Coorong, and Lakes Alexandrina and Albert Ramsar Management Plan

September 2000

Department for Environment and Heritage
Government of South Australia

Published by
South Australian Department for Environment and Heritage
GPO Box 1047, Adelaide, South Australia

Design and production by
Heritage and Biodiversity Division
South Australian Department for Environment and Heritage

Printed by
Print Mint, Adelaide, South Australia

September 2000

ISBN 07308 5861 8

Printed on recycled paper

Printed on recycled paper

Natural Heritage Trust
Helping Communities Helping Australia

Funding for the preparation of the plan was provided by the Commonwealth through the National Wetlands Program under the Natural Heritage Trust and by the State through the Department for Environment and Heritage.

Department for Environment and Heritage
Government of South Australia

FOREWORD

The Coorong and Lower Murray Lakes is one of Australia's most significant wetlands and because of its waterbird habitats it was designated a Wetland of International Importance under the Ramsar Convention in 1985. These wetlands provide habitat for many local species as well as for migratory wading birds, many flying in from as far away as Alaska. The area supports a broad range of other activities including farming, fishing and tourism. There are many stakeholders in the region including the Ngarrindjeri people, recreational boaters and fishers, conservation groups, town residents and water users.

Hon Iain Evans
Minister for Environment and Heritage
Minister for Recreation Sport and Racing
Minister responsible for Volunteers

This management plan for the Coorong and Lower Lakes Ramsar wetlands has been prepared by the Department for Environment and Heritage in consultation with the community and in cooperation with community stakeholders. The Community Reference Group, in particular, made valuable contributions to the planning project. The plan is based on seven discussion papers that provided opportunities for community input. Many people made valuable submissions on the discussion papers, contributing significantly to the development of this plan.

If the region is going to continue to support its diverse wildlife and be a resource for all the other interests and users it will need management in a responsible and integrated manner. This management plan not only contributes to the process of fulfilling Australia's obligations under the Ramsar Convention for the area, but also contributes to responsible, integrated management of the Coorong and Lower Lakes.

CONTENTS

CONTENTS *(Continued)*

LIST OF MAPS

EXECUTIVE SUMMARY

Introduction

Under the Ramsar Convention, Australia has an obligation to prepare management plans for its Wetlands of International Importance. This Management Plan provides for the wise use of the Coorong and Lower Lakes Ramsar Wetlands which are located at the end of the Murray-Darling Basin where the River Murray flows into the sea at Encounter Bay, South Australia.

Planning Process

To prepare this Management Plan, the Department for Environment and Heritage worked in partnership with a Community Reference Group and consulted a number of other groups formed to assist develop the plan. Community consultation was a feature of the planning process and public comment was sought on the seven discussion papers.

Background

The Ramsar principle of *wise use* of wetlands is the sustainable utilisation of wetlands for the benefit of humankind. The principles are compatible with the maintenance of the natural properties of the ecosystem — a similar concept to ecologically sustainable development. Planning for the area operates within the context of planning and policy at all levels from international to local. The existing Ramsar area is not clearly defined and this Management Plan proposes boundary alterations to include the floodplain.

Significance of the Coorong and Lower Lakes

Regionally the Coorong and Lower Lakes Ramsar Wetlands have been altered by river regulation, agriculture, introduced exotic plants and animals, river trade and recreation. It still contains, however, important waterbird habitats and is a significant drought refuge. The Ramsar area includes a variety of habitat types which can vary seasonally. The area is used extensively by people, has economic significance and is a well-used recreation area; the Ngarrindjeri people view the region as having significant importance for them.

Silver Gull

Vision

Vision for the Coorong and Lower Lakes Ramsar Wetlands

Conservation of the Coorong and Lower Lakes Ramsar Wetlands by incorporating the world's best practice in integrated natural resource management to:

- conserve the environmental and ecological attributes of the wetlands for the benefit of future generations
- use the natural resources of the wetlands in a sustainable manner that is compatible with the maintenance of the ecosystem functions
- protect and restore natural habitats
- restore viable populations of native species
- increase community commitment and awareness, including recognition of the Ngarrindjeri association with the area
- improve water quality and increase flows through the wetlands
- fulfil Australia's obligations under the Ramsar Convention and other international agreements

Threats

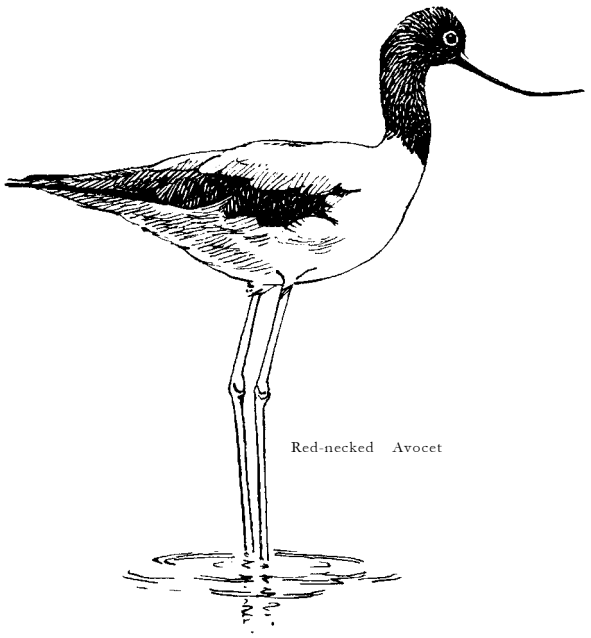
The main environmental and ecological threats to attaining the Vision are:

- habitat decline due to habitat simplification
- conflicts of use leading to excessive disturbance and loss of habitat
- isolation from other wetlands because of changes to land use
- the presence of exotic plants and animals, including predators and competitors
- fragmented management by many agencies and
- the limited ability to influence occurrences upstream in the catchment which impact on the Coorong and Lower Lakes, such as water diversions.

Objectives and strategies

The plan proposes six objectives to achieve the Vision for the region; each has a number of strategies designed to achieve the objectives. The objectives are of three kinds:

1) measures which facilitate change
2) measures which protect the habitats that remain and
3) measures which reverse current processes of environmental degradation.



Red-necked Avocet

Objective 1

Integrated environmental management of the Coorong and Lower Lakes Ramsar Wetlands with monitoring of biotic indicators to ensure the sustainable, multiple use of the region; and monitoring of management performance against the plan objectives.

Objective 2

Increased opportunities for participation by the Ngarrindjeri people in the planning and management of the Coorong and Lower Lakes Ramsar Wetlands, subject to South Australian Government policy relating to the resolution of native title claims.

Objective 3

Improved awareness among all key stakeholders, including the wider community, of the natural values of the Coorong and Lower Lakes Ramsar Wetlands and Ramsar principles expressed in the Management Plan.

Objective 4

Protection of the full range of wetland habitats and restoration of degraded habitats in the Ramsar area and their conservation for future generations.

Objective 5

Increased environmental benefits from the improved management of existing water entitlements and improved water quality and flows.

Objective 6

Ongoing funds and resources to achieve the objectives of the management plan.

ACKNOWLEDGMENTS

This plan was prepared by the Department for Environment and Heritage (DEH, previously Department for Environment, Heritage and Aboriginal Affairs) in partnership with the Community Reference Group (CRG) as a cosequence of the nomination of the Coorong and Lower Lakes as a Wetland of International Importance (Appendix 1). They were assisted by many other people who gave of their time and expertise in the planning process, the preparation of the seven discussion papers and the formulation of this plan.

The Community Reference Group was chaired by Mrs Valerie Ball,OAM, a former Mayor of Strathalbyn Council and Deputy Mayor of Alexandrina Council. The Group comprised of representatives of peak bodies and organisations with a regional focus in the Coorong and Lower Lakes Ramsar Area. They were appointed by the Minister for Environment and met 13 times during the planning process. A full list of members can be found in Appendix 3.

The Government Agencies Steering Group, chaired by Colin Harris from DEH, met throughout the process to provide government agency feedback and coordination. A list of members can be found in Appendix 4.

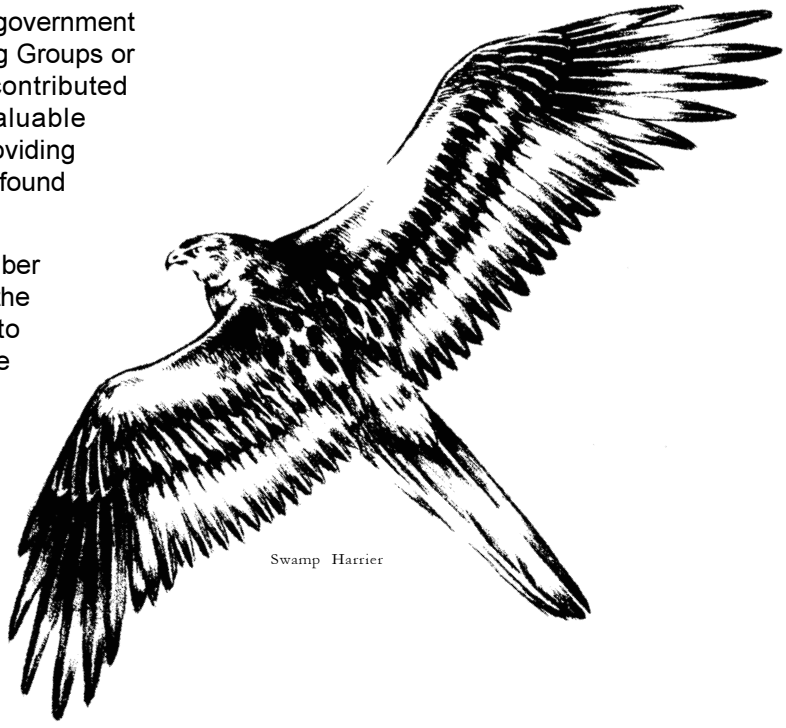
Many people both inside and outside government gave their time to the Technical Working Groups or refereed discussion papers. Some contributed formally while others contributed valuable support by answering queries and providing advice. A full list of these people can be found in Appendix 5.

A workshop at Meningie on 15 December 1997 was attended by participants from the Upper South East and other areas to discuss Coorong and Estuary issues. The names of participants and people who presented papers are in Appendix 6.

The Ngarrindjeri community gave their time to meet with a consultant on a number of occasions and selected and supported a workshop group which provided the Ngarrindjeri input to this plan. The wider community provided valuable contribution to the planning process by providing written or verbal submissions on seven discussion papers.

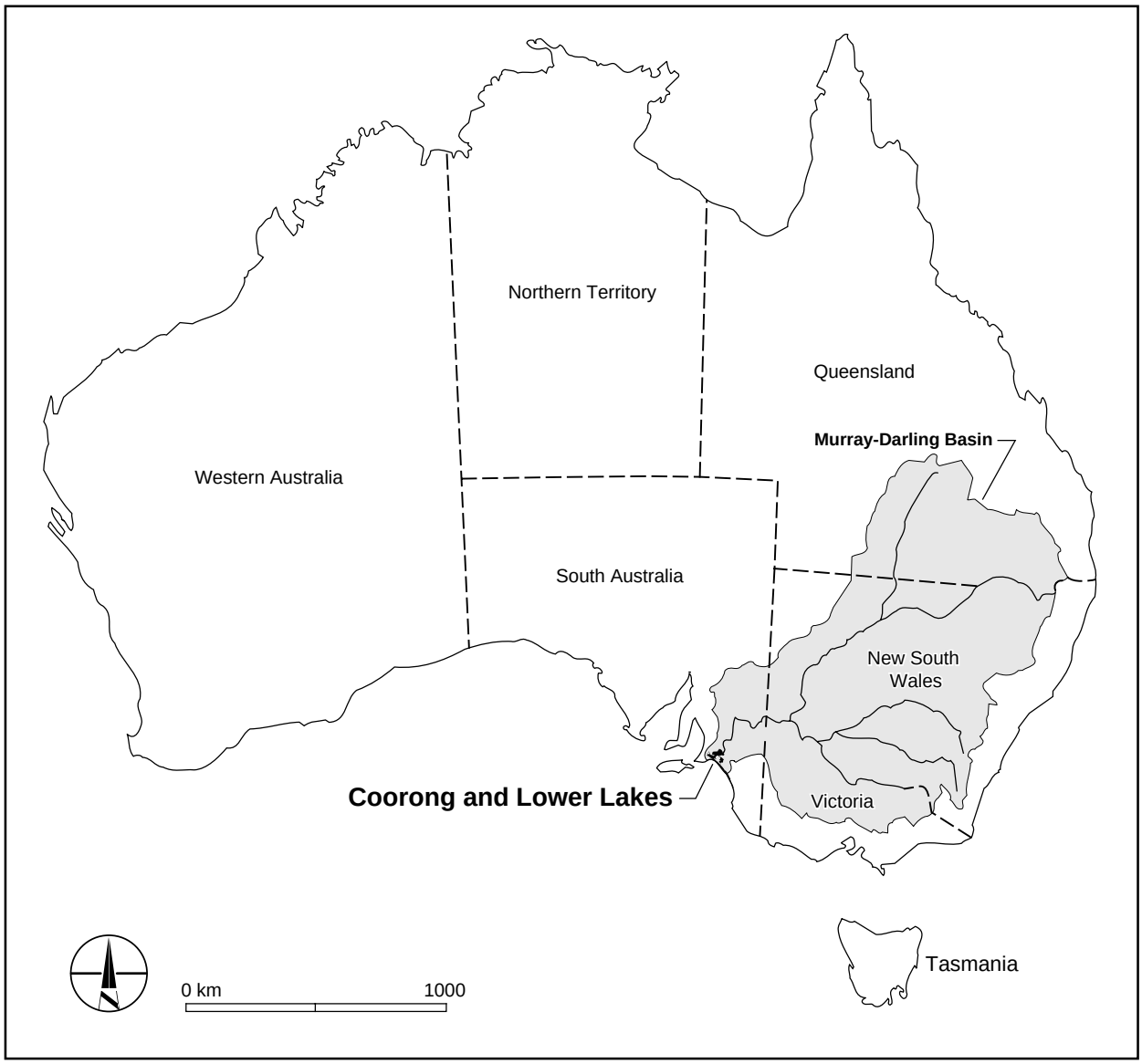
The planning team within DEH consisted of Bernice Cohen, Project Manager; John Berggy, Natural Resource Planner; John Gilliland, Senior Community Consultation Officer (stage 1); Mike Hinsliff, Consultant, community consultation (stage 2) and Joan Murray, Desktop Publishing and Administrative Officer.

Funding for the preparation of the plan was provided by the Commonwealth Government through the National Wetlands Program under the Natural Heritage Trust and by the State Government through the Department for Environment and Heritage.



Swamp Harrier

LOCATION

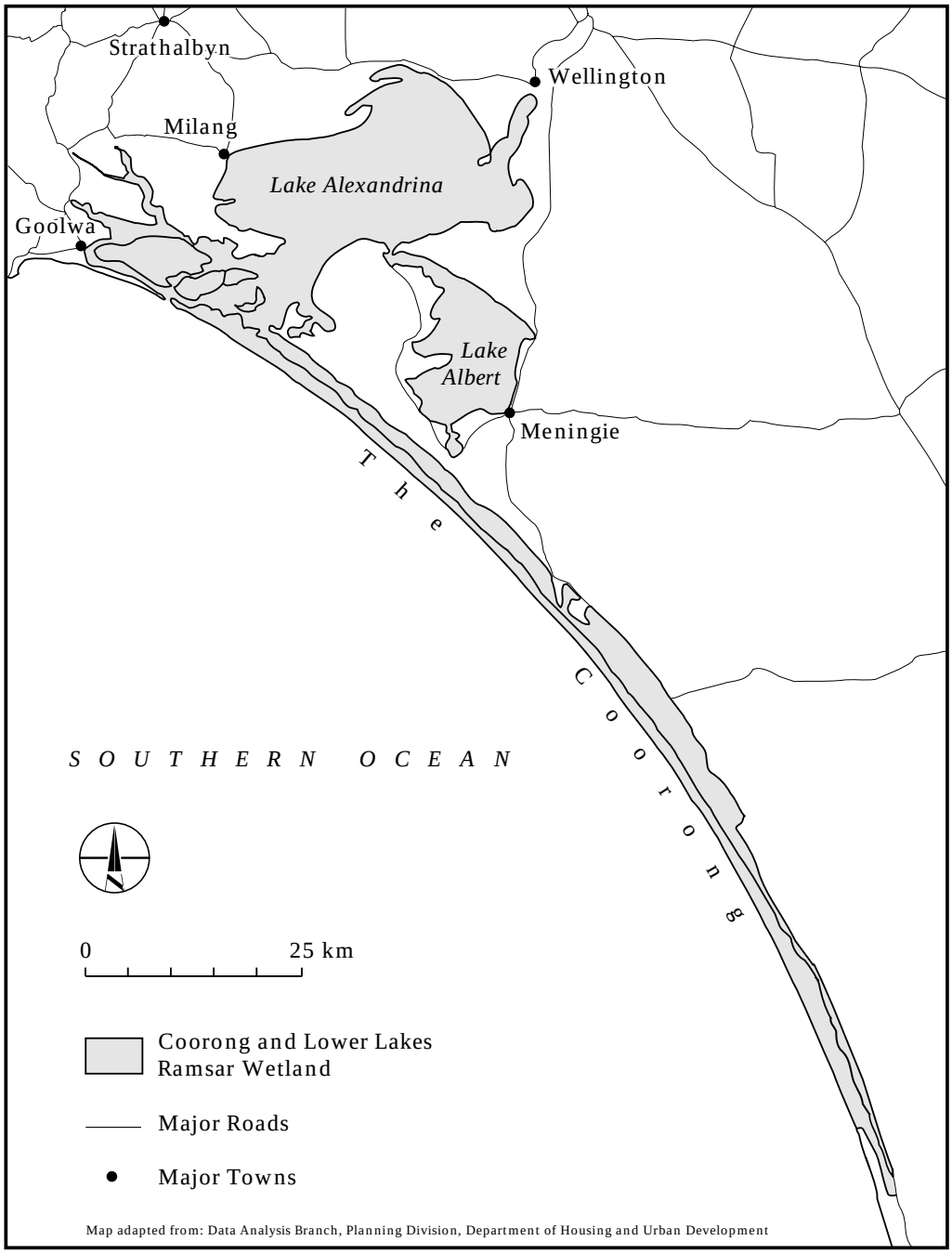


Map 1: Location of the Coorong and Lower Lakes in Australia

INTRODUCTION

The Coorong and Lower Lakes Ramsar area (Maps 1 and 2) was declared a Wetland of International Importance in 1985 under the Ramsar Convention. This Management Plan will, in part, fulfil Australia's obligations under the Convention by providing a framework for the wise use of the area. It aims to integrate the environmental management of the Ramsar area so that the ecological character of the area is conserved, in conjuction with the area's important social and economic functions.

The Plan includes a Vision for the area, analyses threats to attaining the Vision and proposes management actions.



Map 2: The Coorong and Lower Lakes Ramsar Wetlands

PLANNING PROCESS

As a signatory to the Ramsar Convention, Australia has an international obligation to prepare management plans for its Wetlands of International Importance.

Apart from such obligations, the need for integrated planning for the Coorong and Lower Lakes Ramsar Wetlands had become increasingly apparent following other planning initiatives in the area and reports about the area (National Parks and Wildlife Service, 1990; Hinsliff, 1994; Edyvane et al, 1996).

The Government of South Australia authorised the commencement of the management planning process on 6 May 1996, and included the requirements for community involvement and a whole of government approach.

The Department for Environment and Heritage (DEH), formerly the Department for Environment, Heritage and Aboriginal Affairs and the Department of Environment and Natural Resources, became the lead agency for the formulation of a management plan and developed a planning process which emphasised community consultation, transparency and the involvement of all relevant government agencies. This led to the establishment of: a Community Reference Group of people, representing relevant peak bodies and organisations with a regional focus in the study area; a Government Agencies Steering Group; Technical Working Groups; and a planning team consisting of a Project Manager, a Natural Resource Planner, a Community Consultation Officer, a consultant for specialised community consultation and an Administrative Officer.

The Community Reference Group (CRG) was appointed by the Minister for Environment and Natural Resources to advise and assist the planning team and report to the Minister on a three-monthly basis. Members of the CRG represented peak stakeholder bodies and organisations with a regional focus. Thus, members also had responsibilities for accounting to their parent organisations and promoting the Ramsar Plan and the planning process. The role of the Government Agencies Steering Group was to coordinate policy and actions within government with respect to the Coorong and Lower Lakes.

The planning process was publicly launched by the then Minister for Environment and Natural Resources the Hon David Wotton MP on Friday 13 December 1996 at the first meeting of the CRG at Goolwa.

Community involvement was facilitated through:

- regular meetings of the CRG and the communication network of CRG members through their links to the community
- publication of seven discussion papers on key topics and issues which generated in excess of 160 public submissions before the preparation of the plan. In order of publication they were:

  Waterbird and Wetland Habitat Conservation
  Water Quality in the Lower Lakes
  Development in the Coorong and Lower lakes Region
  Recreation and Tourism Use of the Coorong and Lower Lakes Region
  Water Management in the Coorong and Lower Lakes
  Coorong and Estuary Issues
  Implementation and Management Issues
- publication of seven newsletters, *The Wetlands Voice*
- advertisements in *The Advertiser* and regional newspapers advertising the release of each discussion paper
- a targeted consultation program by a Community Consultation Officer which included meetings and with a number of community groups including the Ngarrindjeri people and many individuals
- a workshop at Meningie on 15 December 1997 at which issues relating to the interaction between the Upper South East Dryland Salinity and Flood Management Plan and the Coorong were discussed
- a leaflet drop to all postal addresses in the general region
- establishment of a web site on the Internet
- several press releases by the Minister
- informal consultation with a number of private people in the region.

Communication and consultation with the Ngarrindjeri community was facilitated through a contract consultant who met first with leaders, then with the greater community and facilitated a working group. This group then prepared the Ngarrindjeri submission to this plan which was approved at a meeting of the greater community.

The project team also conducted a literature search of the available technical and scientific material which was reinforced by reference to expert persons on a number of Technical Working Groups and expert persons in government agencies. This input formed the basis for the development of the discussion papers.

The planning team liaised with councils and government agencies and made submissions on both strategic planning initiatives and development applications. The planning team also liaised with steering groups and project officers of Local Action Plan groups and provided advice and comments on some research initiatives.

BACKGROUND

Ramsar and Wise Use

In February 1971, at the town of Ramsar in Iran, delegates from 18 countries and observers from a number of other countries and non-government organisations met because of concerns at the worldwide loss of waterbirds and their wetland habitats. The result was the first international nature conservation treaty. This was the *Convention on Wetlands of International Importance especially as Waterfowl Habitat* (Ramsar Convention Bureau, 1997), commonly known as the Ramsar Convention after the name of the town where it was negotiated. Australia became the first signatory to the Convention in December 1975 and was the first country to propose a Wetland of International Importance, the Coburg Peninsula in the Northern Territory.

Contracting parties to the Ramsar Convention are obliged to nominate wetlands that comply with the Convention's criteria for Wetlands of International Importance. The Coorong and the Lower Murray Lakes, Albert and Alexandrina, together with the islands in the lakes were designated as a Wetland of International Importance in 1985. Once wetlands have been designated, the nominating countries are required to prepare management plans for the wetlands which will promote their ***wise use*** and the ***conservation of their ecological character.***

Wise Use

The concept of wise use is central to developing an integrated planning process for Wetlands of International Importance. According to the Ramsar definition, the ***wise use of wetlands is their sustainable utilisation for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem***. 'Sustainable utilisation' of a wetland is defined as: ***human use of a wetland so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations*** and 'natural properties of a wetland' are defined as ***those physical, biological or chemical components, such as soil, water, plants, animals and nutrients and the interactions between them*** (Ramsar Convention Bureau, 1997)

It is evident that the concept of wise use is both compatible with and very similar to the principles of ecologically sustainable development and the conservation of biological diversity. Wise use embodies the concepts of sustainable use, which is in accord with the maintenance of ecological character and the resource requirements of future generations.

Ecological Character

Ecological character is defined by the Ramsar Convention as being ***the structure and interrelationships between the biological, chemical, and physical components of the wetland. These derive from the interactions of individual processes, functions, attributes and values of the ecosystem(s)*** (Ramsar Convention Bureau, 1997).

These concepts are central to the application of this management plan.

Management Context

Management planning for the Coorong and Lower Lakes has been carried out in the context of a number of planning and policy initiatives that impact on the region.

International

- Australia has agreements with other countries which aim to conserve migratory birds and other wildlife. The Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA) list birds which migrate between Australia and Japan, and Australia and China respectively, and seek to conserve these species. Australia has joined the Ramsar initiated East Asian-Australasian Shorebird Reserve Network which seeks to conserve key wetlands in the migration route flyway. One of these sites is the Coorong and Lower Lakes.

National

- At the national level there is the Wetlands Policy of the Commonwealth Government of Australia, the National Strategy for Ecologically Sustainable Development, the National Strategy for the Conservation of Australia's Biological Diversity, the Intergovernment Agreement on the Environment, the Commonwealth Coastal Policy, the Council of Australian Governments Water Reforms, the Endangered Species Program, the National Feral Animal Control Strategy and the National Weeds Strategy. Under the Natural Heritage Trust there is a mixture of programs and strategies including Bushcare and the National Wetlands Program.

Murray-Darling Basin

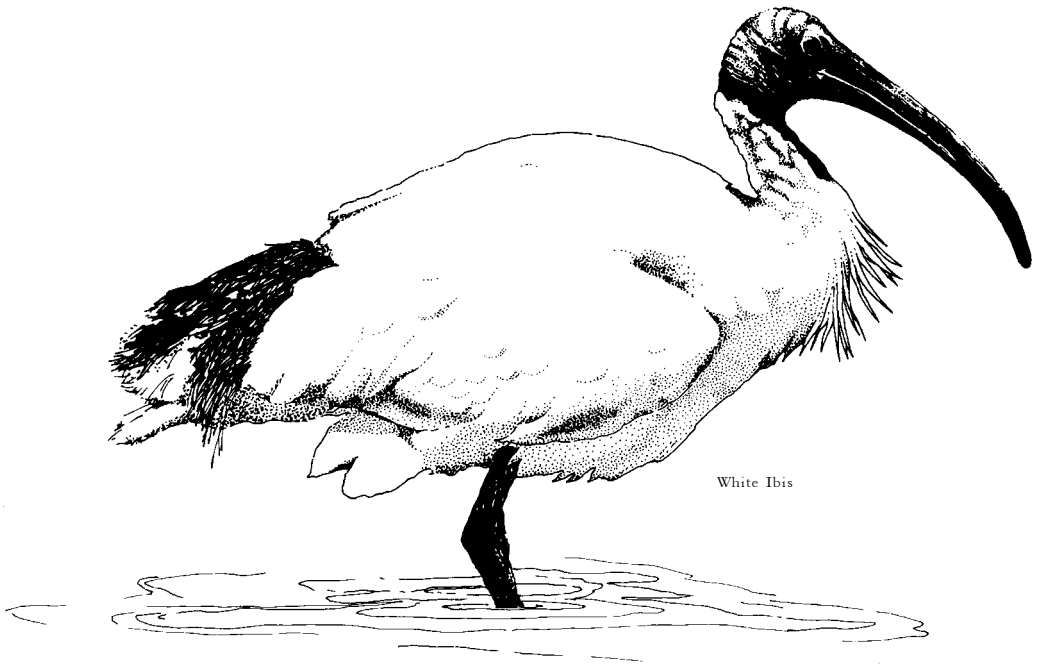
- The Coorong and Lower Lakes are part of the Murray-Darling Basin which extends into four states. The Basin is covered by an integrated catchment management program known as the Murray-Darling Basin 2001 (MD2001) which comes under the Natural Heritage Trust. Within MD2001 is the Natural Resources Management Strategy from which the Basin Sustainability Program has been developed. MD2001 has also been developed to improve the health of the river system through the involvement of local government. South Australia's minimum water entitlement of 1850 gigalitres/year is fixed by the Murray-Darling Basin Agreement.

State

- At the state level, the South Australian River Murray Wetlands Ten Year Plan incorporates the Fish Management Plan, the draft Algal Management Plan and the River Murray Water Resources Management Policy Review.

Regional

- At this level are Local Action Plans and the Planning Strategy for Country South Australia under the *Development Act 1993*. The River Murray Catchment Water Management Board and the South East Catchment Water



White Ibis

Management Board are developing Catchment Management Plans as required by the *Water Resources Act, 1997*. In the Upper South East of the State, the Upper South East Dryland Salinity and Flood Management Plan, which has approvals from both the State and Federal governments, has objectives related to managing rising groundwater and the threat of increasing dryland salinity. The State Government is progressively undertaking regional biodiversity plans and has completed the Biodiversity Plan for the South East of South Australia and is working on the Mt Lofty/ Fleurieu Peninsula area.

Local

- These plans include the Development Plan of each council and the Coorong National Park Management Plan. These plans are statutory documents. There are also a number of informal plans at this level including Alexandrina Council's Recreational Boating Plan.

The Coorong and Lower Lakes Ramsar Management Plan sits at the regional planning level. The objectives and strategies in the Ramsar Plan have been formulated with regard to policy documents at all levels. The Ramsar Plan also aims to be a coordinating document which will facilitate integrated ecological management of the area.

Aims of the Plan

The principal aim of this Management Plan is to fulfil Australia's obligations under the Ramsar Convention which are in part, to produce a plan for the management of a Wetland of International Importance that incorporates strategies to provide for the wise use of the area and maintain its ecological character.

The Plan also aims to further Australia's commitment to other international treaties including JAMBA and CAMBA.

At a regional level the plan recognises the ecological links with other wetlands and highlights the importance of those links.

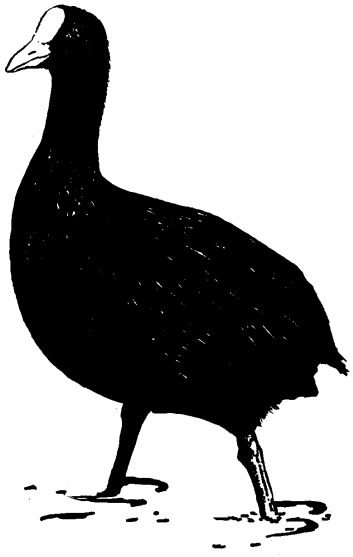
Locally, this plan provides a shared Vision for the area and a framework of coordinated actions designed to achieve the Vision.

The Ramsar Area

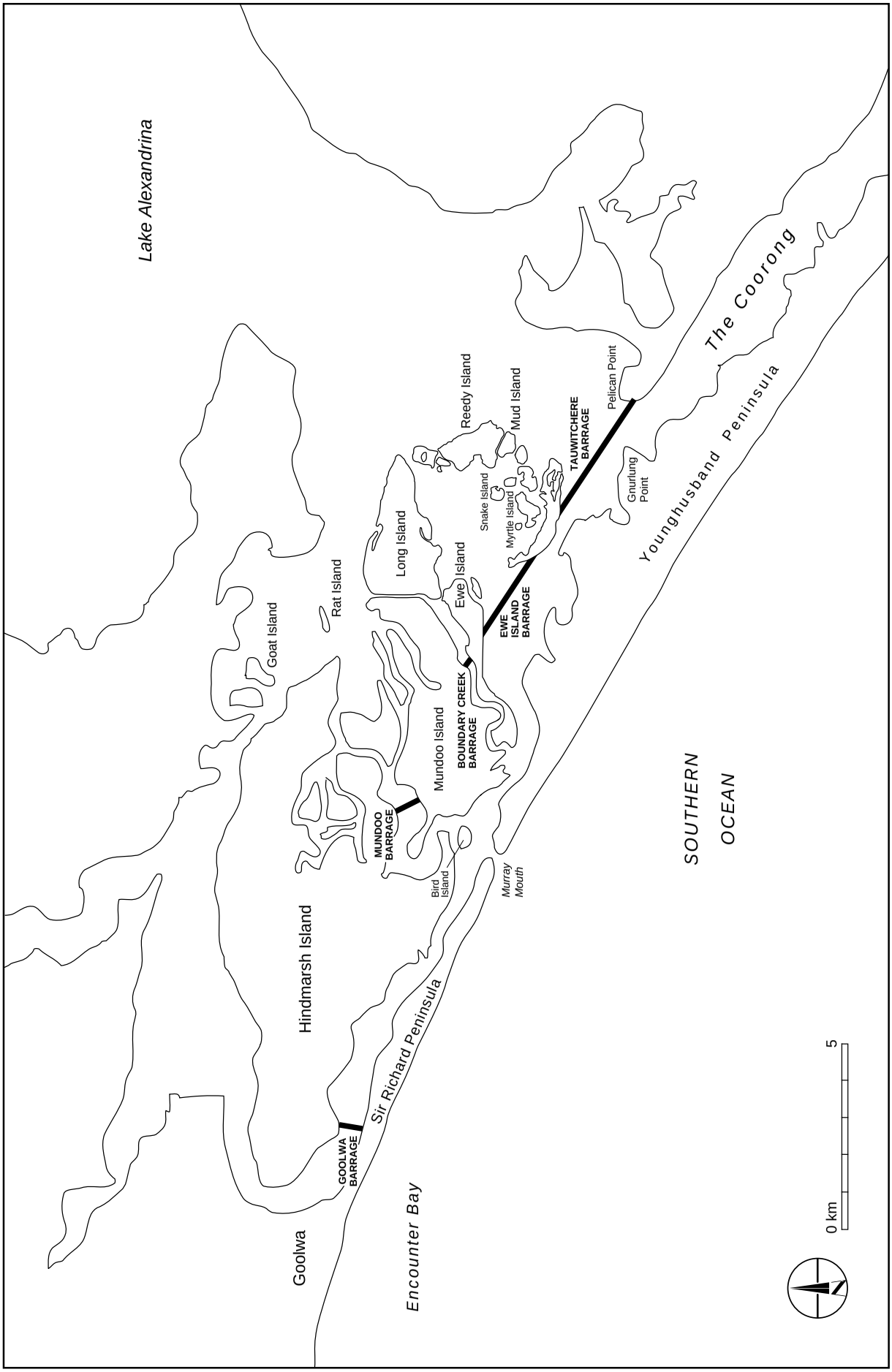
The nominating document for listing the Coorong and Lower Lakes as a Wetland of International Importance (Appendix 1) proposed an indicative rather than an exact boundary for the Ramsar area, but included the Coorong, the Younghusband Peninsula, Lake Albert, Lake Alexandrina and all the islands in Lake Alexandrina, and all of Hindmarsh Island. Not included were the Sir Richard Peninsula and ephemeral wetlands inundated by the record flood in 1956. Discussion Paper No. 3 raised the issues relating to the appropriateness of this boundary and the need for a more definable boundary which could be related to natural and cadastral boundaries, council areas, and the areas of Local Action Plans and the Development Plan, and at the same time be ecologically relevant. The plan contains recommendations which propose amendments designed to rationalise and better define the original boundary of the Ramsar area (see Strategy 4.3).

The Area Affected

Many of the birds and other animals that use the Ramsar area also move to and from other wetlands. Thus the Coorong and Lower Lakes are an open ecosystem with connections to other ecosystems, some as far away as Siberia and Alaska where many of the migratory waders breed. Being at the end of the Murray-Darling Basin, the Coorong and Lower Lakes receive, directly or indirectly, the impact of actions and decisions made throughout the basin. Conversely, decisions made about the Coorong and Lower Lakes may impact upstream by influencing river discharges or triggering variations to flow regimes including the need for dilution flows. The area affected by this plan is dependent on specific objectives, strategies and actions in the plan. For example objectives relating to water quality and management have ramifications that may affect a large part of the Murray-Darling Catchment, while objectives relating to habitat management tend to be site specific.



Coot



Map 3: The barrages and the islands adjacent to the Murray mouth

SIGNIFICANCE OF THE COORONG AND LOWER LAKES

Ecological Character

The Murray-Darling Basin covers about 14% of the Australian landmass and the river system is counted as the world's fourth longest. However, because it drains a largely dry to arid continent, it has low discharge compared to other river systems world wide: on average 16% of the River Nile, 3.5% of the Mississippi and 0.24% of the Amazon. Where the Murray meets the sea, there is no open fan delta, but shallow terminal lakes which empty through a narrow gap in the coastal dune barrier (Bourman and Barnett, 1995).

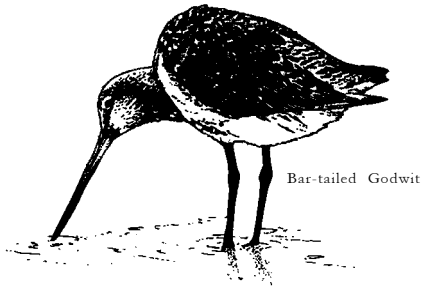
Prior to river regulation, which began last century, the Murray-Darling River system could be described as a spate river system subject to highly variable flows. Lakes Albert and Alexandrina together with the Coorong was a complex and variable estuary emptying through a relatively small river mouth in the coastal dune barrier. There are now over 100 regulatory devices in the Murray-Darling system ranging in size from major storage dams to a variety of smaller locks and weirs. The final regulatory devices are five barrages, which separate salt and fresh water close to the river mouth (Map 3).

Fresh water impounded in Lakes Albert and Alexandrina by the barrages maintains a variety of permanent and ephemeral wetlands. Currency Creek and the Finniss River form sheltered reedy freshwater estuaries on Lake Alexandrina. Tolderol and Mosquito points and the Narrows also support extensive sheltered reed beds. The Bremer River winds through red gum flats to the lake while the Angas River flows seasonally through semi-arid woodlands into the lake. Both rivers have ephemeral wetlands near their mouths on Lake Alexandrina. Lake Albert is more saline than Lake Alexandrina and exhibits more of the original character of the lakes before their impoundment in 1940. Around the lakes are salt marshes and saline lagoons, many of which are occasionally inundated by floods. All retain some water for a while as a result of local runoff from winter rains. In late winter and spring, many of these salt lakes display a bright pink colour due to the presence of the microscopic organism *Dunaliella* sp. The lakes are fringed with tall reeds, *Phragmites* sp., and bulrush or cumbungi, *Typha* sp., and there are sheltered flats and lagoons in places. This lake„ shore vegetation forms an almost unbroken habitat corridor around the lakes which has a critical role in allowing birds and other animals to move between habitats with relative safety from predators and disturbance.

Habitats around the edge of the lakes are influenced by, and change in response to, water regulation procedures at the barrages which maintain the lakes at a nominal level of 0.75 metres Australian Height Datum (AHD). However there is a cyclical change in levels from about 0.85 metres AHD in late spring to a low of 0.6 metres AHD in autumn and lower in drought years. Thus there is some variation in levels around the lake edges resulting in some mud flats being exposed seasonally. This slight rise and fall in lake levels results in seasonal variation to habitats. Grazing around the lake edge also alters the habitats. Wind has an important influence on lake levels. Wind can push water higher up one side of the lakes or the other, and up and down the river resulting in daily and weekly variations in local lake levels of nearly a metre during periods of prolonged, strong winds.

Together the lakes cover approximately 648 square kilometres which makes them the largest freshwater body in South Australia.

The Coorong, which is the waterbody confined by the coastal dune barrier of the Younghusband and Sir Richard peninsulas, is some 140 kilometres long (Map 2). Coorong habitats range from seasonally fresh near the barrages when large quantities of water are being released, to brackish in the Murray Mouth area, grading to hypersaline in the southern lagoon. The Coorong experiences seasonal changes in water level which are as much as a metre in the southern lagoon from late spring highs to late autumn lows. As water levels fall from early summer, extensive tidal mud flats are exposed along the southern shores of the Coorong. These are habitat for a number of species of wading birds, many of which are seasonal migrants to Australia and breed



Bar-tailed Godwit

in Alaska, northern China and Siberia. On the peninsula side, there are freshwater soaks which provide further variety of habitats. Wind and tide also cause short term variations in water levels locally. Storm tide events can force seawater back through open barrage gates into the lakes and across causeways on Ewe and Tauwitchere islands into the lakes.

The seaward side of the coastal dune barrier is a high energy coast with a continuous sand beach broken only by the Murray Mouth, stretching from Lacepede Bay to Encounter Bay, a distance of nearly 200 kilometres. About 150 kilometres of this beach is within the Ramsar area. The beach is habitat for a number of waders, gulls and terns. The Hooded Plover, listed as vulnerable (ANZECC, 1995) breeds on this beach.

River regulation, water abstraction and agriculture replacing the low open woodlands in the region has altered the lakes and the Coorong, contracting some habitats and creating others. The Coorong and Lower Lakes together still retain a mosaic of habitats which support a diversity of bird life and are an important drought refuge.

Fauna

Some 85 species of waterbirds have been recorded in the region (Carpenter, 1995). At the time of nomination, the wetlands fulfilled eight of the 11 criteria for identifying a Wetland of International Importance, indicating a site with comparatively abundant species and many individuals. While bird numbers fluctuate both seasonally and annually, the region is important for migratory waders, principally Red-necked Stints, Sharp-tailed Sandpipers and Curlew Sandpipers. These species and other migratory waders are protected under the JAMBA and CAMBA agreements. Habitats, including the Coorong, on their migratory flyway between Australia and their northern breeding grounds are being conserved under the East Asian-Australasian Shorebird Reserve Network.

Resident waders include stilts, avocets, plovers, lapwings and oystercatchers. Ducks include, at times, in excess of 50 000 Grey Teal and large numbers of Australian Shelducks. There are also Black Swans and about 2000 Cape Barren Geese during the summer months. The rare Fairy Tern and the endangered Little Tern nest on islands in the Coorong. A number of other species nest in the area including pelicans, swans and ibis. The region is regarded as a major site in South Australia for more than 30 species of waterbirds (Carpenter, 1995).

The Water Rat, *Hydromys chrysogaster,* is common in the lakes and the Eastern Swamp Rat, *Rattus lutreolus,* has been reported.

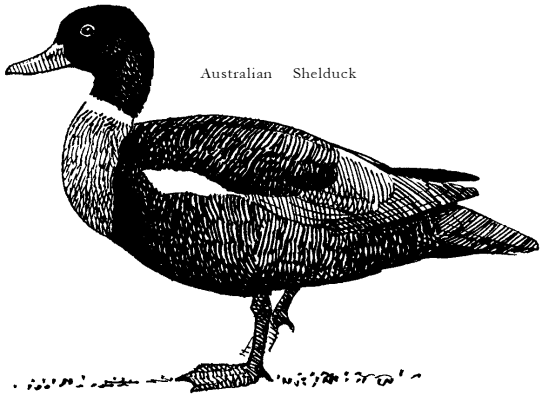
Eckert and Robinson (1990) published a survey of fish in the Coorong and lakes, reporting 59 species. Since then six more species have been added to this list. The fish community can be broadly divided into 33 primarily marine species, 12 estuarine and 23 essentially freshwater species. The lakes are still dominated by native freshwater fish, notably Callop and a few Murray Cod as predators, Bony Bream as detritivores and a diversity of mid-water and benthic native prey/small fish which are generally distributed throughout the lakes.

Introduced species, particularly European Carp, *Cyprinus carpio,* have an influence on the lake environment, but it is as much a case of human influences have benefited carp. Redfin Perch, *Perca fluviatilis,* stocks vary from year to year and their influence is difficult to measure. Selective fishing has reduced both these species. Mosquito Fish, *Gambusia holbrooki,* are mostly present around the lake margins.

The fauna of the Coorong is still composed of native species, the only introduction being the European Shore Crab, *Carcinus maenus*, an exotic predator which has had a significant effect on other estuaries. The importance of its presence in the Coorong is unknown.

Of the reptiles, the Eastern Tiger Snake, *Notechis scutatus,* is common near the lakes and the Eastern Brown Snake, *Pseudonaja textilis,* is common in drier habitats, particularly the Younghusband Peninsula. The Long-necked Turtle, *Chelodina longicollis,* is locally common in the area and the Short-necked or Murray Turtle, *Emydura macquarii,* has been reported. Also present is the Water Skink, *Eulampaus heatwoldii,* wherever there is suitable habitat of rocks near the water (Mark Hutchinson, SA Museum, pers comm).

There are approximately ten species of frogs in the lakes and environs, the populations of which fluctuate in response to changing environmental conditions. Generally, frog distribution is limited by salinity and aridity, with the greatest species richness occurring


Australian Shelduck

in the estuaries of the Finniss River, Currency Creek and the western shore of Lake Alexandrina near Milang. Frogs are an important prey species for herons, egrets and bitterns. The most widespread species in the region is the Banjo Frog, *Neobatrachus centralis* (Mark Hutchinson, pers comm). The Common Eastern Froglet*, Crinia signifera,* and the Spotted Grass Frog, *Limnodynastes tasmaniensis,* are present in large numbers at times (Strathalbyn Field Naturalists Club, pers comm).

Resource Use

The lakes are an important water resource for irrigators. Water diversions for horticulture and viticulture are increasing, although all current diversions are within the Murray-Darling Basin Commission 'cap', which places a finite limit on water diversions throughout the Basin. Currently, between 65% and 85% of the irrigation allocation is utilised, depending on seasonal influences. The barrages maintain a relatively constant pool level upstream to Lock 1 at Blanchetown which also enables water abstraction for irrigating farms on the reclaimed swamps and water to augment Adelaide's water supply. In drought years this can amount to 90% of Adelaide's water supply. In dry years, South Australia receives only its minimum entitlement of 1850 gigalitres under the Murray-Darling Basin Agreement. Depending on seasonal weather conditions which determine both evaporation rates and demand for water, the lakes gradually fall from their surcharged level of 0.85 metres AHD to about 0.6 metres AHD and much lower in drought years, and the barrages remain closed for long periods, often in excess of 100 days (Murray-Darling Basin Ministerial Council 1995 and Edyvane et al 1996).

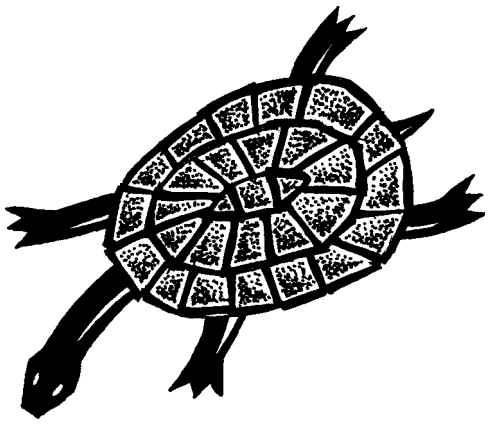
Both the lakes and the Coorong provide a variety of recreation opportunities. There are approximately 1000 wet and dry berths in the region and many more boats are brought to the region and launched from trailers. A 1991 survey (Marina Assessment Advisory Committee, 1991) found that nearly 80% of boats berthed in the region were owned by people resident in Adelaide. When trailerable boats are added it is likely that 80% or more boating is by people from Adelaide, making the region an important recreation resource for metropolitan Adelaide users.

The Coorong and Lower Lakes support an important commercial fishery with an estimated annual value in 1996-97 of approximately $4.6 million (Baker and Pierce, 1998). Importantly, the region supplies some 80% of the total Mulloway catch for South Australia (Pierce, 1995) as well as significant quantities of callop, European Carp, Bony Bream, Black Bream, and Goolwa Cockles. There is a commercial cockle industry along the Coorong beach which takes about 450 tonnes of cockles for bait annually (Pierce, 1995). The fishery works within its own management plan which includes the deliberate over-harvesting of European Carp in order to enhance aquatic environmental benefits. There is also a significant recreational fishery, however its value has not been estimated.

The wetlands are an attractive backdrop to the lakeside towns of Goolwa, Clayton, Milang and Meningie, adding considerable amenity to those towns which is reflected in their high population growth and property values.

Regional Context

Many species of birds that rely on wetland habitats are migratory or nomadic. Of the wading birds, plovers, sandpipers and related species, about 20 species are migratory. These birds breed in the Arctic Circle and spend the remainder of the year in the southern hemisphere. Although some weigh as little as 30 grams, they make the 12 000 kilometre flight to and from the breeding grounds twice a year, often flying up to 5000 kilometres non-stop. These species are not only dependent on summer and winter habitats, but on staging areas along the way where they replenish body fat. The Coorong and Lower Lakes are part of the East Asian-Australasian Shorebird Reserve Network. Some 85% of wetlands throughout the network are under threat and eight bird species are vulnerable (ANCA, undated).



Many waterbirds utilise several habitats in their range and may move between wetlands. For fast flying species such as many ducks and waders, moving to another wetland habitat even 100 kilometres away or further presents little problem in terms of time and distance. But with many wetlands now drained or severely degraded there are fewer habitats and birds may have to move further, exposing them to more predators and hazards. Wetlands are disappearing world wide as a result of demand for water and other resources, including arable land which is often created by draining wetlands.

The Coorong and Lower Lakes Ramsar Wetlands should be regarded as part of a series of wetlands in south-eastern Australia which together supply waterbirds with the resources they require to complete their life cycles. Locally, many of the mobile species move around quite extensively to exploit particular resources at particular times and places. Nomadism in many species is an adaptation to Australia's unpredictable droughts and rain.

Indigenous communities

The Conference of the Contracting Parties to the Ramsar Convention held in Brisbane in 1996 made several recommendations to Contracting Parties in relation to involving local and indigenous people in the management of Ramsar wetlands. These include the need to:

> *make specific efforts to encourage active and informed participation of local and indigenous people at Ramsar listed sites and other wetlands and their catchments and their direct involvement, through appropriate mechanisms in wetland management,*

and

> *develop appropriate national and local mechanisms, drawing from any existing models, to ensure consultation with local and indigenous people with a view to reflecting their needs and values, traditional and other knowledge and practices in national wetland policies and programs, and in management planning for Ramsar sites and other significant wetlands.*

Taking into account this commitment, a consultation process was initiated with the Ngarrindjeri community to actively involve them in the planning process.

The Lower Lakes and Coorong region is central to Ngarrindjeri culture. The Ngarrindjeri express this association through cultural and spiritual histories (or "dreaming stories") which are documented in anthropological and historical records.

Ngarrindjeri communities also have a contemporary association with the Ramsar wetlands, and many Ngarrindjeri people live and work in the region.

The consultation process with Ngarrindjeri people indicated strong support in the community for Ramsar principles and objectives and many of the Ngarrindjeri community's views on fundamental environmental issues in the Ramsar area are consistent with the strategies proposed in this draft management plan.

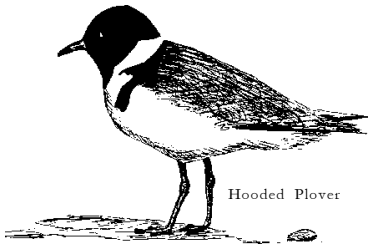
Economic Values

The economic value of the Coorong and Lower Lakes has several facets, all of which are important and should not be overlooked when considering the total value of the area. To begin with there are those activities which require the use and consumption of the natural resources in order to take place. These include the activities of primary industries such as irrigated agriculture, commercial fishing, grazing and recreational fishing. In addition to these there are the recreational and tourism activities such as boating, bird watching and sightseeing, which require the use of the region while not necessarily consuming the natural resources. These activities are all of economic value to those individuals that undertake them.

While the benefits and values of these activities are tangible, there are also values of a less tangible nature which do not physically use the natural resources, but are nonetheless as important, if not more so, and must also be considered. The aesthetics of the region are clearly of value to those individuals who reside in the area; there is bequest value associated with the region, in which individuals derive utility and satisfaction from endowing future generations with the natural resources of the area; and, perhaps most importantly in the case of a Ramsar site, there is existence value where individuals derive utility and satisfaction purely from the continued existence of the resource, even though they may never visit the site. Although many of these economic values are difficult to quantify, they are nevertheless real and should not be overlooked.

VISION

This Vision for the development of the Coorong and Lower Lakes Ramsar Area is intended to place the objectives of the Management Plan into a wider context, rather than just being a list of strategies and actions which address threats to the region.


Hooded Plover

THREATS

Habitat Decline

Since European settlement the exploitation of the natural resources of the Murray-Darling Basin river regulation has changed most of the catchment, including the Coorong and Lower Lakes, quite dramatically. Land clearance has accelerated erosion throughout the catchment and led to soil salinisation. Abstraction of water for irrigation and other uses has reduced flows by about 80% on average (Murray-Darling Basin Ministerial Council, 1995) and river regulation has changed the flow regime. Accelerated soil salinisation, erosion and polluted drainage into rivers has changed the water quality (Steffensen, 1995).

Most of the Murray-Darling Catchment is relatively arid and even the wettest parts are prone to variable rainfall. The river system was a spate system of irregular floods and often prolonged droughts. The ecosystems and the flora and fauna which make up the natural communities has adapted to these variable environmental conditions over millions of years. The ecosystems of the Murray-Darling Basin are generally robust, capable of returning to their equilibrium state after major environmental events such as droughts, fire and flood. The impacts of river regulation and water diversion have appeared slowly over time but are now accelerating.

Today, river flows are regulated and the small floods which once flowed through the river system in six or seven years of every decade, are impounded in storage. The only flood events along the river are the very large ones that exceed the capacity of the storage areas about six or seven times a century. Fish and birds which rely on the periodic flooding and drying of wetlands fringing the river have fewer opportunities to breed, and many of the wetlands have been drained and cleared for farm land. The frequent small floods now impounded in dams are released to supply irrigation demand in summer. This is the cold water from the bottom of dams rather than warmer water flowing off the catchments in winter and spring, which once filled ephemeral wetlands in most years (Mackay and Eastburn, 1990).

Regulatory devices such as the locks and barrages have created a series of pools rather than a flowing stream, permanently inundating some wetlands and leaving others dry for prolonged periods.

The river system, including the lakes, is now a much more steady state system which benefits fewer species of plants and animals. Simple lake edge habitats have replaced complex ones, resulting in less habitat types and thus fewer species.

Flow Patterns

- Flow patterns are now much altered and reduced in volume. Instead of small floods or spates flowing down river and filling wetlands on the floodplain in about seven years out of ten, this water is impounded in the catchment dams and released in increments which fulfil irrigation demand, often resulting in:

  - low or no flow through the barrages most summers (Murray-Darling Ministerial Council, 1995).

  - a shift in the timing and duration of flood events.

  Species that depend on these small floods have fewer opportunities to breed, both on the floodplain and in the estuary.

The Barrages

- The barrages have created an artificially high pool level in the lakes, equivalent to an almost constant artificial flood with only rare drying out episodes of lake edge vegetation. At the same time flows into the lakes are too small to flow through into the estuary, which consequently experiences a state of almost permanent artificially induced drought (Edyvane et al, 1995).

Low Flows in the Estuary

- Cool sea water flowing into the estuary maintains high oxygen levels in the water and helps to maintain the estuary's high productivity, particularly in the warmer months. Lack of flow through the estuary increases the rate of sand accumulation in the river mouth. This sand covers productive mudflats, alienating habitat and blocking channels, and is likely to block the river mouth with increasing frequency. It also prevents sea water from entering the estuary.

River Regulation

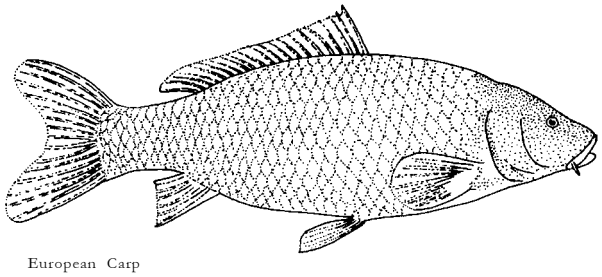
- River regulation has created a relatively stable pool level with a narrower band of fringing vegetation dominated by the tall reeds, *Typha* and *Phragmites.* There are few niches in this vegetation and they are utilised by fewer, mostly larger bird species.

Surcharging the Lakes

- Surcharging (to 0.85 metres AHD) to compensate for reduced summer flows increases erosion rates which directly alienates habitats. Flooding lake edge vegetation for long periods kills many riparian species, particularly the paperbark tea-tree, *Melaleuca halmaturorum* which cannot regenerate on land flooded for long periods (> 3 weeks). The tea-tree has the potential to reduce lake side erosion and provide nesting and roosting sites for a variety of birds.

Turbidity

- The lakes have become more turbid over time. This is largely a result of managed flows supplying a greater percentage of Darling River water which has more fine clays suspended in it (Steffensen, 1995) and because of the presence of European Carp (Fletcher et al, 1985). River bank erosion, often accelerated by land management practices such as excessive grazing also contributes to turbidity. Turbid water reduces aquatic plant growth by limiting light. This leads to a loss of the suite of invertebrate species that rely on aquatic plants, and in turn to the loss of birds and fish that rely on the plants and invertebrates. The ecosystem is simplified to one dominated by microscopic species, principally algae, and filter feeders like carp that can live in the turbid conditions, where most of the nutrients are associated with the bottom silt. Under certain weather conditions, these algae can 'bloom'. Some species are toxic, rendering the water unfit for consumption and adversely affecting native fauna.



European Carp

Low Estuary Flows

- Lack of flow due to the impoundment of winter rainfall and the diversion of water for irrigation has led to long periods when the barrages are closed and no fresh water reaches the estuary. Not only does this change the estuary into a marine rather than a brackish system, but it deprives the estuary of nutrients and allows sand to accumulate inside the river mouth. Estuarine species that rely on the high productivity of a variable, mostly brackish water ecosystem are replaced by marine species. The lower productivity supports fewer waders and other estuarine waterbirds, which must either find resources elsewhere or die out.

Drainage from the Upper South East

- The redirection of surplus surface and ground water under the Upper South East Dryland Salinity and Flood Management Plan into the Coorong via drains to Salt Creek may change the currently hypersaline dominated ecosystem of the southern Coorong. The natural variability of the Coorong has already been reduced because of reduced flows into the estuary, the silting of channels reducing water exchange, and the redirection of flood water from the Upper South East which once reached the Coorong more often than now. There is a lack of information available to predict impacts on the Coorong, but this is being addressed by computer modelling, research and management of surplus water within the Upper South East.

Vegetation Clearance

- Clearance of native vegetation throughout the region and particularly around the edges of the Coorong and Lower Lakes has resulted in a more windswept environment with more wave action and resuspension of silts, contributing to water turbidity. It has also reduced shelter for birds and the nest sites available for many species.

The same or similar symptoms of habitat decline and ecosystem simplification in rivers and estuaries are being noted world wide. Relatively uniform environmental conditions around the lake edges caused by river regulation is leading to habitat variety being replaced by a single habitat type of tall reeds which provides niches for very few species. Combined with increased water turbidity and less aquatic plant growth as a result of less light, this habitat simplification leads to much simpler food chains and fewer species.

Conflicts of Use

The waters of the Coorong and Lower Lakes are, at times, heavily used for a variety of recreation pursuits. The lakes are a water storage which is used locally for irrigation and some town water as well as helping to maintain the pool level of the river from the barrages upstream to Lock 1 at Blanchetown. Most of the land fronting Lakes Albert and Alexandrina is privately owned and is primarily used for agricultural production with some of the lake edge associated with urban and residential development. The Coorong and Lower Lakes support a large commercial and recreational fishery. The region is growing as a tourist destination. All of these activities either conflict with conservation objectives or could potentially do so if they are not managed appropriately. Many conflicts occur because people are unaware that their activity is harmful to the environment or to other users. Increased education and interpretation can address some of these conflicts.

Boating and Birds

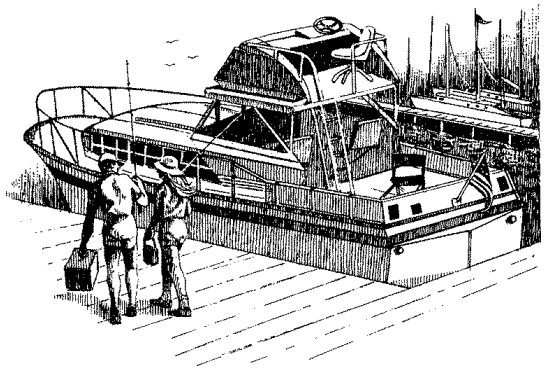
- Recreational boating is already subject to some controls under the *Harbors and Navigation Act 1993*. Boat movement which is relatively low noise and confined to the deeper water and the channels in the Coorong appears to have only minor impact on birds. However boats which emit a lot of noise have greater impacts on birds and this increases significantly when the vessels move fast and in shallow water (Kirby et al, 1993). Bird disturbance disrupts feeding and resting. For birds trying to accumulate fat reserves for long migration flights, this disturbance could be critical and could mean they do not reach their destination. Critical feeding areas include the mudflats immediately downstream of the barrages. Boats which move erratically have also been shown to be highly disturbing compared to boats which move steadily and predictably. Boats of any kind near nesting colonies usually provoke a response which involves birds leaving nests in a defensive response, so nests are open to predation by Silver Gulls and Cattle Egrets (Kirby et al, 1993). Recreational boating also requires shore-based facilities such as marinas, ramps, jetties and car parks, all of which alienate waterside habitat. Boats are also able to enter many areas not otherwise accessible by other means and introduce disturbance where previously none existed. Personal water craft (jet skis), with their high noise levels, high speed, eratic movement and shallow draft are of concern to conservationists, other users of the area and local residents.

Water Storage and Use

- The barrages, which were completed in 1940, were built to create a water storage. The lakes are normally maintained at 0.75 metres AHD or higher, however draw-down of the lakes is not necessarily adverse because it allows some of the periodic drying out of the lake edge vegetation necessary for the full range of plant communities to exist. However, it is acknowledged that this interferes with recreation and irrigation by leaving installations stranded. Irrigation can create return flows of drainage water back to the lakes and their fringing wetlands. This return water may contain pollutants including nutrients and other agricultural chemicals that can impact on ecosystems. For example excessive nutrients contribute to algal blooms. Irrigation can also create groundwater mounding which may change the rate and quality of groundwater inflows into the Coorong and Lower Lakes.

Vegetation Management

- Agriculture and pastoralism in the Coorong and Lower Lakes region has led to the clearing of native vegetation from around their edges. Tall woody vegetation formerly existed in some areas and sheltered lake edge habitat from wind and provided nesting and roosting resources for a number of species (McCourt, 1987). While managed grazing around the edge of the lakes has some benefits in terms of reducing some of the tall reed growth and thus providing a greater range of habitats, overgrazing causes soil pugging and contributes to lake edge erosion and nutrient input from cattle faeces.



Urban Development and Environmental Degradation

- Urban development around the lake edge alienates habitat. It has the potential, through stormwater and effluent runoff, to be highly polluting. It also gives rise to activities which disturb birds. Residents of the lakeside towns enjoy the benefits of living next to a large and generally attractive waterbody. These benefits include access to recreation, a scenic backdrop and locally moderated weather, all of which are reflected in improved property values. Continued modification of the environment could lead to a degree of environmental degradation which has the opposite effect.

Fisheries

- The barrages have reduced the extent of the estuary to about 11% of its former size and also reduced environmental variability. They are also a barrier to the movement of fish that depend on estuarine conditions to complete their life cycles. The freshwater lakes are now invaded by carp, although native species are still harvested from the lakes. The commercial catch is now less than it was before the installation of the barrages and has shifted to fish lower on the food chain. The value of the fishery is now comparatively much less because of the shift to species of lower market value (Pierce, 1995). However, the recreational catch has certainly grown because there are now many more participants, but the extent of the growth has not been quantified. The commercial fishery is strictly managed by restrictions on licences, gear and effort. The recreational fishery is managed through gear, effort and bag limitations.

Barrage Management

- Current barrage management tends to have the barrages either open or shut, so salinity regimes in the estuary fluctuate suddenly, rather than gradually as would have been the case naturally. Fish and other aquatic fauna would be adapted to such gradual changes in salinity. The barrages also have no provision for fish movement to and from the lakes.

Tourism and Habitat

- Tourism activity in the region is increasing. The proximity of the region to Adelaide and the scenic qualities of the area attract a range of visitors from intrastate, interstate and overseas.

  Poorly managed developments could lead to many small developments such as jetties, ramps, toilets, car parks and the like, which collectively could lower the attractiveness and sense of wilderness that the Coorong currently conveys and is an integral part of its fascination.

  Visitor facilities can also alienate habitat, creating zones of disturbance and general degradation. Sensitive environments can be adversely impacted by visitor activities and some wildlife can be easily disturbed. Regular disturbance of some bird species may cause them to desert habitats or prevent adequate feeding time to survive necessary migration flights.

  Due to the reliance of the tourism industry on the natural values of the area, most tourism operators are themselves keen to manage any potential impacts. The Tourism and Recreation Plan for the Coorong National Park developed in cooperation with the South Australian Tourism Commission is an example of working with the tourism industry to enhance opportunities for visitors while carefully managing potential impacts.

Isolation

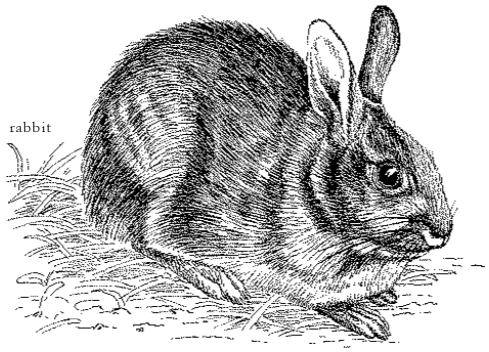
Many nearby wetlands in the Upper South East, along the River Murray, in the Bremer and Angas catchments, the local coast and in the general Mount Lofty Ranges and Adelaide plains region have now been drained, degraded or converted to other uses. Thus the Coorong and Lower Lakes are now more isolated than previously. In isolated habitats such as islands, some species rely on relatively few resources and their populations are vulnerable to even small environmental events such as floods, droughts, fire and disturbance. If a local population dies out, it may not be replaced by recolonisation if the nearest population is too far away, thus leading to a species range contraction, an early step in species extinction (Possingham, 1996). The Coorong and Lower Lakes can be regarded as an island surrounded by a 'sea' of agriculture which is a barrier to the movement of, particularly, smaller sedentary species. Even more mobile species are at risk because they must move further and for longer and are thus more exposed to predators and hazards. As nearby habitats disappear or become unsuitable through modification, the artificial island effect becomes more intense. Populations with nowhere to go to avoid harsh conditions will become locally extinct. Australia experiences harsh climatic events on a regular basis. Many species are adapted to a

more or less nomadic lifestyle which enables them to move to exploit good conditions or avoid bad ones. For this to be of benefit in maintaining viable populations, there must be somewhere to move to, and for smaller, more sedentary species, this must be quite close.

Exotics

The assemblage of plants and animals that has evolved in Australia over a long period of isolation from the rest of the world is very different from the plants and animals of other continents. Since European settlement, more mammal species have been driven to extinction in Australia than on any other continent. While loss of habitat through its conversion to other uses is cited as the principal reason for extinction, habitat modification through the introduction of exotic plants and animals is the second major cause of this wave of extinction. Exotic plants and animals are usually so different to the native fauna and flora that their impact is often relatively sudden and catastrophic. Exotics can be thought of as comprising two general groups. Predators such as feral dogs, cats, foxes, carp, black rats and people, physically kill prey species either directly, such as a fox might kill a tortoise, or indirectly, such as a carp eating the eggs and larvae of native fish. Competitors, such as rabbits, house mice and European honeybees eat the resources of other, often unrelated species or destroy their habitat by eating the plants that form shelter, or both. Often the effects of these species are insidious and become apparent only when it has become very expensive to manage them. Feral ducks and geese on the lakes and rabbits in the surrounding area fall into this category as do exotic plants. Already, 33% of the plants species in the estuarine area are introduced exotics (Edyvane et al, 1996) and it is likely that this is the situation throughout the lakes as well.

The estuary is at risk from rice grass, *Spartina anglica* and *S. townsendii,* mangroves, *Avicennia marina,* and Pacific oysters, *Crassostrea gigas* (Edyvane et al, 1995, Berggy, 1996). Mangroves have been introduced to Hindmarsh Island (Edyvane et al, 1996), where they have spread slowly, possibly because of regular freshening. With lower flows and a more marine environment in the future, they could spread. Rice grass and Pacific oysters have not yet been reported in the estuary but both have had highly significant effects in other estuaries in Australia.



European rabbit

Except in rare circumstances such as on small islands, it is generally not possible to eradicate feral populations; they therefore have to be managed at tolerable levels. While biological control measures have, in some cases, achieved spectacular success, such as the *Cactoblastis* moth on prickly pear, most only give a measure of control and must be combined with other measures. Population control of some feral species has been compromised by deliberate reintroduction.

Fragmented Management

There are about 20 departmental branches in seven government departments which have interests or responsibilities in the region; there are also four local government councils and at least 20 non„ government bodies. Fragmentation of responsibility with many people and organisations each working in their own areas of responsibility without regard for the whole has led to situations where it is sometimes unclear for both agencies and the public where responsibility lies. For example, both the Sir Richard and Younghusband peninsulas are part of the same barrier dune system, but are under different tenures and are managed by separate departments for different purposes.

This Management Plan aims to move towards integrated ecosystem management and attempts to look at the bigger picture and manage the whole system as one unit rather than trying to address parts in isolation.

Limited Jurisdiction

Many of the environmental impacts that affect the region arise from outside the region or are the result of actions taken in response to intergovernment agreements such as the Murray-Darling Basin Agreement, made at the state and federal level. Some impacts are the result of decisions made by other states where there is no agreement with South Australia, such as water allocation from storage under the sole control of New South Wales and Victoria. The result is limited control over the amount of water that does or does not reach the lakes and the way it is managed in terms of the timing, height and duration of flows. Some of the nutrients, particularly phosphorus, in the river are derived from natural sources, but some are derived from effluent and agricultural discharges in South Australia and interstate. South Australia has only very limited ability to control discharges into the river that occur interstate.

ENVIRONMENTAL RESTORATION

There are a number of groups who are currently working towards reducing many of the threats described above. Local Action Planning Committees in the region manage Natural Heritage Trust funded projects related to the restoration of the Coorong and Lower Lakes as well as environmental improvement works throughout the district. These projects are integrated with the work of Government agencies, Local Councils, the Aboriginal Lands Trust, land holders, Soil Boards, the Coorong Consultative Committee, Friends of the Coorong, Southern Fishermen's Association and other local community groups. Together these and other community-based programs will help to control or alleviate threats, as well as improve the Coorong and Lower Lakes wetlands.

OBJECTIVES AND STRATEGIES

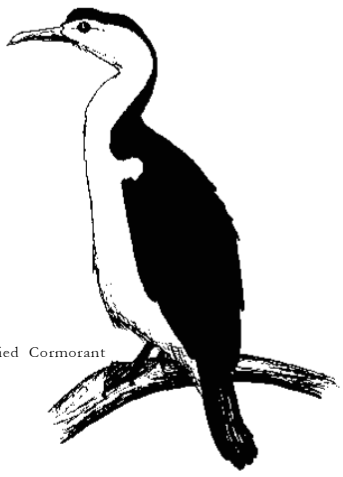
The objectives are broad general statements of end points that together will achieve the Vision for the Coorong and Lower Lakes Area.

The objectives are of three broad types: objectives that facilitate change; objectives that preserve what is left; and objectives which reverse the current processes of environmental degradation, as far as they are known. The strategies represent what is needed for working towards sustaining the ecological character of the Coorong and Lower Lakes Ramsar site. Some of these have strategies associated with them that will help reach the goal. Carrying out the stated actions to achieve the objectives is only part of the process. The results of actions must be monitored and if necessary, the actions must be modified as required.

Many of the processes that have caused environmental degradation have acted very slowly and, in some cases, it has taken decades for the results of river regulation and other processes to become apparent. It is likely that actions designed to reverse the effects of degrading processes will also take years to take full effect.

Various government agencies and groups are responsible for undertaking actions to achieve the objectives. Part of the process of implementation is negotiation and communication with stakeholders on the best way forward.

The summary table at the end of this section groups strategies by department or agency responsibility.



Little Pied Cormorant

Objective 1

Integrated environmental management of the Coorong and Lower Lakes Ramsar Wetlands with monitoring of biotic indicators to ensure the sustainable, multiple use of the region; and monitoring of management performance against the plan objectives.

Strategies

1.1 Establish a Coorong and Lower Lakes implementation task force supported by a government/ community funded executive officer.

1.2 Establish monitoring mechanisms to guide the review of the management plan and ensure:

- effective implementation of the management plan
- fulfilment of Ramsar objectives
- measurement of both biotic and abiotic parameters to detect changes to the abundance and distribution of species.

1.3 Ensure that future government legislation, strategies and policies that affect the region are consistent with the Ramsar principle of wise use and Australia's obligation for the maintenance of the ecological character of the area.

1.4 Instigate management systems that ensure value for money and accountability for all management actions.

Objective 2

Increased opportunities for participation by the Ngarrindjeri people in the planning and management of the Coorong and Lower Lakes Ramsar Wetlands, subject to South Australian Government policy relating to the resolution of native title claims.

Strategies

2.1 Increase the participation of the Ngarrindjeri community in the cultural and environmental management of the Coorong and Lower Lakes Ramsar Wetlands.

Objective 3

Improved awareness among all key stakeholders and the wider community of the natural values of the Coorong and Lower Lakes Ramsar Wetlands and Ramsar principles expressed in the Management Plan.

Strategies

3.1 Integrate the Ramsar principles of *wise use* and Australia's obligation for the *maintenance of the ecological character* of the area into the maintenance, operational and capital works programs of relevant agencies.

3.2 Create alliances with Landcare, Local Action Plan groups, the River Murray Catchment Water Management Board, all relevant government and non-government organisations and adjoining wetland managers.

Actions

3.2.1 Develop a model for consultation with stakeholders which facilitates cohesive planning.

3.2.2 Identify and establish communication networks.

3.2.3 Consult across all relevant organisations with responsibilities in the area.

3.2.4 Educate all relevant groups in Ramsar principles and management objectives.

3.2.5 Actively seek to involve all relevant groups in Ramsar management of the Coorong and Lower Lakes.

3.2.6 Organise a periodic forum of all relevant groups in the region to facilitate information exchange, improve communication and integrate management.

3.2.7 Monitor the efficiency and effectiveness of all relevant operational actions in the Coorong and Lower Lakes Ramsar Area which may impact on the wetlands.

3.2.8 Provide information exchange on the Coorong and Lower Lakes wetlands.

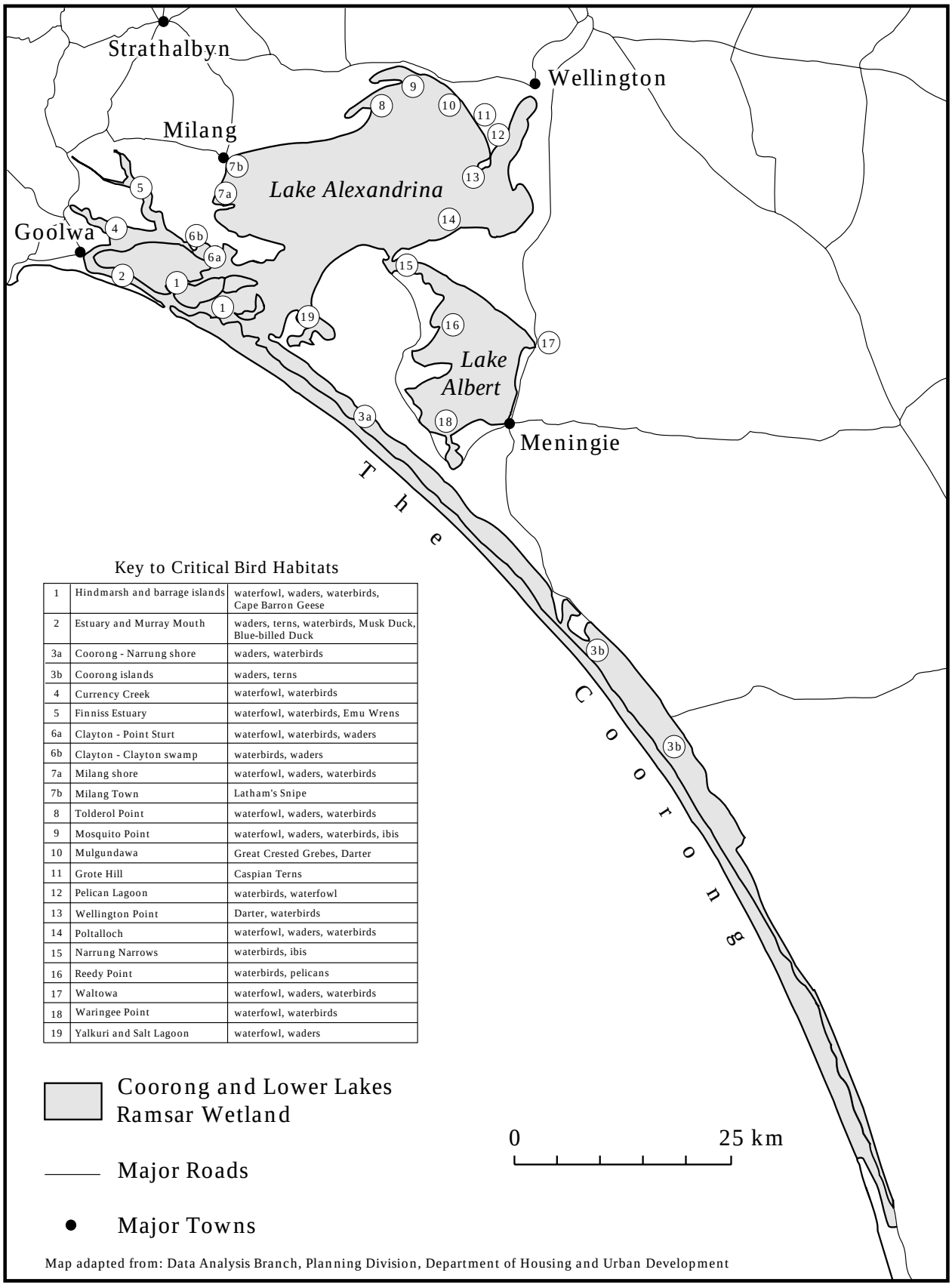
3.3 Introduce a Ramsar Memorandum of Understanding, which agencies, corporations and individuals can sign to demonstrate their support for Ramsar principles and the objectives of the management plan, that is simple, strategic and emphasises:

- the international significance of the Coorong and Lower Lakes wetlands
- the reason for the area's nomination
- a code of behaviour for users
- partnerships between users and stakeholders
- integrated management for sustainable use
- commitment to the objectives of the plan.

3.4 Integrate information on Ramsar into school curricula and ensure education materials include Ramsar material.

Actions

3.4.1 Facilitate collaborative partnerships with government agencies and the school community to promote access to Ramsar information for the development and interpretation of curriculum resources.



1	Hindmarsh and barrage islands	waterfowl, waders, waterbirds, Cape Barron Geese
2	Estuary and Murray Mouth	waders, terns, waterbirds, Musk Duck, Blue-billed Duck
3a	Coorong - Narrung shore	waders, waterbirds
3b	Coorong islands	waders, terns
4	Currency Creek	waterfowl, waterbirds
5	Finniss Estuary	waterfowl, waterbirds, Emu Wrens
6a	Clayton - Point Sturt	waterfowl, waterbirds, waders
6b	Clayton - Clayton swamp	waterbirds, waders
7a	Milang shore	waterfowl, waders, waterbirds
7b	Milang Town	Latham's Snipe
8	Tolderol Point	waterfowl, waders, waterbirds
9	Mosquito Point	waterfowl, waders, waterbirds, ibis
10	Mulgundawa	Great Crested Grebes, Darter
11	Grote Hill	Caspian Terns
12	Pelican Lagoon	waterbirds, waterfowl
13	Wellington Point	Darter, waterbirds
14	Poltalloch	waterfowl, waders, waterbirds
15	Narrung Narrows	waterbirds, ibis
16	Reedy Point	waterbirds, pelicans
17	Waltowa	waterfowl, waders, waterbirds
18	Waringee Point	waterfowl, waterbirds
19	Yalkuri and Salt Lagoon	waterfowl, waders

Map 4: Areas of critical habitat

3.5 Integrate the Ramsar principles of *wise use* and Australia's obligation for the *maintenance of the ecological character* of the area into the planning and operational activities of the tourist industry.

Actions

3.5.1 Identify tourist operators and policy makers and make contact to provide information on Ramsar.

3.5.2 Develop Ramsar policies for tourism in the Coorong and Lower Lakes region which:

- **are nature or culturally based**
- **are sustainable in terms of maintaining the natural resource**
- **encourage local landowners to participate in tourism activity which is within these principles**

3.6 Include Ramsar principles in the planning and promotion of the Coorong National Park and other National Parks reserves in the region.

3.7 Develop a regional plan to promote, interpret and market the Coorong and Lower Lakes Ramsar Wetlands.

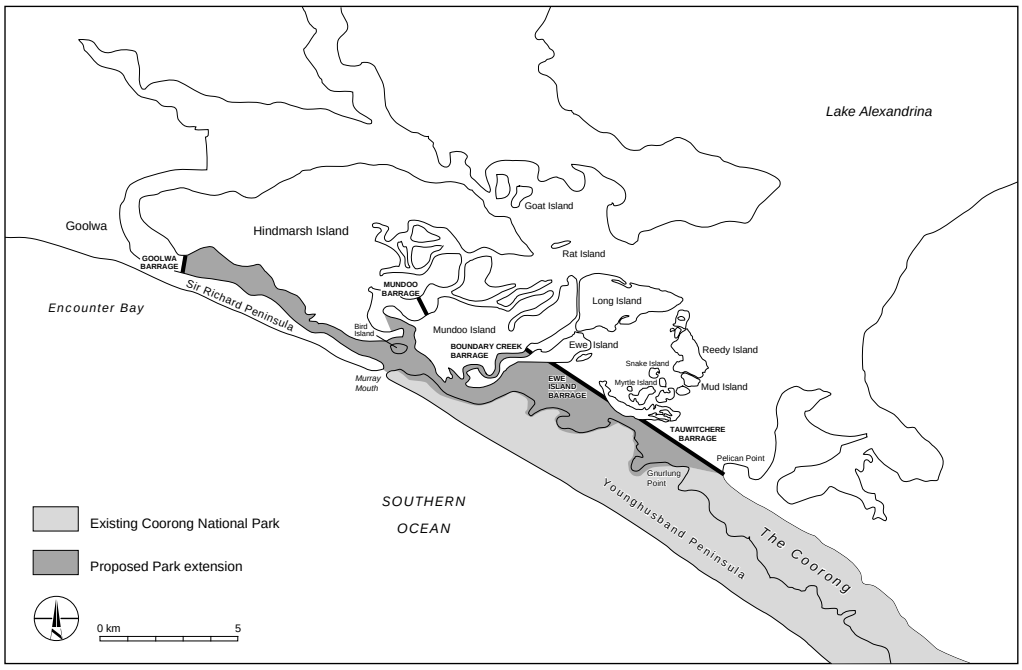
3.8 Encourage awareness and compliance with all environmental legislation.

3.9 Encourage all government and private works and developments which affect the Coorong and Lower Lakes to include contract clauses relating to environmental protection.

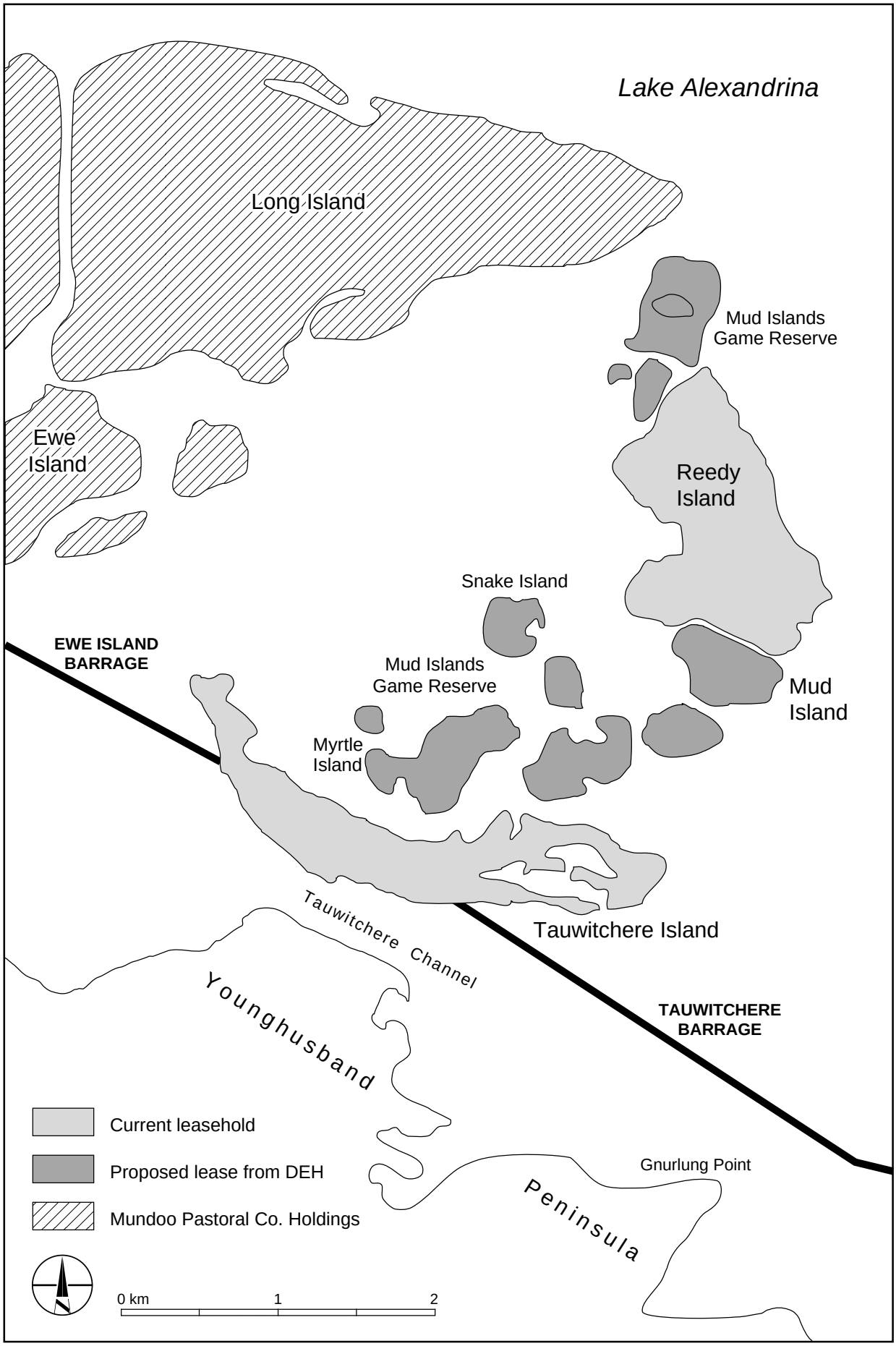
3.10 Organise international student and wetland manager exchange.

3.11 Establish contacts with international groups/organisations to share information and experiences.

3.12 Investigate with the Commonwealth Government how the community's views might be incorporated into Australia's reports to the Ramsar Conference of Parties and the Ramsar Bureau.



Map 5: Proposed extension to the Coorong National Park



Map 6: Islands to be included in revised management arrangements (Action 4.2.3)

Objective 4

Protection of the full range of wetland habitats and restoration of degraded habitats in the Ramsar area and their conservation for future generations.

Strategies

4.1 Establish a detailed mapping program and database which expands on the initial habitat mapping program (Map 4) to identify at a local scale:

- areas of significant environmental importance
- all habitat types, including reed beds, managed and natural short riparian vegetation, salt marsh
- the habitats of key species identified as rare, vulnerable or endangered in the area, including, for example, Little Tern, Fairy Tern, Hooded Plover
- degraded and degrading habitats.

4.2 Institute a program to protect habitats in the Coorong and Lower Lakes area.

Actions

4.2.1 Revise the boundary of Coorong National Park to include all the estuarine waters from Pelican Point to the Goolwa barrage up to the high tide mark (Map 5). This area should include Bird Island, Scab Channel, PT Section 601 (Crown Land, east Hindmarsh Island), and Mundoo Channel east of a line from the north-easterly point of PT Section 601 and the south-westerly point of Section 545, Mundoo Island. The park extension should not include any part of barrage structures or land on which there are shack sites or shacks.

4.2.2 With a view to including Sir Richard Peninsula into the National Parks reserve system, assess the conservation and recreation implications of the proposal.

4.2.3 Implement cooperative management arrangements between Mundoo Pastoral Co. and National Parks and Wildlife SA for Reedy and Tauwitchere islands, and Mud Islands Game Reserve (Map 6) to achieve a more varied vegetation structure which includes some ground that is bare or sparsely vegetated with low growth, some trees, and low or zero erosion[1]. Any agreement must bring all the affected land under DEH tenure with long term grazing rights (five or seven years with similar rights of renewal) and access for management purposes as required. The agreement should also include regular environmental monitoring to ensure that the objectives of the agreement are being achieved.

[1] These islands have gradually changed from short and medium growth vegetation to dominance by tall reeds. They abut Mundoo Pastoral Co. leases and stock currently move between the islands so it is intended to use grazing as a vegetation management tool to create a greater diversity of vegetation structures which provide greater variety of habitats.

4.3 In co-operation with landowners, progressively include the floodplain (the area inundated by the 1956 flood, rationalised to take account of changes brought about by development since 1956) within the Ramsar boundary (Map 7).

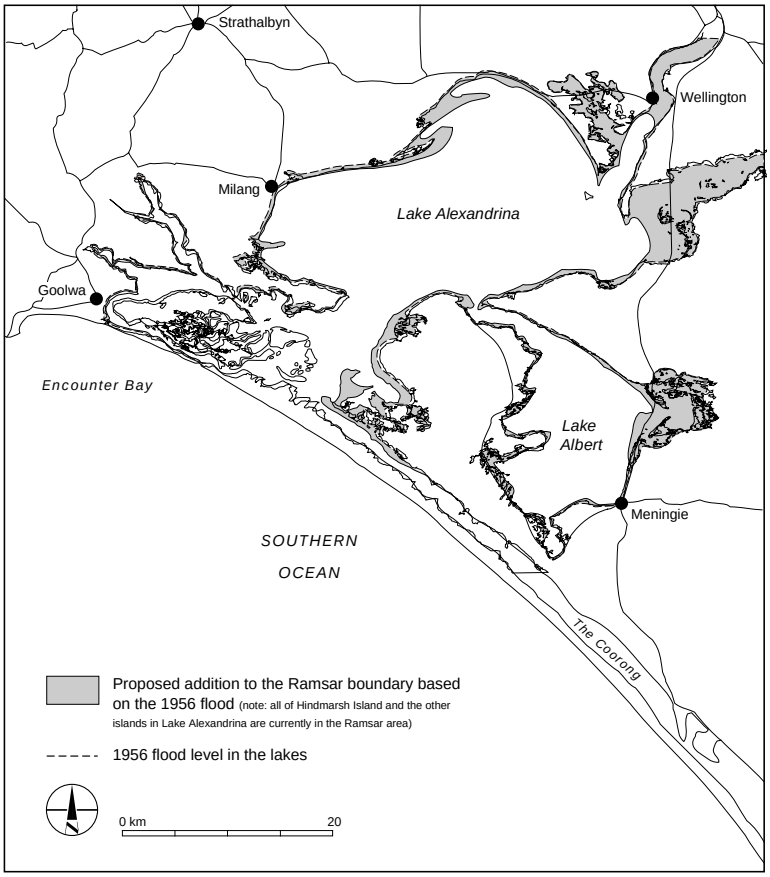
4.4 Promote property management techniques which increase the diversity of lake edge vegetation, reduce erosion and increase the amount of indigenous woody vegetation around the lake edges.

4.5 Wherever possible, work with landowners to restore lakeside swamps which have become isolated because of silt accumulation and reed growth where they formerly joined the lakes (eg Waltowa Swamp).

4.6 Acknowledge the Coorong and Lower Lakes Ramsar Wetlands as a Wetland of International Importance in the appropriate sections of the Planning Strategy and include its identification on regional maps.[2]

Actions

4.6.1 Ensure DEH works with Planning SA to effect appropriate changes to the Planning Strategy.[2]



Map 7: Proposed new boundary for the Coorong and Lower Lakes Ramsar area to include the floodplain

[2] The Planning Strategy under the *Development Act 1993* is a broad statement of the Government's policy directions for development in South Australia. The Development Plan and amendments to it are at local government council scale and must be consistent with the policies in the Planning Strategy.

4.7 Introduce consistent planning controls to protect wetland habitats in the floodplain.

Actions

4.7.1 Ensure the councils of Alexandrina, Murray Bridge and Coorong cooperate with Planning SA and DEH to amend the Development Plan by introducing consistent planning controls in the floodplain which protect wetland habitats from inappropriate development, and implement the Planning Strategy (in consultation with all relevant agencies including the River Murray Catchment Water Management Board).

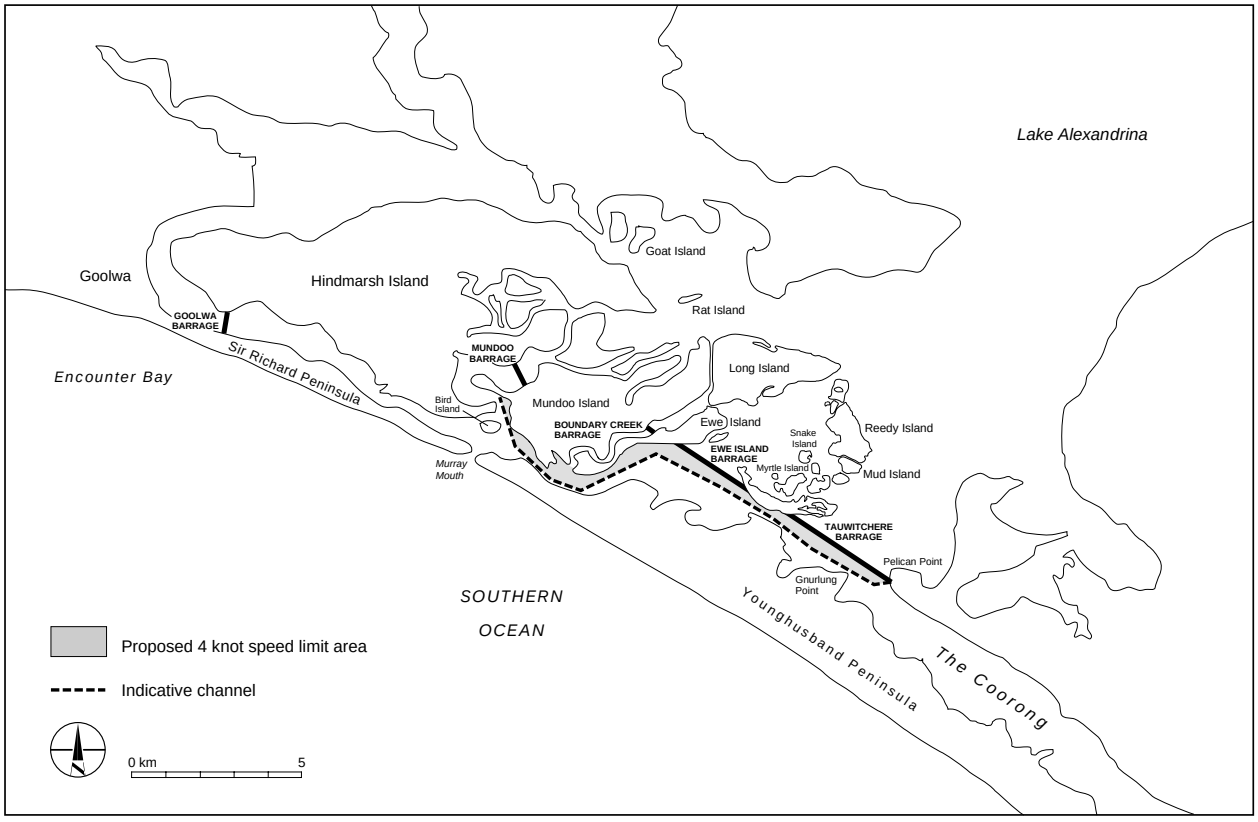
4.8 Utilise the regulations under the *Harbors and Navigation Act 1993* to manage recreation activities to ensure that their impact on key habitats is minimised.

4.9 Instigate species management programs for both rare and vulnerable species, and pest species.

4.10 Undertake integrated management programs for exotic species, particularly foxes, cats and rats, aiming for eradication where this is deemed feasible, for example of feral geese.

4.11 Support national carp management initiatives.

4.12 Coordinate and identify research opportunities in the areas of species resource requirements and human impacts on waterbirds and waterbird habitats, with particular emphasis on migratory waders and also including the diving ducks and smaller waterbirds.



Map 8: The area of 4 (four) knot speed limit shown approximately by the dashed line (see Action 4.8.1)

Objective 5

Increased environmental benefits from the improved management of existing water entitlements and improved water quality and flows.

Strategies

5.1 In cooperation with the Murray Darling Basin Commission and SA Water work towards barrage management practices that will avoid sudden fluctuations in salinity and water level in the estuary and obtain environmental benefits from water discharges into the estuary.

5.2 In cooperation with the Murray Darling Basin Commission and SA Water work towards avoiding prolonged surcharging in the Lower Lakes through options such as negotiating a change to South Australia's monthly water entitlements, increasing summer flows in return for lower flows in winter and spring.

Actions

5.2.1 Investigate options with the Murray-Darling Basin Commission.

5.3 Support current moves to mechanise and ultimately automate all barrages. Work with the Murray Darling Basin Commission and SA Water to ensure that the automation will allow fine adjustments to water discharges for environmental purposes, including:

- using Mundoo Barrage to help retard sand build-up in the estuary
- opening and closing barrages in response to weather conditions and tidal cycles
- providing fish passage.
- Mundoo Barrage should be the first priority in this mechanisation and automation process.

5.4 As part of South Australia's involvement in the cooperative management of the Murray Darling Basin, work towards an environmental allocation of 500 000 megalitres (500 gigalitres) of low turbidity water in late summer early autumn, in addition to minimum entitlement flow, to apply in at least six years out of every ten.[3]

Actions

5.4.1 Negotiate with the Murray-Darling Basin Commission on the options for the allocation and delivery of this water.

[3]Flow modelling in the estuary demonstrates that it requires a flow of about 20 000 megalitres/day for about a month to substantially clear the Murray Mouth (Harvey, 1995) and possibly less if Mundoo Barrage is open as this barrage has the steepest gradient to the sea. However, it is also the barrage most at risk to seawater intrusion to the lakes and needs to be automated to operate efficiently and without risk to the freshwater storage. Most of the Mundoo Channel is badly silted and the barrage would have to be used for some time to clear this silt.

5.5 Reduce all polluting discharges into the River Murray, Coorong and Lower Lakes.

5.6 To conserve the ecological character of the southern Coorong as a mostly hypersaline lagoon, manage the timing and volume of discharges under the Upper South East Dryland Salinity and Flood Management Plan (USEDS & FMP) into the southern Coorong, based on the approved discharge[4] of 40 000 megalitres/year as the mean of a rolling ten-year average with most discharge through winter and early spring.

5.7 For any proposal to increase the currently approved discharge to the southern Coorong, seek to have an appropriate environmental assessment carried out as the basis for any new approval.

5.8 Coordinate discharges through the barrages with discharges from Salt Creek to get the best possible environmental outcome for the Coorong lagoons and the estuary, based on local conditions and requirements at any given time.

Objective 6

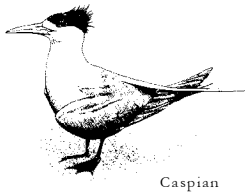
Ongoing funds and resources to achieve the objectives of the management plan.

Strategies

6.1 Prepare a funding and sponsorship plan which:

- identifies funding opportunities such as Commonwealth Government, State Government, levies, private/international, user pays and sponsorship.
- obtains commitments from key government agencies including the Commonwealth for ongoing support for the Coorong and Lower Lakes Ramsar Wetlands.

6.2 Establish a process to audit all Ramsar expenditure against plan objectives.



Caspian

[4] The Commonwealth of Australia has imposed, as a condition of its approval and financial support for the Upper South East Dryland Salinity and Flood Management Plan, a maximum discharge of 40 000 megalitres/year as an average of a rolling ten-year average of surplus water into the southern Coorong. However, since this Ramsar Plan has been finalised new modelling for inflows suggests that even at the 40 000 ML level the hypersaline character of the southern lagoon is at risk of changing to the point where average salinity levels will more closely approximate estuarine than hypersaline. The biological consequences of this are still under consideration by the Comonwealth and State Governments (July 2000).

REFERENCES

ANCA. Undated. *Migratory Bird Agreements*. Australian Nature Conservation Agency, Canberra, Australia.

ANZECC. 1995. *The ANZECC List of Threatened Australian Vertebrate Fauna*. Australian and New Zealand Environment and Conservation Council.

Baker, DL and Pierce, BE. 1998. *Re-assessment of the gross economic value of South Australian commercial inland fisheries harvest.* SARDI Research Report (32): 46p.

Berggy, J. 1996. *Gulf St Vincent/Fleurieu Aquaculture Management Plan.* Department of Primary Industries, South Australia.

Bourman, RP and Barnett, EJ. 1995. Impacts of River Regulation on the Terminal Lakes and Mouth of the River Murray, South Australia. *Australian Geographical Studies, April 1995. 33(1):101-115.*

Carpenter, G. 1995. Birds of the Lower Murray region of South Australia. In *Proceedings of the Murray Mouth Biological Resource Assessment Workshop*. South Australian Research and Development Institute.

Eckert, J and Robinson, RD. 1990. The Fishes of the Coorong. *The South Australian Naturalist. 65(1) 5-30.*

Edyvane, K, Carvalho, P, Evans, K, Fotheringham, D, Kinloch, M and McGlennon, D. 1996. *Biological Resource Assessment of the Murray Mouth Estuary*. South Australian Research and Development Institute.

Fletcher, AR, Morrison, AK and Hume, DJ. 1985. Effects of Carp, *Cyprinus carpio* L., on communities of aquatic vegetation and turbidity of water bodies in the Lower Goulburn River Basin. *Australian Journal of Marine and Freshwater Research*, 36, 311-327.

Hinsliff, M. 1994. Hindmarsh Island Bridge „ Environmental Issues and Options. Available from the Department for Environment and Heritage , South Australia.

Kirby, J, Clee, C and Seager, V. 1993. Impacts and extent of recreational disturbance to wader roosts on the Dee estuary: some preliminary results. In *Disturbance to Waterfowl on Estuaries*: *Wader Study Group Bulletin 68.* Royal Society for the Protection of Birds, UK.

Mackay, N and Eastburn, D. 1990. *The Murray.* Murray-Darling Basin Commission. Canberra.

McCourt, T. 1987. *The Coorong and Lakes of the Lower Murray.* Meningie

Marina Assessment Advisory Committee. 1991. *Lower Murray Lakes Marina Strategy*. Minister for Environment and Planning, South Australia.

Murray-Darling Basin Ministerial Council. 1995. *An Audit of Water Use in the Murray-Darling Basin*. Murray-Darling Basin Ministerial Council, Canberra.

National Parks and Wildlife Service. 1990. *Coorong National Park Management Plan*. Department of Environment and Planning, South Australia.

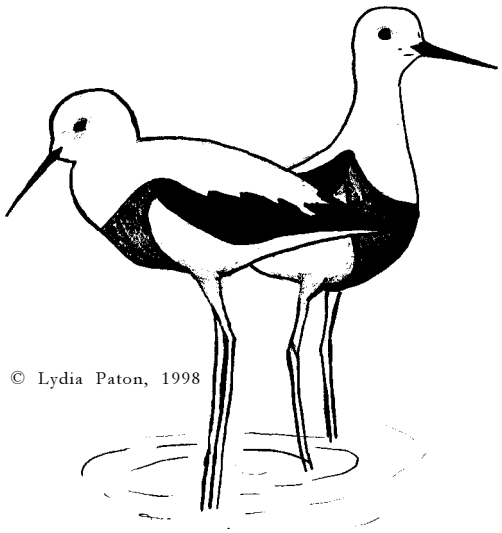
Pierce, BE. 1995. *Coorong and Murray Mouth Fish and Fisheries*. In Proceedings of the Murray Mouth Biological Resource Assessment Workshop. South Australian Research and Development Institute.

Possingham, H. 1996. Biodiversity conservation after vegetation clearance controls. In *From Conflict to Conservation: Native Vegetation Management in Australia.* Department of Environment and Natural Resources, South Australia.

Ramsar Convention Bureau. 1997. *The Ramsar Convention Manual*. Ramsar Convention Bureau, Switzerland.

Steffensen, DA. 1995. Water Quality in Lake Alexandrina and its Impact on the Murray Mouth Estuary. In *Proceedings of the Murray Mouth Biological Resource Assessment Workshop*. South Australian Research and Development Institute.

The Wetlands Voice. April, June, October, December 1997, and April, June 1998. Department for Environment, Heritage and Aboriginal Affairs, South Australia.



The table below summarises where responsibility lies for the strategies under the objectives. In a number of cases, responsibility is shared because of overlapping jurisdiction. The task force and its executive officer will exercise a coordinating role. The numbers in the table are strategy numbers in the Plan.

TRANS (MS)	LAPS	DEH	TASK FORCE	PIRSA	PLAN SA	EDUC	TOUS
3.1	3.1	1.1	1.2	3.1	3.1	3.1	3
3.8	3.2	1.5	1.3	4.4	3.9	3.4	3
4.8	4.4	3.1	1.4	4.11	4.6		3
	4.5	3.6	2.1	5.6	4.7		
	4.9	3.8	3.1	5.7			
	4.10	4.1	3.2	5.8			
		4.2	3.3				
		4.3	3.7				
		4.9	3.8				
		4.10	3.9				
		4.11	3.10				
		4.12	3.11				
		5.5 (EPA)	3.12				
		5.7	4.1				
			4.2				
			4.3				
			4.12				
			5.4				
			6.1				
			6.2				

DEH	Department for Environment and Heritage
COUNCILS	Alexandrina, Coorong, Murray Bridge and Lacepede
EDUC	Department of Education, Training and Employment
PIRSA	Primary Industries and Resources SA
PLANSA	Department of Transport, Planning and the Arts
TASK FORCE	The community based task force created by the Management Plan
TRANS (MS)	Department of Transport, Planning and the Arts (Marine Safety)
TOURISM	Tourism Commission of SA
SAWATER	SA Water acting for the Murray-Darling Basin Commission
LAPs	Local Action Planning Committees
	Coorong and Goolwa to Wellington

APPENDIX 1

NOMINATION OF THE COORONG, AND LAKES ALEXANDRINA AND ALBERT WETLAND, SOUTH AUSTRALIA, AS A WETLAND OF INTERNATIONAL IMPORTANCE

NAME:

The Coorong, and Lakes Alexandrina and Albert Wetland, South Australia

DESIGNATED:

November 1985

GEOGRAPHICAL COORDINATES:

Latitude (approx.) 35^0 18'S to 36^0 33'S.

Longitude (approx.) 138^0 46'E to 139^0 50'E.

GENERAL LOCATION:

The mouth of the Murray River, South Australia

AREA:

Total Area — 140,500 ha. (approx.)

WETLAND TYPE:

Dominant:

Inland Wetland— 7

Others:

Inland Wetland — 1, 5 & 7

ELEVATION:

Sea level.

OVERVIEW:

The Coorong is a long, shallow saline to hypersaline lagoon more than 100 km in length that is separated from the Southern Ocean by a narrow sand dune peninsula. The Lakes Alexandrina and Albert form the mouth of the River Murray and are comprised of fresh to brackish/saline waters.

Wetlands specifically included are :

- Lake Alexandrina including Tolderol, Mud Islands and Currency Creek Game Reserves, otherwise mainly Crown Lands. 76 000 ha.
- Lake Albert. Mainly Crown Lands. 16 800 ha.
- Coorong - mainly covering Coorong National Park and Game Reserve, otherwise mainly Crown Lands. 47 700 ha.

PHYSICAL FEATURES:

The Lakes Alexandrina and Albert form a natural wetland system with associated shoreline marshes at the mouth of the River Murray and are connected with the Coorong - a long, narrow wetland complex extending from the Murray Mouth to parallel coastal dunes and consisting of saline marshes, samphire, freshwater soaks and open water with a hypersaline area at the southern end. The area also contains a number of ephemeral salt lakes and examples of ephemeral carbonate lakes of national and international significance.

ECOLOGICAL FEATURES:

The wetland consists of ocean beach, together with the mouth of the River Murray and associated lakes and estuaries. This combination provides a wide range of habitats from freshwater to hypersaline which are mostly in a natural state.

There is a diversity of species with waders and waterfowl predominating. The 1981 count of the Australasian Wader Studies Group of the Royal Australasian Ornithologists Union estimated the summer population of waders for the area at 122 000, compared with a South Australian population of 200 000 and an Australian population of 403 000.

Common species included:

Red-necked Stint	*Calidrisruficollis*
Curlew Sandpiper	*C. ferruginea*
Sharp-tailed Sandpiper	*C. acuminata*
Banded Stilt	*Cladorhynchus leucocephalus*
Red-capped Plover	*Charadrius ruficapillus*

Other species included:

Red-necked Avocet	*Recurvirostra novaehollandiae*
Greenshank	*Trinqa nebularla*
Sanderling	*Calidris alba*
Black-winged Stilt	*Himantopus himantopus*
Masked Lapwing	*Vanellus miles*
Pied Oystercatcher	*Haematopus longirostris*
Black-tailed Godwit	*Limosa limosa*
Lesser Golder Plover	*Pluvialis dominica*
Eastern Curlew	*Numenius madagascariensis*
Common Sandpiper	*Tringa hypoleucos*
Red Knot	*Calidris canutus*
Bar-tailed Godwit	*Limosa lapponica*
Marsh Sandpiper	*Tringa staqnatilis*
Hooded Plover	*Charadrius rubricollis*
Red-kneed Dotterel	*Erythroqonys cinctus*
Grey Plover	*Pluvialis squatarola*
Sooty Oystercatcher	*Haematopus fuliginosus*

Accurate counts of waterfowl are not available, however, in 1982 it was estimated that there were 45 000 ducks in the area. Spectacular numbers of Black Swan (*Cygnus atratus*) are present at times and H.J. Frith estimated 50 000 in the Coorong in 1957. Typical numbers for the whole wetland would be in excess of 5000. Approximately 2000 Cape Barren Geese (*Cereopsis novaehollandiae*), normally summer within 1 km of the wetland. The area also supports large numbers of Grey Teal (*Anas gibberifrons*), Pacific Black Duck (*A. superciliosa*) and Australian Shelduck (*Tadorna tadornoides*) with lesser numbers of:

Hardhead	*Aythya australis*
Chestnut Teal	*Anas castanea*
Australasian Shoveler	*A. rhynchotis*
Maned Duck	*Chenonetta jubata*
Pink-eared Duck	*Malacorhynchus membranaceus*
Musk Duck	*Biziura lobata*
Blue-billed Duck	*Oxyura australis*
Freckled Duck	*Stictonetta naevosa*

Other common waterbird species include:

Silver Gull	*Larus novaehollandiae*
Whiskered Tern	*Chlidonias hybrida*
Crested Tern	*Sterna bergii*
Caspian Tern	*Hydroprogne caspia*
Australian Pelican	*Pelecanus conspicillatus*
Great Cormorant	*Phalacrocorax carbo*
Pied Cormorant	*P. varius*
Little Black Cormorant	*P. sulcirostris*
Little Pied Cormorant	*P. melanoleucos*
Straw-necked Ibis	*Threskiornis spinicollis*
Sacred Ibis	*T. aethiopicus*
Glossy Ibis	*Pleqadis falcinellus*
Royal Spoonbill	*Platalea regia*
Yellow-billed Spoonbill	*P. flavipes*
Great Egret	*Egretta alba*
Hoary-headed Grebe	*Poliocephalus poliocephalus*
Marsh Harrier	*Circus aeruginosus*
Welcome Swallow	*Hirundo neoxena*
Fairy Martin	*Cecropis ariel*

Many other species are present in lesser numbers, including the endangered Orange-bellied Parrot (*Neophema chrysogaster*) which over-winters on the reserve.

LAND TENURE:

The area is mostly Crown Land (water) and National Park and Game Reserves. Lakes Alexandrina and Albert are surrounded mainly by private property. The Coorong is surrounded mainly by National Park and Game Reserve.

CONSERVATION MEASURES TAKEN:

The Coorong is reserved as a National Park and Game Reserve. A management plan has been prepared for the Coorong and is implemented.

CONSERVATION MEASURES PROPOSED BUT NOT YET IMPLEMENTED:

None.

CURRENT LAND USE:

(a) on site: Conservation, recreation: camping, boating, duck hunting (not over entire area; in game reserve only).

(b) surroundings/catchment: grazing and light farming in adjacent areas.

Most of the edge of Lakes Alexandrina and Albert is used for farming, with tourist development in several areas. Development is otherwise restricted under the State Planning and other Acts and most of the area is in its natural state.

DISTURBANCES/THREATS:

Increased salinity due to lack of peak flows from the Murray River as a result of water controls and potential salinization associated with regional land clearance and drainage schemes.

HYDROLOGICAL AND PHYSICAL VALUES:

Not applicable.

SOCIAL AND CULTURAL VALUES:

The area is valued for its conservation - scenic attributes and is used for outdoor recreational pursuits including: wildlife observation and studies and recreational fishing and hunting. Professional fishing occurs both along the beach and in parts of the wetland complex. The area and particularly the Coorong, is noted for its extensive aboriginal (traditional and archaeological), historic and geological sites.

Note: some of the northern islands within the Coorong lagoon are not part of the Coorong National Park or Game Reserve but are reserved for use by Aboriginal people.

NOTEWORTHY FAUNA:

The Coorong is an important breeding area for the Pelican, Crested Tern and Fairy Tern, and Lake Alexandrina for egrets, ibises, cormorants and the Rufous Night Heron (*Nycticorax caledonicus*).

NOTEWORTHY FLORA:

The Coorong contains endemic plant communities of musk grass (*Lamprothomium populosum)*.

CURRENT SCIENTIFIC RESEARCH AND FACILITIES:

The South Australian National Parks and Wildlife Service maintains on-going monitoring of the habitats and wildlife associated with the Coorong and adjacent areas in accordance with objectives established in the Plan of Management.

CURRENT CONSERVATION EDUCATION:

The South Australian National Parks and Wildlife Service has a visitor centre at the Coorong and rangers are on site to provide information and interpretation programs.

CURRENT RECREATION AND TOURISM:

The wetlands and adjoining areas are used for outdoor recreation and research purposes. It is estimated that the area under the park reserve receives in excess of 200 000 visitor days per year and activities include: boating, fishing, camping, walking and wildlife observation. Access to important wetland sites - particularly waterbird breeding areas - is restricted.

MANAGEMENT AUTHORITY:

South Australian National Parks and Wildlife Service
GPO Box 1782
ADELAIDE SOUTH AUSTRALIA 5001

JURISDICTION:

Government of South Australia

REFERENCES:

South Australia National Parks and Wildlife Service (1988). Coorong National Park and Coorong Game Reserve Management Plan. Department of Environment and Planning, Adelaide.

Note: The National Parks and Wildlife Service maintains an extensive bibliography and reference collection of resource information of the Coorong.

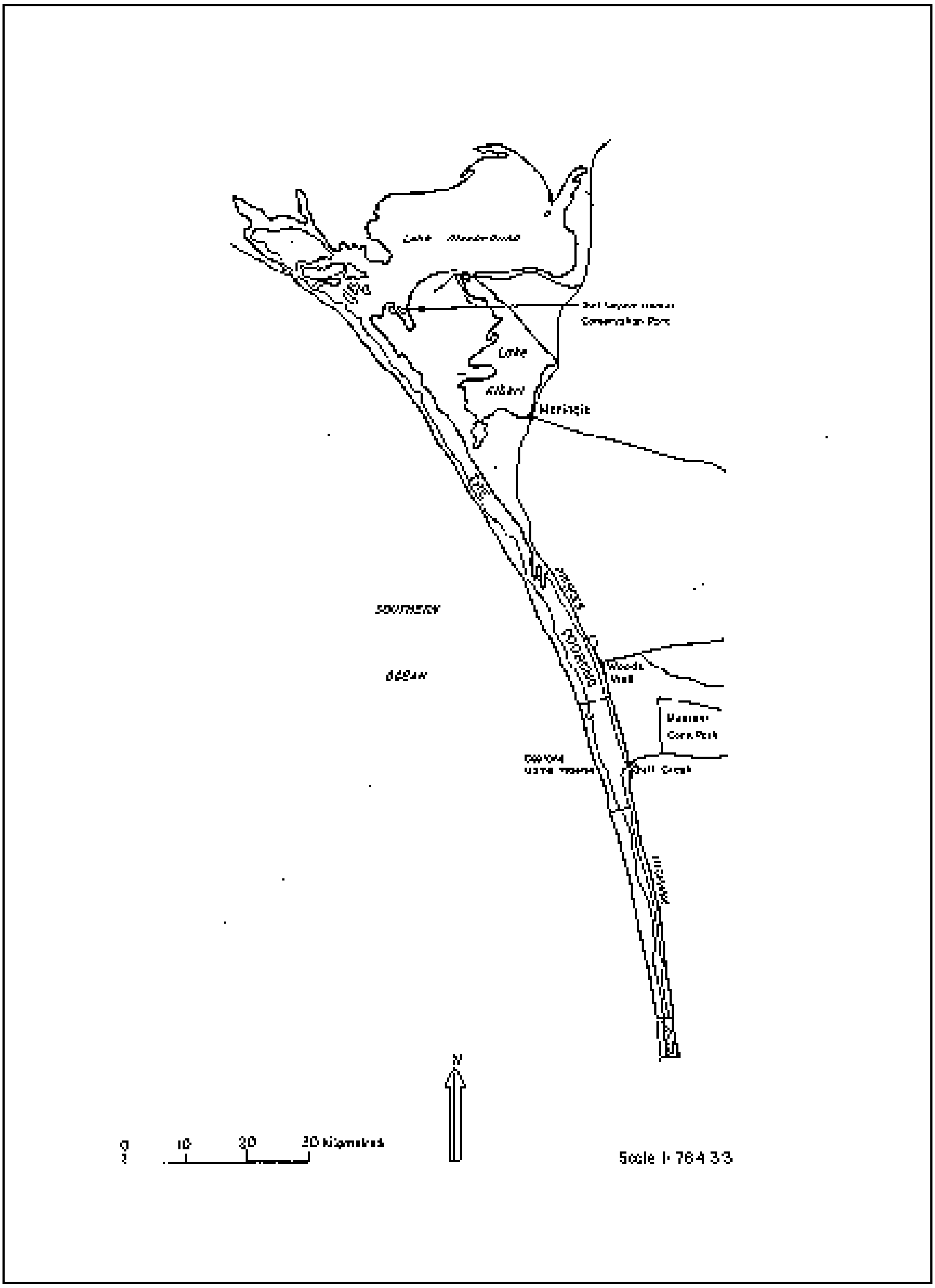
CRITERIA MET:

l(a) l(b) l(c) 2(a) 2(b) 2(c) 2(d) & 3.

MAP:

See Page 44

THE COORONG



APPENDIX 2

REFER TO THE FOLLOWING DISCUSSION PAPERS

DISCUSSION PAPER NO 1:	WATERBIRD AND WETLAND HABITAT CONSERV ATION
DISCUSSION PAPER NO 2:	WATER QUALITY IN THE LOWER LAKES
DISCUSSION PAPER NO 3:	DEVELOPMENT IN THE COORONG AND LOWER LAKES REGION
DICCUSSION PAPER NO 4:	RECREATION AND TOURISM USE OF COORONG AND LOWER LAKES REGION
DISCUSSION PAPER NO 5:	WATER MANAGEMENT IN THE COORONG AND LOWER LAKES
DISCUSSION PAPER NO 6:	COORONG AND ESTUARY ISSUES
DISCUSSION PAPER NO 7:	IMPLEMENTATION AND MANAGEMENT ISSUES

APPENDIX 3

COMMUNITY REFERENCE GROUP

‘

Chair	**Valerie Ball, OAM**
Alexandrina Council*	Terry McAnaney
Conservation Council of SA	Dr David Paton
Conservation Council of SA	Richard Owen
Coorong & Districts Soil Conservation Board	Jo Gemmell
Coorong Consultative Committee	Don Ransom
Coorong District Council	Keith Scobie
District Council of Lacepede	Graham Usher Rex Dunstan (from 9/97)
Fleurieu Regional Tourist Association	Mary Beckett
Murray Plains Soil Conservation Board	Christine Jones
Murraylands Regional Tourism Association	Margaret Dadd
Ngarrindjeri Heritage Committee	Elizabeth Tongerie
Ngarrindjeri Land & Progress Association	Thomas Trevorrow
Raukkan Community Council	
River Murray Water Resources Committee—superseded by River Murray Catchment Water Management Board	Joanne Pfeiffer Guy Boothby (from 1/98)
Rural City of Murray Bridge	Lui Fabbian Milton Weinert (from 3/98)
SA Farmers Federation	John Follett
SA Farmers Federation	Bill Gemmell
SA Fishing Industry Council	Garry Hera-Singh
SA Recreational Boating Council	Ken Holbert Glen Jones (from 9/98)
SA Recreational Fishing Advisory Council	John Winwood Tweed Harris (from 3/98)
Southern Hills Soil Conservation Board	Kym Denver

*Alexandrina Council was formed by the amalgamation of the District Council of Strathalbyn (represented by Terry McAnaney) and the District Council of Port Elliot and Goolwa (represented by Guy Boothby).

APPENDIX 4

GOVERNMENT STEERING GROUP

Chairperson

Colin Harris	Deputy Director, Heritage and Natural Resources Department for Environment and Heritage

Members

Cath Moore Chris Halstead (delegate)	Heritage & Biodiversity Department for Environment and Heritage
Doug Fotheringham	Environment Protection Agency (Coast and Marine Section) Department for Environment and Heritage
Dr Bryan Pierce	South Australian Research and Development Institute, Aquatic Sciences Strategic Research Area
Lindsay Best	Deputy Director, Biodiversity Heritage & Biodiversity Department for Environment and Heritage
Bob Newman	Water Resources Group, Department for Environment and Environment Protection Agency (Berri Office) Department for Environment and Heritage
Paul Moran Tony Sharley (from 3/98)	Primary Industries & Resources, SA
John Schulz Brenton Grear (delegate)	South East Region Department for Environment and Heritage Heritage & Biodiversity
John Parsons Bob Osmond (from 3/98)	SA Water
Helen Cooke	Division of State Aboriginal Affairs Department of Transport, Urban Planning and the Arts
Lance Park Amanda Price (from 5/98)	SA Tourism Commission
Anne Westley Stevie Austin (from 11/97)	Department Premier & Cabinet
Joycelyn Bowden Liz Thorburn (from 4/97)	Environment Australia
Neville Clifford	Marine Safety Section Department of Transport, Urban Planning and the Arts
Terry Bell Jo Connor (from 4/97) John Barker (from 3/98)	Department of Housing & Urban Development now Department of Transport, Urban Planning and the Arts Area Strategy & Programs Branch

APPENDIX 5

TECHNICAL WORKING GROUPS

Members of Technical Working Groups and people who refereed discussion papers or provided contributions to the discussion papers or to the project overall.

David Baker, Steve Barnett, Bob Bourman, Kate Bruce, Graham Carpenter, Terry Clark, Andy Close, Des Commerford, John Cugley, Nicolas Cundell, Laurie Delroy, Tim Dendy, Kevin Dodd, Roger Ebsary, John Eckert, Dennis Elliott, Rob England, John Evans, Clarry Fisher, Doug Fotheringham, Graham Gates, Steve Gilbert, Derek Gollan, Peter Goonan, Brenton Grear, Colin Grundy, Chris Halstead, Colin Harris, Keith Harris, David Haslam, Mike Harper, Phil Hollow, Brian Hughs, Mark Hutchinson, Beth Jeffries, Anne Jensen, Leigh Jordan, Chris King, David Litchfield, Carol Maezler, Jim Marsh, the Ngarrindjeri Working group and the Ngarrindjeri Community, Bob Newman, Vic Neverauskas, Bob Osmond, Bill Paterson, David Paton, Lydia Paton, Bryan Pierce, Peter Schulz, Dennis Steffensen, Gordon Stidson, Robin Storr, Rod Thomas, Liz Thorburn, Tom Vartzokas, Harry Wallace, Jan Whittle.

APPENDIX 6

COORONG ISSUES WORKSHOP

Participants at the Coorong Issues Workshop held at Meningie on 15 December 1997.

Michael Aldersey, Colette Barton, Guy Boothby, David Cooney, Margaret Dadd, James Darling, Julian Desmazures, James Fairbairn, Jim Fairbane, Graham Gates, Bill Gemmell, Gary Hera Singh, Phil Hollow, Christine Jones, Henry Jones, John Keesing, Jock MacFarlane, Heather Moore, Bill Paterson, Evan Pettingaill, Bryan Pierce, Bob Pond, John Ratcliffe, Marie Richards, John Schultz, Keith Scobie, Fred Stadter, Liz Thorburn, Harry Wallace.

Papers were presented by Bernice Cohen, Roger Ebsury, Rob England, Chris King and David Paton.

Colin Harris chaired the workshop which was facilitated by Margaret Dugdale. John Berggy and Mike Hinsliff from the DEH planning team also attended.