with rich biodiversity reserves (CALM 1998).

Loosely defined, the coastal zone includes both the area of land subject to marine influences and the area of the sea subject to land influences. A more rigorous definition varies from state to state, but in Western Australia is defined as: "Coastal waters to a depth of 30m, reefs, estuaries, tidal rivers and land which is presently subject to coastal processes such as mobile sand dunes, areas inundated by storm surge and vegetated foreshore areas exposed to onshore winds" (Harvey & Caton 2003). This definition divides the coastal zone into four main components:

- The coastal waters: the near-shore marine environment, which extends from the low water mark seaward to 30m depths. This area includes the shallow marine habitats, such as the sea grass meadows, and the rocky coastal platforms and shallow reefs and offshore islands.

- The beach and shoreline flats subject to tidal influence: the beach zone extends from the low water mark to the seaward edge of the dominant coastal landform. The brilliantly white sandy beaches of the South Coast are often highly changeable, high-energy environments. However, for much of the South Coast coastline, the base of a rocky headland, cliff-face or vegetated dune-edge with exposed tree root mats marks the interface between water and land, and the sandy beach zone is absent.

- The land behind the beach potentially subject to shoreline movement: this zone extends landward for some distance from the end of "beach" interface. The actual distance of marine influence will vary according to each location. If the land is flat, the coastal zone may extend for a considerable distance inland, and may consist of shifting sand sheets, vegetated sand dunes, swamps or lagoons. Where the land is steep, the coastal zone may be very narrow.

- The estuaries and coastal lagoons, which constitute a major environmental, lifestyle and tourism feature of popular areas of the South Coast region. (*Adapted from WAPC 2001*)

The four subsystems described here interact in many ways, and the boundaries between them are dynamic, exposed to change by the coastal processes of tide, wind and wave erosion, sediment movement, storms, currents and human disturbance.

The coastal zone of the South Coast Region is not an isolated system. Rivers and waterways carry pollutants and sediments arising from inland activities to the coast, where they have an impact on coastal zone habitats. Agricultural and forestry practices bring increased sediment and chemical loads to the coastal wetlands and marine environment, where they result in the degradation of the health of the shallow inlets, seagrass meadows and reef environments (DEST 1995). Water currents and offshore pollution sources may carry biological organisms and chemical pollutants from offshore to the coastal zone, or from one region's coastal zone to another's. Coastal development, artificial breaching of inlet sandbars, dredging and harbour groynes interfere with coastal processes, changing coastlines and sedimentation processes (WRC 2002).

1.2 Integrated Coastal Zone Management (ICZM)

There is a growing awareness that Australia's coastal zones need to be managed within an integrated, ecosystem-based policy framework (Commonwealth 1998, DEST 1995, DPI 2003, WAPC 2001, EA 2004). Ultimately, management of the coastal system is driven by the demands of society, expressed in terms such as water quality standards, recreational facilities, annual fish harvests or town and harbor development. Complex coastal systems and their utilization are so interlinked that the full variety of coastal resource utilization needs to be managed as parts of one, integrated system if sustainable output from healthy ecosystems is to be guaranteed. This will only be effectively achieved through the development and implementation of an Integrated Coastal Zone Management (ICZM) framework (EA 2004 (draft), Harvey & Caton 2003). ICZM has four major aspects:

- Co-management, where local community and stakeholders share aspects of governance with the government agencies, and overlapping jurisdictional bodies share common, not conflicting, best-practice management principles. Community participation is an essential part of the management process.

- Long-term coastal zone goals, regional plans and active research and monitoring programs play a key role in providing sets of management options, performance indicators and potential consequences.

- Commitment to policy agreement across agencies and disciplines, which requires holistic conservation strategies, and catchment-coast-ocean and ocean-to-coast management and planning co-ordination.

- Accountability and pro-active risk management is an essential component of ICZM planning in the face of uncertainties, predicted climate change and rising global sea-levels.

ICZM should encourage the guidance and management of all aspects of human use of the Region's coastal areas, so as to yield the greatest possible benefits for the present population without compromising the opportunities of future generations who will live and recreate along this coastline. Western Australia still lags behind other Australian states in the implementation of ICZM (EA 2004), and suffers from having a large number of statutory and legislative bodies with overlapping jurisdiction over coastal and marine issues. The need for ICZM is however increasing by recognized in WA (DPI 2003 - *Coasts WA: Better Integration. The Western Australian*

Government's Response to the Coastal Taskforce Report), and local authorities are beginning to show commitment to building partnerships with community for joint management of coastal areas (*Southern Shores, 2001*).

2. An Overview of the Natural Assets and Values of the South Coast Region's Coastal Zone

2.1 The South Coast coastal processes, IBRA and IMCRA Regions

Coastal processes active on the coastline of the cool temperate South Coast Region are comprehensively described in WAPC 2003, but, in summary, the predominant formative natural processes of the South Coast are wave regimes, oceanic currents, weather and climate and tidal exchanges. These forces combine with local topographical and geological aspects to create a complex and highly dynamic coastline, with shifting sediment loads and budgets, dangerous exposed rocky headlands and sheltered coastal inlets and embayments. The terrestrial environment spans 5 IBRA regions- the Warren, Jarrah Forest, Esperance Plains, and Mallee IBRA (Interim Biogeographic Regionalisation of Australia) Regions. The marine environment is wholly contained within the WA South Coast IMCRA (Interim Marine and Costal Regionalisation of Australia) Region. However, the Region's coastal Southern Oceanic marine environment is strongly influenced by the warm Leeuwin Current, which originates in the tropics and flows down the west coast of Australia, around Cape Leeuwin from the Leeuwin-Naturalist IMCRA Region, to the South Coast, bringing with it tropical marine organisms and fish species from northern WA.

2.2 The coastal geology and landforms

The coastal zone of the South Coast Region is a complex geological system. The Region is a composite of a number of geological domains: crustal basins (the Bremer Basin and the Eucla Basin), reworked quartzo-feldspathic gneiss and granitic plutons (the Albany-Frazer Province), the folded quartzite and phylite outcrops of the Mount Barren Group, limestone deposits of the Mount Ragged Beds (Eucla) and recently flooded coastal platforms, overlying the ancient Archaen shield, the Yilgarn Craton. A detailed review of the geology of the area is provided by Green 2000. The coastline is spectacular and diverse, alternating between sandy beaches, granite headlands, limestone cliffs and coastal wetlands and inlets, and the dramatic coastal scenery is a major tourism drawcard for the Region.

Natural coastal landforms and features of this coastline include:

- High energy sandy beaches.
- Mobile sand dunes, sand sheets and blow-outs.
- Limestone cliffs.
- Rocky shores of granite and quartzitic boulders and headlands.
- Tombolos.
- Flooded river gorge (Wychinicup River).
- Embayments and natural harbours.
- Permanently and semi-permanently open coastal lagoons (inlets) and wetlands.
- Estuarine terraces with fringing melaleuca and saltmarsh vegetation.
- Coastal plains and valleys.
- Coastal lakes.
- Foredune plains.
- Vegetated coastal dunes with coastal tall Eucalypt forests.
- Nested parabolic dunes.
- Shallow intertidal limestone rock platforms.
- Shallow seagrass meadows.
- Coral reefs.
- Island coastal environments of near-shore islands and island archipelagos.

2.3 The Coastal Flora and Fauna

2.3.1 Terrestrial Flora:

International biodiversity hotspot:

The South Coast is recognized as an international hotspot of biodiversity for floral species (see http://www.biodiversityhotspots.org/xp/Hotspots/australia). The southwest floral region also contains an abnormally high proportion of endemic species, with many species either wholly or partially endemic to the South Coast Region (Craig 2000). High plant species diversity and endemism is attributed to the high degree of isolation from the rest of Australia by the central deserts, the relict Gondwanan influences, extreme climate changes, fire adaptation, and specialization in nutrient poor sandy soils.

Botanical diversity:

Review of the botanical diversity and distributions is currently ongoing in the Region as new understanding is gained of floral diversity. Previously adopted plant districts, sub-districts and systems of the South Coast region are detailed by Craig 2000, summarized below:

1. Southwest Province:

- **Darling District**: the high-rainfall forest zone of the western shores (Walpole to Albany) of the South Coast which contains:
  Warren Sub-district with the Boranup, Denmark Torndirrup systems: characterized by tall Karri (*Eucalyptus diversicolor*), Marri (*Eucalyptus calophylla*) and Jarrah (*E. marginata*) forests, with Paperbark (*Melaleuca*) and sedge thickets in lowlying swamp areas. Interspersed with Peppermint (*Agonis flexuosa*), *Banksia*, and scrub-heath with *Scaviola,* balga and *Acacia* in younger sands and foredunes.
  Menzies Sub-district with the Albany, Narrikup and East Kalgan systems: characterized by low-forest mosaic with Jarrah-Marri-*Allocasuarina* , scrub-heath with *Scaviola,* Balga and *Acacia,* reed swamps and *Melaleuca, Agonis juniperina* and swamp Yate along river beds.
- **Eyre District**: the moderate rainfall region (<700mm/a) which contains:
  the Cape Riche, the Jerramungup, the Qualup, the Barren Ranges, the Ravensthorpe, the Esperance, the Fanny's Cove, Culver and Cooper systems. These systems are characterized by mallee-heath and scrub-heath growing on nutrient poor quartzitic, granitic and limestone sandy soils dominated by mallee form *Eucalypt sp, Banksia sp., Dryandra sp, Scaviola, Acacia sp.* and *Allocasuarina-Melaleuca* thicket, with swamp Yate, Redheart, Paperbark and *Nuytsia floribunda* in water-logged soils. The West Eyre sub-district (centred on the Fitzgerald National Park) has exceptional species densities of endemics for the Region.

2. South West Interzone:

- The transitional zone between the South West Province and the Eremanean Province. Dominated by open Eucalyptus woodland and saltbush-bluebush understorey, and *Allocasuarina* thickets on the sand plains.

3. Eremaean Province:

- **Eucla District:** The Nullarbor Region includes the moderate-low rainfall region of the Hampton Tables systems, characterized by tall shrublands of *Eucalyptus* and *Melaeleuca*, with a sclerophyll and succulent shrub understorey, and the Roe Plain, dominated by unconsolidated and consolidated dunes, and mobile dune sheets. Saltbush and greybush forms understorey to belts of mallee *Eucalyptus sp.* in areas of exposed stony Eocene limestone bedrock, and *E.gracillis and E.oleosa* in association with *Callistris verrucosa* are dominant on the areas of vegetated dunes.

  Macro-corridor landscape conservation and wildlife habitat linkages: The unusually high percentage of land in conservation management along the South Coast (more than 70%) has resulted in a nearly continuous strip of coastal native vegetation intact for the whole of the South Coast, with gaps only occurring at the major towns of Albany and Denmark, and to a lesser extent at Esperance and Hopetoun. A unique opportunity exists for landscape scale planning for coastal vegetation management and biodiversity conservation, through maintenance and revegetation of macro-corridor linkages, currently being progressed by CALM and Greening Australia (Gondwana Links Program).

  Threatened coastal plant communities:

Two ecological communities of the South Coast Region have been identified as threatened:

- Montane thicket and Heath above 900m above msl (mean sea level) – critically endangered.

- Stomatolitic communities of hypersaline lakes (Pink Lake, Esperance).

It has been suggested that relictual Gondawanan assemblages may contain site specific genera which could be threatened (Craig 2000).

Threatened coastal flora species:
Lists of threatened flora for the Region are provided in the Biodiversity background paper, (See Appendix… Danks 2004.)

2.3.2 Marine Flora:

The distribution of the marine flora is determined by the benthic substrate, which alternates between shallow sandy flats and estuarine shallow siltbeds with associated seagrass meadows and epiphytic algae, and rocky headlands and nearshore reefs with associated macro-algal beds.

Seagrass meadows:
Seagrass meadows are an extremely important habitat of the South Coast subtidal environment, where they stabilize sandy areas and provide nurseries, habitat and primary food for numerous marine invertebrate meiofauna, mollusc, crustacean and fish species, and, at death, provide a source of detritus and soluble nutrients for detritivores and planktonic organisms. Seagrasses are typically dominated by the genus Posidonia, and the South Coast may represent the centre of the distribution of the genus (Green 2001). Posidonia grows to depths of 15m and is a critical benthic habitat for numerous subtidal marine fauna species, in particular the leafy and common seadragons, and the highly valued King George Whiting, Black Bream (estuaries) and the Australian Herring.

Macro-algal beds:
The marine algae, or seaweeds, of the South Coast are dominated by the small kelp plant, Ecklonia radiata, which can form dense cover over shallow rocky reefs in the sublittoral zone where strong wave action occurs. The kelp beds are very important habitat, protection and feeding grounds for numerous subtidal species of invertebrates, crustaceans, holothuroidean (sea cucumber) and other echinoderms (starfish and sea urchins), molluscs and fish, such as the shallow and offshore reef-dwelling wrasse species.

2.3.3 Terrestrial Fauna

Rich faunal habitat diversity and significant habitat refuges
As a consequence of the diverse botanical biogeography, the area comprises a high diversity of faunal habitats. However the broader region has been subject to extensive agricultural clearing, and numerous species have shown severe range contractions, and are now restricted in distribution to remnant vegetation stands in coastal reserves. Species which have been particularly vulnerable to range contraction are the critical weight (5.5kg – 35kg) mammals, and 6 species of mammals and 2 species of bird are now presumed extinct in the Region (Gilfillan, 2000). (Threatened Faunal species list are provided in the biodiversity background paper (see Appendix …Danks 2004).

Despite a relatively low degree of endemism amongst vertebrate species of the Region, the coastal area (in particular east of Albany and Fitzgerald River National Park) represents very significant habitat refuges for threatened indigenous fauna with greatly contracted ranges, such as the Gilbert's Potoroo (*Potorous gilbertii*) (Critically Endangered), the Dibbler (*Parantechinus apicalis*) (Endangered), the Western Ground Parrot (*Pezoporus wallicus*) (Endangered) and the Western Whipbird (*Psophodes nigrogularis*) (Endangered).

Important mainland and offshore seabird breeding colonies:
Many species of seabirds breed on the offshore islands of the South Coast, including albatross, petrels and penquins. The only mainland breeding colony of the Little Penguin (*Eudyptula minor*) in Australia is found on the South Coast along the coast of Israelite Bay, at the base of the rocky cliffs.

Water birds: Wetlands of International Significance (RAMSAR) and of local significance:
The coastal Lake Warden wetland system of Esperance and the nearby Lake Gore are registered as RAMSAR sites, due to their high significance as a major refuge for migrant and resident waterbirds of the region during the dry season. Lake Gore is the single most important wetland for resident water-birds, including the hooded plover (Charadrius rubricollis) (Gilfillan 2000). Refer to the Waterways and Wetlands Background paper (Number 4 - Gunby 2004) for full listing of coastal wetlands of conservation significance of the Region.

2.3.4 Marine Fauna

The predominant intertidal and sublittoral marine fauna is described in 2.5 below (*The Intertidal and marine environment*). Predominant recreationally fished fish species occurring on the sub-tidal reef systems are: Harlequin, Dhufish, Queen Snapper, Western Blue Groper, Tarwhine.

2.4 The Coastal Wetlands and Estuaries

For the purposes of this background paper, coastal rivers, wetlands and estuaries are not discussed in any detail due to the full description of these assets, and the threats and management options relating to them in Background Paper 4 (Chris Gumby, DOE, 2004). There are over 25 estuaries along the South Coast, all of which are vital, integral and a highly valued dimension of the South Coast coastal environment. Coastal NRM priorities will in many instances be focused on management of these geographical areas due to coastal wetlands having very high social and ecological value, and significant development pressure with associated serious threats impacting on estuarine environments.

2.5 The Nature Reserves, National Parks and Sites of Conservation Significance

Natural Heritage Conservation: 71% of the South Coast region is either gazetted as national park and under management of CALM, or designated local government nature reserve, vested in and managed by the local Shire for conservation. The major coastal conservation reserves occurring along the South Coast Region are (Map 11):

- The Fitzgerald River National Park and Fitzgerald River Biosphere
- Cape Le Grand and Cape Arid National Park
- The Walpole-Nornalup Wilderness
- Mt Manypeaks Nature Reserve and Waychinicup National Park
- Two Peoples Bay Nature Reserve
- Torndirrup National Park
- West Cape Howe National Park
- Nuytsland Nature Reserve
- Stokes National Park
- Lake Shaster National Park
- Jardacuttup Lakes Nature Reserve
- William Bay National Park
- Quarram Nature Reserve
- Offshore islands and Recherche Archipelago
- The RAMSAR coastal wetlands of Lake Warden and Lake Gore

All national parks and nature reserves of the coastal region have significant biodiversity and ecological functioning conservation values and are a major draw card for nature-based tourism to the region. The extremely good connectivity of the terrestrial conservation estate along the coastline provides a unique opportunity for large ecosystem and landscape-scale conservation

initiatives. Ideally, areas of the land-based conservation estate will be extended into the marine coastal environment in the future through the implementation of Marine Protected Areas along the South Coast, particularly in wilderness areas such as the Fitzgerald River National Park.

2.6 The intertidal and marine environments

Intertidal communities have been described by Hodgkin (1960) for specific localities along the South Coast, but generally these habitats are poorly studied. Granite headlands and shallow reefs are dominated by gastropods (sea snails and turbo), crustaceans (barnacles and crabs), cephalopods (octopuses), cnideria (anemone) and macrophytes (algae) showing distinct vertical zonation. The flat shallow intertidal rocky shores and platforms form important feeding grounds for the oystercatchers, shorebirds and marine and terrestrial raptors (e.g. osprey and sea eagles) that feed along these shores. The subtidal flats of sandy beaches are dominated by bivalves and gastropods and sea grass meadows. Offshore are the biodiverse rock wall habitats of the deeper sublittoral zone, where numerous multi-coloured species of sponges, coelenterates, crinoids and ascidians cover the steep faces of headlands as it drops off to as much as 40m depths. New species of sponges are still being described, and a single research sampling quadrate from the Recherche Archipelago yielded more that 140 species of sponges (Euan pers comm.).

The marine environment of the South Coast Region is covered in detail in Background Paper 6 (Green 2003). An excerpt from this document is given below for completeness:

"The south coast marine bioregion's land edge is the longest, south-facing coastline in the southern hemisphere and is therefore unique in the world.

It is expected that the high level of endemism throughout the south coast terrestrial area will also occur in the sea due to the long geological isolation of south coast seas and influence of various changes in currents and water temperature over millions of years. Essentially, this endemism can only be expected as there has been little research undertaken in the south coast marine bioregion and that which has, can only be considered provocatively indicative. It is estimated that approximately 90-95% of the marine life of temperate southern Australia is endemic (Poore, 1995) and as such has special importance to the maintenance of marine biodiversity. While very little is known about marine biodiversity of the south coast marine bioregion it is expected that endemism will be high, particularly amongst invertebrates such as sponges. As an example approximately 150 new sponge species have been found in the Recherche Archipelago in the last two years. It is also expected that several new alga will be described (Thomson-Dans C, Kendrick G, Bancroft K, 2003). "

2.7 The island environments

There are approx 580 offshore islands located along the South Coast which range in size from 800ha to less than 0.5ha, but all are important ecologically for native flora and fauna habitat, protected from mainland impacts of feral invaders and predators. The islands provide resting places and breeding sites for resident and migratory marine seabirds, haul out and breeding places for seals, and rocky platforms for the attachment of intertidal and subtidal invertebrates and marine plants. Reef fish and marine predators will also breed and feed in waters around islands.

The islands of the South Coast are poorly studied due to lack of funds, and some ecologically important sites are currently threatened by weed encroachment, feral animals and rising interest as eco-tourism destinations.

2.8 The wild places

The South Coast Region has some of the last remaining intact coastal wildernesses in the world. This has been recognized nationally with the declaration of the Fitzgerald River Wilderness and the Walpole Wilderness areas, and it is important to conserve and protect these increasingly scarce values, as global coastal wilderness areas dwindle with increasing population and urban expansion pressures. Other areas of the South Coast, which may in future qualify for wilderness conservation, are coastal areas of the Cape Arid and Cape Le Grand National Parks.

3. An Overview of Issues and Threats Impacting on the South Coast Region's Coastal Zone

The issues and threats impacting on the South Coast Region's coastal zone are comprehensively discussed in Background Paper 6 (Green, 2001) and the Regional coastal and marine strategy document: *Southern Shores 2001-2010.* For the purposes of this background paper, a brief summary overview is given below:

3.1 The Issues

- *Coastal Planning, development and management:* Historically, land managers have not approached coastal planning and development approval in an integrated way, and coastal developments have to some degree lacked strategic direction or concern for secondary or long-term impacts. With the current national, state and international focus on Integrated Coastal Zone Management (ICZM), coastal planning and management is undergoing considerable change. Eutrophication, rising salinity, declining water quality, algal blooms and death of sea-grass meadows in estuaries has forced recognition of the need for Integrated Catchment Management. Increasingly, catchment management is beginning to include identification of catchment-coast-ocean implications for coastal management and water quality (WRC 1996, 2002). Issues concerned with
  - coastal setbacks and coastal erosion,
  - coastal pollution,
  - shoreline movement,
  - coastal aquaculture enterprises,
  - commercial fishing leases,
  - harbours, groins and artificial reefs,
  - mineral extraction,
  - squatter settlement,
  - off road vehicle recreational driving,
  - and the placement and management of coastal recreation facilities and activities

  are all aspects of coastal planning which need an ICZM approach in the future.

- *Recreation:* A wide variety of recreational activities are undertaken in the coastal zone, many serving important functions for community health, nutrition, income and spiritual well-being. The impacts and issues associated with the recreational use of the coastline, in particular the use of off road vehicles, and formal and informal walk-trail/dune path development, are ongoing and cumulative, increasing annually as the population grows in number and affluence. Numerous impacts are associated with poor coastal amenities and informal camping, such as waste disposal and destruction of coastal woody habitat for firewood. This is an area where on ground community effort along the South Coast has greatly assisted in the improvement of coastal facilities.

- *Nature- based coastal tourism:* This is one of the fastest growing economic sectors of the tourism industry along the South Coast and has the potential to contribute significantly to the future population growth of the Region.

- *Land Tenure:* Management responsibility for land along the South Coast is complex. Much of the land is in public ownership, and managed by CALM as conservation estate. Local government manages State reserves, DOLA manages Unallocated Crown Land, and some land is in freehold. Port Authorities have jurisdiction over land immediately surrounding ports and the shipping waterways within estuaries.

- *Terrestrial Conservation:* With 71% of the terrestrial coastal environment under conservation management, the unique opportunity arises for macro-corridor habitat linkages, in particular in the region of East of Albany to east of Esperance, and Walpole to west of Denmark. These significant remnant vegetation corridors have been identified by CALM under the "Macro Corridor Project," however, implementation of the project is limited due to resource constraints. Threatened species recovery programs, dieback disease control, weed and feral animal management, off road vehicle management, fire issues and protection of mainland and island breeding sites, are all

issues which need to be addressed to ensure terrestrial conservation of significant ecologically intact coastal habitat. The Fitzgerald Biosphere Reserve and the proposed Biosphere reserve in the Denmark region are examples of community driven terrestrial conservation initiatives in the Region.

- *Marine planning and Marine Protected Areas:* There are currently no Fish Habitat Protection Areas or Marine Protected Areas (MPA) within the coastal zone of the South Coast, despite identification of priority marine conservation areas for the South Coast in the Wilson Report of 1994 and a CALM Terrestrial and Marine Integration Study of 1998 (CALM 1998). This is an obvious gap in NRM of the coastal zone, and the fact has been nationally recognized in that the South Coast has been identified as a priority region for the imminent implementation of priority MPAs, and negotiations for the establishment of the first MPA for the Walpole-Nornalup Inlet is currently underway (A Kendrick pers.comm.).

- *The intertidal zone:* Currently no management regulations or conservation protection measures are in place for marine organisms of the intertidal zone, even within national parks. This gap leaves these organisms vulnerable to overexploitation or lack of planning concern when disturbed or threatened by coastal development proposals.

- *Fishing and marine aquarium collection:* Extraction of coastal marine organisms, either by recreational and commercial fishing, or collection for aquariums, requires regulation by licensing and monitoring through catch statistics collection and beach patrols. Fisheries WA is increasing the deployment of officers along the South Coast in order to promote enforcement of new bag and size limits, however, the length of the coastline and remoteness of many fishing spots makes this a very difficult task. Due to the historical lack of regulation and monitoring of recreational fishers, knowledge of the long-term impacts of this fishery on the coastal target fish species abundance and distribution is to date very limited. This is a very important information gap, which requires attention. The collection of marine organisms for the aquarium trade has also been difficult to regulate, resulting in overexploitation of the community of seadragons at Bremer Bay (C Lebens pers comm.).

- *Sea and Land-based Aquaculture:* Aquaculture is a growing industry and has great potential for economic investment and return for the South Coast Region. Fisheries WA are responsible for the sustainable development of aquaculture and work with proponents in developing aquaculture proposals. Current operations for oyster, abalone and mussel aquaculture exist at Albany and Bremer Bay, and tuna ranching has been proposed for the Recherche Archipelago. Issues associated with aquaculture include coastal impacts associated with infrastructure and offshore impacts of water quality, introduction of marine pest organisms, disturbance of trophic relationships, attraction of predators and changes of sediment and benthic communities near and under the grow-out facilities.

- *Acid Sulphate Soils:* The acid pollution of coastal waterways through exposure of acid sulphate soils during coastal development and sand mining operations has received increasing attention as the severity of this environmental problem and the resultant impacts on ecosystems becomes evident. South Australia is currently undertaking a full review of potential sites for coastal acid sulphate soils (CSIRO 2003), and this project is to be extended to a full Australia-wide inventory of coastal acid sulphate soils (M Heller pers comm.).

- *Marine Pollutants and Oil Spills:* Toxic contaminants find their way into the coastal and marine environment through numerous routes, entering from catchment washout of herbicides and pesticides, polluted/contaminated stormwater outfalls, inappropriate coastal sewage systems, anti-fouling paints, oil spills and bilge pumping, rubbish blow out from land (including plastic bags from popular coastal fishing spots and campsites) and illegal dumping at sea. Obvious NRM issues associated with coastal pollutants are impacts on estuarine and marine biota and ecosystem functioning and implementation and enforcement of onshore and offshore monitoring and regulation, to comply with nationally prescribed water quality standards (ANZECC 2000).

3.2 The threats to coastal assets

Clearly many of the above issues constitute direct and indirect threats to the natural assets of the South Coast Region's coastal zone. Prioritisation of threats for the coastal zone is not a simple procedure as cumulative impacts from the multiple use of coastal areas might not be adequately addressed in the simplification of issues. Furthermore, there are future and potentially dramatic threats not yet encountered, such as sea level rise due to global warming, which although predicted with some degree of certainty, the severity of impact is currently unknown. However, the following primary threats to coastal assets are presented as a starting point:

- Lack of long-term integrated coastal zone planning in coastal areas experiencing rapid urban growth and on under-managed land such as Unallocated Crown Land.
- Unregulated off road vehicle driving and unmanaged off road vehicle access in sensitive coastal dune environments.
- Community resistance by recreational off road vehicle drivers to closure of sensitive coastal or significant seabird breeding beach habitats.
- Lack of baseline data and information on marine biodiversity values and the paucity of understanding of the impact of commercial and recreational fisheries on these values.
- Limited enforcement of fishing regulations for commercial and recreational fisheries due to lack of on ground law enforcement officers.
- Inadequate management of the majority of informal camping locations due to their remote locations and high management costs.
- Potential for the introduction of marine pest organism species due to limited sea vessel management and harbour surveillance and monitoring.
- Spread of disease, feral animals and weeds in coastal National Parks, reserves and unallocated Crown Land due to lack of resources, continued introduction of domesticated pest animal species (cats, ferrets, rabbits), and the geographical extent of the problem.
- Continued pollution of coastal waterways and environments through agricultural, industrial and urban expansion activities.
- Lack of resources for the implementation of large ecosystem conservation programs such as the coastal Macro Corridor Project.
- Delay in the implementation of Marine Protected Areas, No Take Zones and Fish Habitat Protection Areas, with associated ongoing impacts and potential local population extinction threats for territorial home-dwelling reef fish species such as the Blue Groper, currently subject to heavy recreational fishing pressure.
- Poor understanding of marine trophic interactions, keystone species and secondary impacts of alteration of predator/prey abundance through extraction/fishing activities, with implications for quota setting and ecologically sustainable fisheries management.
- Poor understanding of climate change models and the potential implications for sea level rise along the South Coast coastline, and a local authority reluctance to build future predictions into coastal planning, setbacks and industrial/harbour development proposals.
- Poor understanding of the potential impacts of surface exposure of acid sulphate soils and the implications for sand mining leases and coastal urban development schemes such as marinas and canal development.

4. NRM Targets for the Coastal Environment

4.1 What is being done?

- Regional coastal management strategy has been prepared for the South Coast Region: *Southern Shores: 2001-2010*. Regionally and locally specific Management Mctions are identified in the document, and the implementation of actions pending regional NRM strategy priority identification.
- Numerous coastal planning and management documents have been developed for local govt areas and are detailed in Southern Shores. Some of these documents are, however, due for review as a result of changing socio-economic and environmental aspects of coastal settlements.

- Estuarine management plans have been drawn up for the Albany Harbour waterway, Wilson Inlet, etc.
- Albany Harbours Planning Strategy and Waterways Project developed for Albany Harbour, provides guidelines for management, but this is not a statutory document.
- Coastal reserve management plans for local government coastal reserves (e.g.Lowlands) and CALM reserves.
- Macro-corridor project proposal for the conservation of the coastal vegetation corridor is being progressed by CALM.
- Draft aquaculture guidelines for land-based aquaculture in the South Coast Region (2002) and an Aquaculture Plan for the Recherche Archipelago.
- Department of Local Government – Control of Vehicles (Off –road areas) Act (1978) is in place for control, licensing and restriction of ORV use, but is poorly enforced.
- Prohibition of ORV on popular swimming beaches in Esperance and Albany.
- 70% of terrestrial coastal environment is within reserve estate, managed by CALM for biodiversity conservation.
- New legislation for remnant native vegetation protection and wetland conservation on privately owned coastal land to be implemented by DOE.
- Scientific assessment of the terrestrial and marine integration study for the identification of priority marine areas for conservation done by CALM in 1998.
- Scientific survey currently underway for fish and macroinvertebrate biodiversity and benthic habitat mapping research in Recherche Archipelago and Bremer Bay.
- Ecologically Sustainable Development for fisheries and aquaculture in WA in progress, Dept of Fisheries policy document released March 2002.

Current capacity:

- The high social attachment to coastal recreational areas and popular fishing spots allows for a high prominence in local government priorities for coastal management.
- Demand for urban expansion in coastal settlements has preempted the development of urban management planning documents, and the need for a regular review of these documents is well appreciated by local land managers.
- CALM conservation estate (70% of coastal lands) is generally managed for biodiversity conservation, however funds are limited.
- Most coastal towns have had some community group involvement in coastal management, either through statewide and national initiatives such as Coastcare or NHT funding, or in partnership programs run by local authority and state agencies.
- Volunteer dive and marine observational work has greatly increased local knowledge of marine environments.
- Low capacity for broad identification of marine biodiversity values due to very high expense associated with the research.
- Increasing capacity for enforcement of fisheries legislation with increased number of fisheries officers recently being deployed on the South Coast.

4.2 What needs to be done and what are the priority areas?

- Implementation of the Management Actions recommended by the coastal management strategy: *Southern Shores 2001-2021*.
- Identification of critical fish nursery areas and important benthic habitat for the broader coastal region – estuaries, nearshore, island and offshore areas.
- Research into marine fauna species population dynamics and trophic interactions.
- Marine fauna inventory and improved baseline information on species richness of the marine environment.
- Development and implementation of marine protected areas with no take zones, particularly where the marine-coastal continuum of conservation estate can be secured (e.g. Fitzgerald National Park, Two Peoples Bay, Recherche Island Archipelago).
- Further development of the coastal macro-corridor project with a focus on habitat restoration in vegetation gaps and reintroduction of species throughout the Region.
- Implementation of sustainable fishing practices and the enforcement of recreational fishing bag limits.
- Integrate NRM into coastal planning and management to move towards a long-term target of regional Integrated Coastal Zone Management.

- Support research and development of climate change models for the South Coast incorporating modeling of possible future sea level rise, and make information on sea level rise available to all coastal planning agencies.
- Support research and identification of distribution of coastal acid sulphate soils and integrate information into coastal planning, mining and infrastructure development.
- Review existing out-dated coastal management plans and coastal land-use strategies and support large ecosystem approach to integrated coastal land-use planning.
- Implement *Southern Shores 2001-2010* recommendations for regional assessment of recreation opportunities and impacts, and support increasing management of ORV, possibly with the introduction of a permit system.
- Continue to support community involvement in coastal zone management through Coastcare activities and partnerships with coastal land managers.

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