NATIONAL PARKS AND WILDEFFE SERVICE EASTERN REGION OFFICE

BOOL LAGOON GAME RESERVE and HACKS LAGOON CONSERVATION PARK



NATIONAL PARKS AND WILDLIFE SERVICE EASTERN REGION OFFICE

BOOL LAGOON GAME RESERVE and HACKS LAGOON CONSERVATION PARK MANAGEMENT PLAN

South East

South Australia

This plan of management has been prepared and adopted in pursuance of Section 38 of the National Parks and Wildlife Act, 1972-81

"王子"的"你们的人"。

â

e,

3

Published by Department of Environment and Planning September 1988

© Department of Environment and Planning 1988

ISBN 0 7243 9063 4

Prepared and Edited by South East District National Parks and Wildlife Service

Cartography and Design Drafting Branch, Departmental Services Division DEPARTMENT OF ENVIRONMENT AND PLANNING

Printed D.J. Woolman, Government Printer

Cover Photographs Top: Magpie Geese Bottom: The Boardwalk, Bool Lagoon Game Reserve (Craig Wickham)

FOREWORD

This document is one of a series of Management Plans for South Australia's reserves to be adopted under the provisions of the National Parks and Wildlife Act 1972.

It relates to Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park, located in the South East region of South Australia.

The Plan has been prepared by district staff of the National Parks and Wildlife Service supported by comprehensive survey work carried out by the Programmes Branch.

The format of this plan is a significant departure from that used by the Service for Management Plans to date. Most of the comprehensive resource descriptions have been omitted from the plan so that the management prescriptions for the reserves stand clearly as a set of policies followed by management actions (Section 5).

The draft management plan was released for public comment in March 1988, resulting in fourteen written submissions from interested individuals and organisations. The issues to receive most attention were visitor facilities and vegetation management. All comments received are appreciated and serve to highlight the importance of public participation in the preparation of this plan.

Following consideration of the public comments and advice by the Reserves Advisory Committee, the plan has now been formally adopted under Section 38 of the National Parks and Wildlife Act as the Plan of Management for Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park. I believe that with responsible management, the natural features of these important areas can be maintained and enhanced for the enjoyment and enrichment of our future generations.

Approved

(Don Hopgood) MINISTER FOR ENVIRONMENT AND PLANNING

Ð

Page

CONTENTS

a

Ð

1.	INTRO	DDUCTION	1
2.	MANA	SEMENT CONTEXT	2
	2.1	International Agreements and Conventions 2.1.1 Wetlands of International Importance	2 2
		2.1.2 International Migratory Bird Agreements	3
	2.2	Conservation Parks & Game Reserves in S.A.	3
	2.3	Location and Regional Context	3
3.	OBJE	CTIVES OF MANAGEMENT	6
	3.1	Wetlands of International Importance	6
	3.2	Game Reserves and Conservation Parks	6
4.	ENVII	CONMENTAL DESCRIPTION	8
5.	POLIC	CIES AND FRAMEWORK FOR MANAGEMENT	12
	5.1	Natural Resources 5.1.1 Water Management 5.1.2 Vegetation Management 5.1.3 Fauna Management 5.1.4 Fire Management	12 12 14 15 16
	5.2	Cultural Resources	16
	5.3	Recreation Opportunities 5.3.1 Visitor Use 5.3.2 Bool Lagoon Game Reserve Main	17 17
		Entrance 5.3.3 Tea Tree 5.3.4 Hacks Peninsula 5.3.5 Little Bool 5.3.6 Twig Rush Lagoons 5.3.7 Big Hill 5.3.8 Hunting	18 19 20 21 23 24 25
	5.4	Management Support 5.4.1 Interpretation and Environmental	26 26
		5.4.2 Research, Inventory and Monitoring 5.4.3 Management Facilities 5.4.4 Development & Commercial	27 28
		Activities 5.4.5 Staffing	28 30
6.	PLAN	IMPLEMENTATION AND PRIORITIES	31
SE	LECT B	IBLIOGRAPHY	34
FI	GURES	Figure 1 Location and Concept Diagram	5

9

ŝ

NATIONAL PARKS AND WILDLIFE SERVICE

1. INTRODUCTION

Section 38 of the National Parks and Wildlife Act 1972 states that plans of management are required for all reserves and that such plans should "set forth proposals" in relation to the management and improvement of reserves and the means by which it is proposed to accomplish the objectives of this Act in relation to the reserve.

This document is the Plan of Management for Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park. The reserves have been considered together because they conserve contiguous wetland habitat and function jointly as part of the South Eastern Drainage Board's drainage and flood mitigation scheme. The reserves are currently managed as a single unit, except on open days during the duck hunting season when shooting is permitted only within the game reserve.

Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park fulfil a number of significant functions. Principally, the reserves form one of the most important wetland areas remaining in the South East, providing habitat for a diversity of waterbird species, a number of which rely on Bool Lagoon as a major breeding and refuge area. On this basis both reserves were accepted for inclusion on the List of Wetlands of International Importance in 1985.

The lagoons act as a buffer storage basin in the drainage scheme for the South East and Bool Lagoon is a site highly favoured for recreational duck hunting. The reserves also have considerable potential for public use, enjoyment and education and will, over time play a significant role in the local tourism industry. This plan outlines proposals to effectively balance the future demands of visitor use in the reserves with the continued conservation of wildlife and management of waterfowl for game purposes.

2. MANAGEMENT CONTEXT

2.1 International Agreements and Conventions.

The National Parks and Wildlife Service has special obligations to manage and protect wildlife and wetland habitat in the Reserves under three international agreements entered into by the Commonwealth Government.

2.1.1. Wetlands of International Importance

Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park are included in the List of Wetlands of International Importance, maintained by the International Union for the Conservation of Nature and Natural Resources (IUCN). The List is constituted under Article 2 of the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar convention) which entered into force on 21st December, 1975 (Australia signed the Convention on 8th May, 1974). The South Australian Government selected Bool and Hacks Lagoons for nomination to this list according to the following criteria:

 (a) regularly supports in excess of 1 per cent of the total Australian population of Australasian Shoveller (<u>Anas rhynchotis</u>) and Great Egret (Egretta alba). Ð

57

- (b) regularly supports in excess of 10,000 ducks.
- (c) regularly supports in excess of 1 per cent of the breeding pairs in the Australian population of Great Egret (Egretta alba) and Straw-necked Ibis (<u>Threskiornis spinicollis</u>).
- (d) supports an appreciable number of rare, vulnerable or endangered species, including Freckled Duck (<u>Stictonetta naevosa</u>), Little Bittern (<u>Ixobrychus</u> <u>minutus</u>) and Brolga (<u>Grus rubicunda</u>).
- (e) is of special value as the habitat for summer concentrations of the southern Australian population of the Brolga (Grus rubicunda).
- (f) is of special value as a drought refuge for many species of waterbirds.
- (g) is an important example of a freshwater wetland over fertile, high pH soil.

Inclusion on the Ramsar Convention carries with it an undertaking by the State and Federal Governments to ensure that the reserves are managed in a way which promotes their conservation value (Article 3 of the <u>Convention</u>).

2.1.2 International Migratory Bird Agreements

Two agreements entered into by the Commonwealth Government with the Government of Japan and the Government of the Peoples Republic of China protect birds that migrate between those two countries and Australia. In addition the agreement with Japan (JAMBA) protects birds in danger of extinction. Twelve species recorded for Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park are listed in JAMBA and fifteen are listed in the agreement with China (CAMBA). Both agreements undertake the protection of the habitat of migratory species listed.

2.2 Conservation Parks & Game Reserves in S.A.

The classification which a reserve receives on being dedicated under the National Parks and Wildlife Act (1972-81) is a general statement of the purpose for which that area of land was acquired.

<u>Conservation Parks</u> are lands that are to be protected or preserved for the purpose of conserving any wildlife or any natural or historical features which occur on them. <u>Game</u> <u>Reserves</u> are lands which are to be preserved for the conservation of wildlife and management of game. It is further stated in National Parks Regulation 14 of the National Parks and Wildlife Act 1972 that a Game Reserve may be set aside for the purpose of fishing or hunting. They have an important conservation role and may be declared open at prescribed times for strictly controlled hunting.

Reserves dedicated under the National Parks and Wildlife Act are a part of a regional pattern of land use. The management of those areas aims at minimising disturbance to natural and cultural resources. Other land uses agriculture, forestry, viticulture etc., - are distinguised by community acceptance of environmental modification. Reserves therefore can provide for only a limited part of the range of land uses in any region.

2.3 Location and Regional Context

In spite of its general aridity, South Australia has several regions which contain substantial and important wetlands. In terms of waterfowl and other waterbird habitat the most important wetland areas consist of inland freshwater and estuarine areas found in the Lake Eyre, Cooper and River Murray basins, the Coorong and the South East. Many of these wetlands (with the exception of parts of the Lake Eyre basin) have been focal points for agricultural and pastoral development since the time of first European settlement and consequently large areas have been modified.

Loss of wetlands has been most substantial in the South East where the drainage of land on an organised basis has been a necessary prerequisite of agricultural success. Prior to drainage, extensive areas of the South East flooded during winter when rainfall filled lagoons and formed swamps in low lying areas. It is estimated that about 11 per cent of former wetlands in the South East survive. Many of these remaining wetlands are seasonally semi-permanent; only about 14 per cent are permanent areas of open freshwater. As a result of this reduction in area the wetlands which remain have become particularly important for conservation purposes.

Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park, situated in the South East of South Australia are 24 kilometres by road south of Naracoorte and approximately 393 kilometres by road from Adelaide (Figure 1).

Bool Lagoon Game Reserve presently comprises Sections 223, 224, 323, 356 and 380 Hundred of Robertson, County of Robe and covers an area of 2690 hectares. The National Parks and Wildlife Service has purchased Section 324 (about 333 ha) which, owing to a dispute over occupation is held under licence by the Minister for Environment and Planning (Crown License OL 17588) for conservation and grazing purposes. The section will be dedicated as an addition to Bool Lagoon Game Reserve when circumstances permit. Hacks Lagoon Conservation Park comprises Section 249, 372, 373, 379, 382 and 383 Hundred of Robertson, County of Robe and covers an area of 198 hectares. At their maximum storage capacity Bool and Hacks Lagoon fill with water to an area of 2530 hectares.



G

3. OBJECTIVES OF MANAGEMENT

3.1 Wetlands of International Importance

As reserves listed in the convention on Wetlands of International Importance, Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park will be managed in accordance with the Articles of that Convention.

The objectives of management for the reserves (as stated below) are consistent with the requirements of the Convention.

3.2 Game Reserves and Conservation Parks

The following general objectives relate to the Management of Game Reserves and Conservation Parks in South Australia.

- (a) the preservation and management of wildlife;
- (b) the preservation of historic sites, objects and structures of historic or scientific interest within reserves;
- (c) the preservation of features of geographical, natural or scenic interest;
- (d) the destruction of dangerous weeds and the eradication or control of noxious weeds and exotic plants;
- (e) the control of vermin and exotic animals;
- (f) the control and eradication of disease and injurious affection of animals and vegetation;
- (g) the prevention of bush fires and other hazards;
- (h) the encouragement of public use and enjoyment of reserves and education in, and a proper understanding and recognition of, their purpose and significance;
- (i) generally the promotion of the public interest.

In addition, the following specific objectives apply to Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park.

- * Protect endangered, vulnerable and rare species;
- Control unscheduled fire to minimise threats to life, property and the natural and cultural resources of the reserves;
- Provide a range of recreation facilities in selected areas to enhance access and enjoyment;
- Develop interpretation and education programs and prepare information about recreation opportunities, resources and management;

- * Contribute to regional and State tourism while protecting the natural values of the reserves;
- Provide a base for extension services to landholders for the development and management of wetlands on private land;
- * Ensure the continued role of the Reserves' waterbodies in flood mitigation for south eastern South Australia.

For Bool Lagoon Game reserve only:

 Provide opportunities for recreational hunting of proclaimed species of waterfowl.

4. ENVIRONMENTAL DESCRIPTION

The sedimentary basin south of Naracoorte began to form about 150 million years ago, as the ancient super continent of Gondwanaland fragmented and Australia separated from Antarctica. About 15 million years ago, after a long period of marine inundation during which the two continents moved further apart and sands, silts and marine sediments up to 6000 m thick were deposited, the sea began to regress from the basin.

However, around 2 million years ago, shallow seas again penetrated inland as far as the present Cave Range. Shelly, sandy limestone and calcareous sand were deposited at this time. Much of the limestone on the sea floor to the west of the Cave Range was eroded forming the silt-stone containing pebbles of limestone now present in the Bool Lagoon area.

Each of the coastal dune ridges between the Cave Range and the present coastline formed during alternating periods of high and low sea levels as a result of fluctuating glaciation in the Northern hemisphere (the so called Ice Age). Since the coastal plain had been gradually uplifted during this time, the record of high sea levels has been preserved in sequence, with each coastal dune range being stranded above subsequent rises in sea level. The ridges are composed of calcarenite (calcareous sandstone) formed in much the same way as the present coastal dunes.

The Bool Lagoon interdunal flat was cut off from the open sea as the dune barriers formed. This "limestone flat" is overlain by a thin layer of estuarine and swamp deposits including clays, silts and some dolomite and peat. The shallow circular swamps, characteristic of the Bool Lagoon flats, were probably formed by solution of the limestone in areas of high groundwater levels. The water table in this region often lies at or near the surface.

Lunettes are a distinctive feature of the Bool Lagoon landscape. A number of explanations have been given for their formation. Current opinion suggests that the lake depressions and lunettes are related: in dry periods after the standing water had evaporated, wind abrasion scoured the fine-grained clay from the lagoon bed which was then trapped a short distance downwind by vegetation on the lee shore, eventually building up to form these distinctive crescent-shaped ridges. The Bool Lagoon lunette is located on the eastern side of the main lagoon basin. It is one of the largest in South Australia.

Bool Lagoon also provides an example of multiple lunettes. Within the larger swamp basin lies a complex of smaller lakes, each with its associated lunette. These apparently developed after the formation of the main lunette. Bool and Hacks Lagoon soils include rendzinas, red brown earths and saline swamp soils. The sediment beneath Bool Lagoon consists of alternating layers of white marl and greenish clay, with a surface layer of peaty loam. These black organic soils have a high pH and are generally very poorly drained.

Also associated with these swamps are groundwater rendzina soils. These are moderately deep, poorly drained and consist of black cracking clays over limestone or marl.

The lunette ridges have better drained soils of moderate fertility. The main lunette has a dark grey rendzina soil, consisting of silty loam over marl (calcareous mud). These soils are similar to the groundwater rendzinas, but develop on well-drained sites which are not subject to waterlogging. Red-brown earths also occur on some lunettes and consist of a red-brown to brown compact loam surface layer overlying a dark red-brown subsoil clay.

The climate at Bool Lagoon is one of warm to hot, dry summers and cool, wet winters. Annual rainfall in the area is about 600mm. Wind direction data show predominantly southerlies and westerlies during spring, summer and autumn. In winter wind speed and frequency increases and direction shifts to the north-west/north east quadrant.

Each of the interdunal flats between Naracoorte and the coast has a slight slope towards the coast and to the north-west. The gradients are very low, however, and no major river channels have developed. Prior to drainage the interdunal flats were covered in winter with wide, slow-moving sheets of water, interspersed with deeper more permanent swamps. During the hot, dry summers most of this water evaporated.

A number of seasonally high volume creeks with headwaters in Western Victoria descend on to the Naracoorte Plain. Mosquito Creek, which is the major contributor of floodwaters in this region, originally discharged into the Lagoons through a relatively small channel on the north-eastern side of Hacks Lagoon near the site of the present concrete spillway. Prior to flood mitigation structures being installed the lagoon filled during periods of high flows in Mosquito Creek and overflowed around the north-west side of the lagoon, flooding across the plains into Moyhall, Garey and Lochaber Swamps. Some of these waters eventually reached the Coola Coola watercourse, then the Bakers Range watercourse and ultimately Alf Flat and Tilley Swamp to the east of the Coorong.

e.

NATIONAL PARKS AND WILDLIFE SERVICE EASTERN REGION OFFICE

The main Bool Lagoon and Hacks Lagoon basins (when inundated) are a mosaic of aquatic and semi-aquatic vegetation interspersed with areas of open water. In general the lagoon margins are vegetated with dense beds of reeds and rushes and the deeper water with free-floating and ribbon-leaved aquatic plants rooted in the silty substrate of the lagoon floors. An area of about 40 hectares near the eastern side of the main Bool Lagoon basin is densely vegetated with a senescent stand of swamp paperbark, a relic of the natural water regime prior to the installation of flood control structures.

The western lagoon basins support a variety of wetland vegetation ranging from open water (Little Bool, Round and House swamps) through dense Black rush stands (south western basins) to the rush and sedgeland vegetation of the so called Twig rush lagoons. This range in vegetation types is related to variations in water depth, salinity and frequency of inundation.

The remaining areas of Reserve land not subject to inundation are almost entirely vegetated with improved pasture and other introduced species, with the exception of several small areas of native grassland and isolated individual Pink Gum, dry land Teatree and Drooping Sheoak trees.

The variety of wetland vegetation types provides a diversity of habitats for animals, reflected in the rich aquatic invertebrate fauna of the reserves. These animals constitute an important food source for fish, amphibians, reptiles and bats, all of which are relatively well represented, given the highly modified nature of the reserve ecosystems. Native herbivorous mammals such as kangaroos and wallabies are not resident in the reserves but use them as a corridor and temporary refuge. The only endemic small mammal (apart from six species of bats which have either been recorded or are expected to occur in the reserves) is the Water Rat. Foxes, cats, rabbits and hares are common throughout the reserves.

The richness of the wetland habitat is most vividly expressed in the birdlife of the reserves, particularly those species that occupy the extensive rookeries. As stated in Section 2.1.1, the reserves regularly support in excess of 1 per cent of the breeding pairs in the Australian population of Great Egret (up to 120 pairs) and Straw-necked Ibis (up to 40,000 pairs). In addition, up to 1200 pairs of White Ibis and 100 pairs of Royal Spoonbill breed annually in the complex. a Handillan (m. 1996), ann an Anna an A Anna an Anna an

At least sixty seven of the seventy nine waterbird species recorded in the reserves are residents or regular visitors. None are unique to the reserves but nine are considered rare or vagrant in South Australia. There are forty eight known breeding species of which twenty nine breed regularly. Two rare species, the Intermediate Egret and Little Bittern occasionally breed in the complex. The rare freckled duck irregularly visits the complex in numbers ranging from a few individuals to hundreds.

Magpie Geese became extinct in South Australia after European settlement but were reintroduced to the reserves through a controlled breeding programme completed in 1986.

Sixteen species of shore birds (waders) have been recorded in the reserves. Of these, nine species migrate between Asia and Australia and receive special protection under Agreements between the governments of Australia, Japan and China for the protection of migratory birds. The habitat of these species is also protected under the agreements.

5. POLICIES AND FRAMEWORK FOR MANAGEMENT

Policies developed for the important issues in the Reserves are summarized below. They have been developed within the constraints of:

- State Government Policy
- The National Parks and Wildlife Act, 1972 and Regulations
- National Parks and Wildlife Service policies
 - Community attitudes and expectations at State, Regional and Local levels
- The South Eastern Drainage Act (1931-1985).

5.1 Natural Resources

5.1.1 Water Management

The overall effect of the South Eastern drainage scheme has been to divert the north-westerly flow of water in the region by cutting channels through the ranges to the coast. In part, the aim of these works was to prevent the flooding of land adjacent and to the north of Bool Lagoon by control of Mosquito Creek floodwater. As a result the lagoon is now required to handle the total floodwaters whereas in the past most of the creek flows bypassed the lagoon.

Under present management arrangements Bool Lagoon can be expected to dry out during the summer and autumn months about once every two years. The frequency and timing of drying out is a fundamental management issue at Bool Lagoon, since it affects the diversity of flora within the reserve and the value of the wetland complex both as a summer refuge for wildlife and as a game reserve in which waterfowl can be hunted during the open season.

Initial results of a study being undertaken (1985-89) by the University of Adelaide indicate that long term management under the existing water regime will have significant adverse effects on the floral composition of the lagoons.

Hacks Lagoon and Bool Lagoon act as sumps for a 1215 square kilometre catchment. Consequently, a range of nutrients, salts and pesticides accumulate within the lagoon basins. In addition, the South Eastern Drainage Board uses herbicides to maintain a vegetation-free flow path across Bool Lagoon. Some of these compounds break down and are of little concern, whilst others may accumulate in the biota and may lead to reproductive impairment.

Recent studies have shown that the level of expended lead shot from hunting has reached unacceptable levels both in the digestive systems of the waterfowl and the Lagoon sediments. Research in U.S.A. and U.K. has shown that ducks and other waterbirds are adversely affected after ingestion of whole or fragmented shot.

Policy:

* Subject to the concurrence of the South Eastern Drainage Board, water levels will be managed to provide sufficient ponding capacity to cope with high winter flows and to retain sufficient water for summer and autumn waterbird refuge.

The agreed levels to achieve this are:

48.15 m AHD (Australian Height Datum) during June
48.24 m AHD During July
48.30 m AHD At the end of first week in August
48.40 m AHD During third week of August
48.55 m AHD At the end of August
48.61 m AHD From the second week in September for as long as possible

These levels are a guide only and where special circumstances exist may be varied by the Board.

- Liaison will continue between the Service and the South Eastern Drainage Board to ensure that the rate, frequency and type of herbicide applied to maintain vegetation-free flowpaths in the reserves has minimal impact on other natural values.
- * Displace chemical vegetation management in flow paths with non-chemical management where practicable.
- * Only steel shot will be permitted at shoots on Bool Lagoon Game Reserve.

Action:

 Optimum water levels agreed to between the Service and the South Eastern Drainage Board for specific times of the year will be maintained subject to annual seasonal variation.

ç,

 Investigate the practicability of mechanical maintenance of the flowpath.

- Sudden fluctuations in water levels will be avoided when possible.
- South Eastern Drainage Board maintenance work will be carried out at times when the lagoon is dry or at low levels. The Board may carry out work at other times as necessary having due regard to the circumstances.
- The Engineering and Water Supply Department will be engaged to undertake a water quality monitoring programme.
- Investigate the feasibility of constructing a stopbank to separate the main basin from the central and western basins to permit greater flexibility of water level and vegetation management.
- Prohibition of the use of lead shot at shoots on Bool Lagoon Game Reserve will be strictly enforced.

5.1.2 Vegetation Management

Prolonged high water levels have led to deterioration in the old tea-tree stand in the main basin of Bool Lagoon, preventing establishment of seedlings within that area. New stands of tea-tree are establishing along the more recent highwater mark in the basin. Although these new stands are used by a small number of nesting birds they may prove to be too exposed to disturbance (most rookery species using the tea-tree require their nesting trees to be surrounded by water throughout their breeding season).

The dryland vegetation of the reserves is entirely the product of past land use. No indigenous species exist with the exception of a few small discrete areas of native grassland and isolated trees within extensive areas of improved pasture.

The management of this vegetation constitutes a major recurrent task. It is a fire hazard in summer and contributes to the spread of pest plants in the reserves.

Policy:

 $\mathbf{\hat{n}}$

- Tea-tree habitat will be established in appropriate areas throughout the Reserves.
- Aquatic vegetation associations and their specific needs will be identified and their continued presence will be provided for.

- Introduced grasses and broad leafed weeds will be managed with specific regard to:
 - legislative responsibility
 - fire hazard reduction
 - economic constraints

Priority will be given to long term eradication over short term control programmes.

Action:

- Accurate records of environmental conditions will be compiled so that present distribution patterns and tolerance levels of important species can be interpreted.
- * Open and shallow water habitats will be maintained in order to maximize diversity within the reserves.
- A revegetation programme will be initiated to rejuvenate or replace the senescent Paperbark stand in the main Bool Lagoon.
- Water levels in the peripheral lagoons will be managed at varied levels to maintain the present diversity of vegetation associations.
- * Improved pastures will be progressively displaced through a planned programme of revegetation on selected areas using species formerly indigenous to the area.
- * Habitat diversity will be maximized through the planned application of vegetation control techniques. These techniques may include prescribed burning, grazing, mechanical removal and herbicide application.
- Vegetation associations threatened by stock grazing impact will be protected by the exclusion of livestock from sensitive areas.
- 5.1.3 Fauna Management

Policy:

* Free living, self perpetuating populations of existing species native to the reserves will be maintained.

Action:

 Priority will be given to research into aspects of the ecology and distribution of rare and endangered species and to research which has direct management implications.

ā.

- Priority for control of introduced species will be given to those which affect significant natural resources and/or neighbouring landuses.
- Visitor access impact on breeding areas will be carefully monitored and remedial action taken as necessary.
- Ongoing waterfowl monitoring will be maintained on a seasonal basis.

5.1.4 Fire Management

Unplanned fires have been a rare occurrence at Hacks and Bool Lagoons, due partly to the presence of the large areas of water, and partly to past management practices. However, the swamp and surrounding dryland vegetation will burn given suitable conditions. Areas of reeds and rushes have been deliberately burnt in the past. This indicates the potential for major fires and care must therefore be taken to prevent wildfires spreading within the reserves.

Policy:

- * Fire management will aim to protect life and property within and adjacent to the park.
- Fire regimes will be manipulated to manage the parks natural resources.

Action:

- Provide fire management access tracks around the perimeter of the reserves.
- Reduce potential fuel levels over dryland areas dominated by pasture plants, by mowing and/or grazing and/or burning.
- Prohibit the use of open wood fires within the reserves.

5.2 Cultural Resources

Although it is recognised that Aborigines of the Meintangk and Bunganditj groups occupied land in the vicinity of Bool Lagoon, little detailed information of their use of the area is known. To date, no archaeological survey has been carried out in the reserves although landholders from nearby properties have uncovered Aboriginal relics in the surrounding areas. Policy:

 Sites and relics of previous aboriginal occupation will, if located in the reserves, be protected after consultation with local aboriginal people.

Action:

 Research programmes for the inventory, analysis and assessment of any relics found within the reserves will be encouraged.

5.3 <u>Recreation Opportunities</u>

National Parks and Wildlife Service reserves provide a significant proportion of the opportunity for outdoor recreation in South Australia. In providing for this activity the Service must balance the demand for recreation against its conservation objectives.

5.3.1 Visitor Use

Visitors to Bool Lagoon fall into two basic categories: day visitors and hunters. The day visitors include local people, passing tourists and educational groups interested in natural history, sightseeing and other passive pursuits. They visit the reserves throughout the year. Hunters, on the other hand, represent a more local interest, predominantly from the south east of S.A. and western districts of Victoria. They visit Bool Lagoon on designated hunting mornings, up to six times each year, to hunt proclaimed species of waterfowl.

Based on current levels of interest and enquiry, in the long term the reserves will probably attract comparable, if not greater, numbers of visitors than nearby Naracoorte Caves Conservation Park. At present Naracoorte Caves is promoted as the prime tourist attraction in the Naracoorte district and has good facilities for both day visitors and campers. From accurate statistics kept regarding the sale of camping permits and tickets for guided tours of the caves it is known that the number of visitors to Naracoorte Caves has almost doubled since 1970.

Policy:

Recreation opportunities provided within the Reserves will promote and encourage public use, enjoyment, education and understanding of the reserves. In particular, opportunities will be provided which:

à.

- . are consistent with the protection of natural features and processes;
- . are appropriate to the appreciation and understanding of natural features;
- . complement recreation opportunities provided elsewhere in the region;
- where appropriate, cater for aged and disabled park visitors.
- Six visitor use areas will be provided within the reserves. These areas are:
 - . Bool Lagoon Game Reserve main entrance
 - . Tea Tree
 - . Hacks Peninsula
 - . Little Bool
 - . Twig Rush Lagoons
 - . Big Hill

Proposed developments for these areas are outlined in Sections 5.3.2 to 5.3.7.

- On proclaimed open days for duck hunting all public entrances to the Game Reserve will be adequately posted to advise non-shooting visitors that duck hunting activities are in progress.
- On proclaimed open days for duck hunting, public access to bird hides and boardwalks will not be permitted.

5.3.2 Bool Lagoon Game Reserve main entrance

Apart from signs at the Reserve boundary which identify the area, the entrance to Bool Lagoon Game Reserve differs little from entrances to rural properties in the surrounding district. In order to instill in visitors a "sense of arrival" and to signal a change in tenure and hence the expectations of visitors, reorganisation of the current layout and location of the entrance is proposed. Such a proposal may require the acquisition of some adjoining land. If that is the case the planned development will not proceed without the agreement of the affected landholder to that acquisition and the inclusion of the land in the Reserve.

Policy:

 Facilities will be provided at the Bool Lagoon Game Reserve main entrance to introduce visitors to the reserve complex, allow them to orientate themselves in the landscape and obtain an overview of the reserves.

Action:

- Relocate the main entrance, if practicable, to enhance visitor safety.
- Liaise with adjacent landowners and District Council of Naracoorte to identify the most appropriate site and design of the main entrance and car park.
- * Provide a carpark with a capacity of twenty cars and two buses near the reserve entrance. The carpark design will incorporate appropriate landscaping, screening and shade vegetation and toilets.
- Erect interpretive displays in the vicinity of the carpark which introduce visitors to the features of the reserves and describe the facilities and activities available to them.

5.3.3 Tea Tree

The stand of swamp paperbark near the eastern side of the main Bool Lagoon basin is a focal point for the entire reserves complex. Up to 40,000 pairs of ibis, egret, spoonbill and cormorant nest in the stand annually. To date, visitor access to this rookery has been restricted because of the sensitivity of the breeding birds and the difficulty in gaining access to the area. It is important that visitors be given an opportunity to see, appreciate and understand this spectacular natural phenomenon. It is equally important that the integrity of the rookery and its avifauna are safeguarded.

Policy:

- * The ecological values of the Tea Tree area will be protected from adverse human impacts.
- Controlled public access will be provided to view the Tea Tree bird rookeries.

Action:

 Provide a carpark with a capacity of up to twenty cars and two buses adjacent to the main access road east of the Tea Tree stand.

3

- Provide an appropriately designed and constructed bird observation hide within the Tea Tree stand adjacent to a small area of open water near the edge of the Ibis rookery.
- * Provide a boardwalk, built to standards enabling access by disabled people confined to wheelchairs, linking the carpark and the bird observation hide.
- * Provide a loop boardwalk of approximately 300 metres length from the bird observation hide, which circles the small area of open water, allows observation of a part of the rookery and returns to the hide.
- * Incorporate barriers in the design of the boardwalk to prevent entry of introduced predators to the rookery.
- * Provide interpretive information explaining wetland and waterbird ecology at the start of the boardwalk, the bird observation hide and other selected locations along the boardwalk.
- Public access to the boardwalk will be restricted to parties of visitors accompanied by a National Parks and Wildlife Service tour guide or other appropriately qualified and authorised persons.
- * A fee will be levied on persons participating in the guided tour. The fees collected will be credited to the South East Environmental Management Programme of the General Reserves Trust.
- * The loop boardwalk from the bird observation hide will be closed during the breeding season of birds nesting in the Tea Tree rookery.
- The boardwalk system will be closed to public access on proclaimed hunting days.

5.3.4 Hacks Peninsula

Hacks Peninsula forms the natural division between the Hacks and Bool Lagoon basins and is one of the few areas in the reserves offering access to good bird observation sites where established canopy trees provide shade and wind shelter. It is a popular site for day visitors and overnight campers. Policy:

- Facilities will be provided on Hacks Peninsula for day use and camping.
- Access to the scenic features of Hacks Peninsula and the adjacent lagoons will be provided.

Action:

- Provide basic toilet facilities and water supply in the vicinity of and accessible from both the day visitor and camping areas.
- * Establish up to ten individual camp sites on the eastern side of the access road.
- Implement a tree planting programme to provide visual barriers, shade and wind breaks for campsites.
- * Upgrade the day visitor carpark at the road terminus.
- Provide a walking track incorporating two small bird observation hides from the day visitor carpark to Hack's Island. The flow path cuttings between the carpark and Hack's Island will be bridged by boardwalk.
- * Provide orientation and interpretive information at the day visitor carpark, the bird observation hides and other selected locations along the walking track.
- Free public access will be available to this track system except in times of high visitation when guided tours may be required.
- * A fee will be levied on persons participating in the guided tour. The fees collected will be credited to the South East Environmental Management Programme of the General Reserves Trust.

5.3.5 Little Bool

The north western sector of Bool Lagoon Game Reserve contains three relatively deep basins - Round Swamp, House Swamp and Little Bool Lagoon - and is generally known as the Little Bool area. ٢

â

These deep, open waters with well grazed margins attract an abundance and variety of birds not readily seen in the main Lagoon. However, due to the very open nature of the Little Bool area, vehicle activity around the margins is a major source of disturbance to birdlife.

Policy:

- Promote public use and enjoyment of the Little Bool area through the provision of day use facilities.
- * The feasibility of providing camping opportunities at Little Bool will be investigated and, if proven, implemented having regard to:
 - . the protection of the natural values of the area
 - . the perceived demand for camping
- Vehicle disturbance to the avifauna of the area will be minimised.
- * Stock grazing of this area will be maintained.

Action:

- Provide a day visitor carpark in the vicinity of the north western corner of the Little Bool Lagoon basin with vehicle access from the adjacent Public road reserve.
- Provide toilet and picnic facilities adjacent to the carpark.
- * Implement a tree planting programme to provide habitat diversity and visitor facility screening .
- * Establish an interpretive walking track, incorporating three small bird observation hides linking the day visitor area, Little Bool Lagoon, the northern shore of Bool Lagoon and Round and House Swamps.
- * Erect a vehicle barrier along the northern boundary to prevent unauthorised vehicle access.
- Pending an investigation and decision about camping in the Little Bool Lagoon area, unauthorised camping will not be permitted.
- On proclaimed hunting days, hunters may be authorised to drive or camp in closed areas.

Bird observation hides will be closed to public access on proclaimed hunting days.

5.3.6 Twig Rush Lagoons

Three small partially interconnected lagoons lie adjacent to the western margin of the Bool Lagoon basin. They are accessible from Moyhall Road and are surrounded by a dryland zone revegetated between 1985 and 1987 by tubestock planting and direct seeding of indigenous trees and shrubs.

These lagoons, collectively known as the Twig Rush Lagoons were connected to the main lagoon in 1986 to facilitate water level regulation. The open water with heavily reeded margins of these lagoons constitute a markedly varied habitat from that of the Little Bool and the main lagoons.

In this context the Twig Rush lagoons provide an opportunity to interpret a variety of wetland habitats in conjunction with vegetation management techniques. The developing revegetation areas will eventually form a screening windbreak for campsites.

Policy:

- Visitor use and enjoyment of the Twig Rush lagoons will be encouraged by providing facilities for day use and camping.
- Visitor understanding will be encouraged by providing walking tracks and interpretive information around the Twig Rush lagoons.
- * Design constraints on visitor facilities will minimise unnecessary interaction between day visitors and campers.

Action:

- Provide vehicle access from Moyhall Road to a day visitors carpark on the western margin of the Twig Rush lagoons.
- * Provide five campsites adjacent to but screened by vegetation from the day visitors carpark.
- Provide toilet facilities and water supply in the vicinity of and accessible from both the day visitors carpark and the campsites.
- Provide a walking track which encircles the northern most of the Twig Rush lagoons, commencing and terminating at the day visitor carpark.

Ð

Ť

- Provide interpretive information about a variety of wetland habitats at selected locations along the walk.
- * Provide a loop walking track about 300 metres in length through the revegetation area at Twig Rush lagoons, commencing and terminating at the day visitor carpark.
- Provide interpretive information about revegetation techniques at selected locations along the walk.

5.3.7 Big Hill

The Big Hill is the southern half of a breached lunette which once separated the central and main basins of Bool Lagoon. A rough, single vehicle width track, suitable for summer use only, along the crest of Big Hill provides visitors with a panoramic view of the Lagoon from their vehicle.

A broad flat area at the north-east tip of the hill offers an opportunity to establish a relatively well wind sheltered group campsite. The geological features of this area - the ancient breached lunette, the newly forming lunette known as Snake Island and views across the main basin to a stable lunette - combined with varied wetland vegetation associations, provide an opportunity to establish a system of walking tracks to interpret aspects of the lagoons geomorphology and ecology not provided for in other visitor use areas.

Policy:

- Camping and day visitor use of the Big Hill area will be encouraged.
- Visitor understanding of the reserves' geomorphology and other natural features will be encouraged by providing walking tracks and interpretive information.

Action:

- Provide safe all-weather vehicle access from the main entrance of the lagoon to a day visitor parking area at the tip of Big Hill.
- Provide safe all-weather vehicle access from the base of Big Hill to the access track around the central and south-western basin to the Moyhall Road near the outlet gate.

- Provide an off-track three vehicle capacity standing bay adjacent to the track along the crest of Big Hill.
- * Establish a group campsite of sufficient size to accommodate 60 persons on the flat area along the north-eastern side of Big Hill.
- Provide toilet facilities adjacent and accessible to both day visitors and campers.
- * Construct a system of walking tracks and interpret:
 - The geomorphology of the lagoon. This track will commence at the day visitor carpark and travel along the western edge of Big Hill towards its base, crossing the crest and looping back towards the carpark.
 - 2. The importance of fluctuating water levels in the Bool Lagoon system. This track will commence at the day visitor car park traversing the open water to Snake Island via boardwalk and looping around the main part of the island to return to the carpark. In dry years a secondary loop across the floor of the lagoon will be incorporated.
 - 3. The aquatic flora and fauna of Bool Lagoon. A "wet" walking track through three distinct vegetation associations will be established adjacent to the camping area. In peak visitation periods guided tours will be conducted as required along the "wet" track. A fee for hire of waders and participating in the tour will be levied on users.
- * Provide appropriate information signs at:
 - . the off-track vehicle standing facility
 - . the day visitor car park
 - . the group camping area
 - . selected locations along the system of walking tracks.

5.3.8 Hunting

Bool Lagoon has a long established history as a prime duck hunting area in the South East. Private shoots have been conducted there since the early 1920's and since dedication public shoots have been held during the open season when conditions have been suitable. Hunting is presently permitted at Bool Lagoon on a maximum of six days each 0

3

NATIONAL PARKS AND WILDLIFE SERVICE

year. As for other game reserves in South Australia, the timing of the open season, bag limits and permitted species can be varied from year to year according to seasonal conditions and population trends.

Policy:

 In accordance with and subject to proclaimed conditions, duck hunting will be permitted on Bool Lagoon Game Reserve.

Action:

- Service staff will continue to liaise with hunter organizations regarding the management of open days.
- If pre-hunt surveys reveal the presence or condition of waterfowl species likely to be adversely affected by an open day shoot, the shoot may be cancelled after appropriate consultation with hunter and conservation organisations.

5.4 Management Support

Effective implementation of the management programmes outlined in this plan requires:

- * An informed community with an understanding of the areas resources, recreational opportunities and management.
- * Facilities to enable the Service to implement management programmes.
- * Administrative procedures and support services.

5.4.1 Interpretation and Environmental Education

Interpretation and environmental education assists in protection of natural and cultural features and is a major aspect of managing public use. There is a strong community expectation that information will be readily available. Bool and Hacks Lagoon have a significant role to play in the community as a resource for environmental study and education.

Policy:

* Interpretation and environmental education programmes will seek to assist people to reach and enjoy the reserves, and understand and appreciate their features and the Service's approach to management.

Joint interpretive programmes may be developed with other authorities, landowners and managers to incorporate information about wetlands into their operations.

Action:

- Printed interpretive information about the Reserves will be made available to the public.
- Costs associated with the production of interpretive information may be recovered through sales and credited to the South East Environment Management Programme of the General Reserves Trust.
- * Guided educational activities will be provided in the reserves at selected times and locations.

5.4.2 Research, Inventory and Monitoring

The function of research is to assist in the understanding of resources, their use and effective management. Priorities for research are outlined throughout the plan. 2

3

Policy:

- Service conducted research will aim to provide information on natural and cultural features, and human use to improve management of the reserves.
- * All research will be subject to Service policy and procedure for the granting of scientific permits, for the conduct of research and the production and distribution of results.
- * Research applications will be granted only where:
 - . the research has the potential to facilitate better management of the wetland environment.
 - . the effect of that research on the natural and cultural features and visitor use of the park does not conflict with the objectives of management and cannot be undertaken elsewhere.

Action:

- * Research will be encouraged which has the potential to facilitate better management.
- * Support of existing research programmes will continue.

5.4.3 Management Facilities

Certain facilities are required to implement management programmes within the reserves. Only facilities that cannot be provided outside the reserves will be provided within the reserves.

Policy:

 Roads, tracks, structures and equipment will be provided and/or maintained within the reserves for essential management operations.

Action:

- * Undertake an assessment to determine the type and disposition of facilities essential for management operations required to be undertaken in accordance with this plan.
- Close, salvage, dismantle or rehabilitate all unnecessary management facilities or construct, install or purchase new facilities as required.

5.4.4 Development & Commercial Activities

Facilities planned for the encouragement of visitor use, enjoyment and understanding are detailed in Section 5.3. These developments and any other commercial activities permitted pursuant to this objective will be undertaken in accordance with a Development Plan for the reserves which will be prepared, kept under review and amended as management techniques and financial constraints change over time.

In cases where the National Parks and Wildlife Service is unable to provide services to the public because of insufficient expertise or resources, opportunities may be offered to private individuals or organisations to operate concessions within the reserves for those services under appropriate leasing arrangements. Other activities which may be commercial <u>and</u> facilitate management or promotion of the reserves but not of direct benefit to the visiting public may be provided for under licence.

Policy:

* The Development Plan will be consistent with the objectives set out in the Plan of Management, aiming to provide facilities which are appropriate to public use of the reserves.

- Facilities will be designed to harmonise with the local environment and to ensure that minimal visual and ecological impact results from their construction and operation.
- * The effects of each prescribed development will be monitored and the construction of planned facilities will be staged, having regard to the visitor demand or management need for additional facilities and their potential environmental impact.
- * Where permitted in the reserves, commercial activities undertaken by private organisations or individuals will, where they are associated with the provision of visitor services, conform to policies listed in Section 5.3.1.
- * Alien uses, such as grazing, cropping, meadow-hay baling, commercial filming and photography may be permitted under licence within the constraints of current service policy and the following guidelines:
 - . Alien land uses will be consistent with the conservation of park values and facilitate protection or management of the reserves.
 - . Commercial activities will not conflict with natural values or visitor use of the reserves.
- * Income generated from fees collected for public use of facilities and services or from the issue of permits, leases or licences will be credited to the South East Environmental Management Programme of the General Reserves Trust and used to improve visitor services and facilities in the reserves.

Action:

- * Prepare a five year development plan for the reserves.
- * Monitor the environmental and social effects of developments.
- * Consider and determine any application for concession arrangements within the guidelines of this Plan of Management, the National Parks and Wildlife Service Policies Document and the National Parks and Wildlife Act 1972.

Review existing licences for alien land use to ensure their consistency with this Plan of Management. Ó

5.4.5 Staffing

On-ground implementation of this plan requires a basic staffing commitment with the flexibility to expand to cater for an expected increase in visitor numbers, maintenance of facilities and conservation programmes. Staffing must be seen within the context of a management district; human resources are most efficiently utilized if they are managed in accordance with demand.

Policy:

- Staff numbers will be maintained at a level which allows effective implementation of management actions.
- * Consideration will be given to the encouragement of volunteer groups to assist with specific programmes where the assistance of such groups would result in the achievement of tasks which would otherwise not be achieved.

Action:

- * Permanent on-site staff (one) will be employed as required to execute the plan of management, with support from other district staff.
- Casual staff will be employed according to the seasonal demands for visitor services, or for particular conservation, management or development requirements.
- Volunteer groups will be approached for assistance with programmes or tasks otherwise beyond the limit of available resources.

6. PLAN IMPLEMENTATION AND PRIORITIES

This section provides a summary of the key management proposals outlined in the plan and gives an indication of the priority and duration of each proposal.

Under Section 40(1) of the National Parks and Wildlife Act 1972 no operations can be undertaken within Bool Lagoon Game Reserve and Hacks Lagoon Conservation Park except in accordance with this plan. However, if after adequate investigation, operations not included in the plan are found to be justified, this plan will be amended in accordance with Sections 38(2) and 38(3) of the Act.

Act	ion	Priority	Ref.	
Water Management				
*	maintain agreed water levels with allowance for annual seasonal variations	high	ongoing	
*	ensure minimal environmental impact of SEDB herbicide application for clearance of flow paths			
* *	investigate non-chemical control methods	high	short	
*	investigate establishment of water quality monitoring programme	mod	ongoing	
*	investigate division of Bool Lagoon basins	high	short	
*	maintain ban on lead shot	high	ongoing	
Vec	getation Management			5.1.2
*	maintain records of environmental conditions to aid interpretation of distribution of vegetation	high	ongoing	
*	maintain open and shallow water habitats	high	ongoing	
*	revegetate improved pastureland	mod	long	

2

з

3

Plan

Act	tion	Priority	Duration	Plan Ref
*	maintain habitat diversity through vegetation control techniques	mod	ongoing	
Fai	<u>ina Management</u>			5.1.3
*	encourage research into the ecology and distribution of rare and endangered species	mod	ongoing	
*	monitor waterfowl populations	mod	ongoing	
*	control introduced species which affect significant natural resources and neighbouring land use	high	long	
Fi	re Management			5.1.4
*	provide fire management access tracks	high	ongoing	
*	reduce fuel levels over dryland areas	high	ongoing	
*	prohibit wood fires	high	short	
<u>Cu</u>	ltural Resource Management			5.2
*	encourage research programmes	mod	ongoing	
*	liaise with aboriginal people	mod	ongoing	
Red	creation Opportunity Management			5.3
*	construct or upgrade vehicle access and carparks at nominated sites	high	short	
*	construct walking trails, lookouts, birdwatching hides and boardwalks with associated facilities	high	long	
*	establish camping areas at nominated sites	high	long	
*	establish day use facilities at nominated sites	high	short	
Hu	nting			5.3.8
*	liaise with hunting organisations regarding the management of open days	s high	ongoing	

3

ĩ

9

Act	ion	Priority	Duration	Plan Ref.
*	maintain pre-hunt surveys to determine the presence or condition of waterfowl species likely to be adversely affected by open days	high	ongoing	
<u>Int</u> Edu	erpretation & Environmental cation			5.4.1
*	provide interpretation facilities and services at major visitor use areas	high	ongoing	
Res	earch, Inventory and Monitoring			5.4.2
*	encourage research which will facilitate better wetland management	high	ongoing	~*
*	support existing research programmes	high	ongoing	
Management Facilities				5.4.3
*	rationalize management facilities	mod	short	
Development & Commercial Activities			•	5.4.4
*	prepare and implement a five year rolling development plan	high	short	
*	monitor environmental and social effects of developments	high	ongoing	
*	review existing alien land use licences	high	short	
*	consider and determine concession applications	high	ongoing	
<u>Sta</u>	Staffing			5.4.5
*	employ staff as required to execute this plan	high	ongoing	
* .	encourage volunteer assistance for the implementation of selected programmes	high	ongoing	

33.

SELECT BIBLIOGRAPHY

Aborigines

- Campbell, T.D. (1934). "Notes on the Aborigines of the South-East of South Australia Part I. "<u>Transactions of the</u> <u>Royal Society of South Australia</u> LVIII: 22-32.
- Cleland, J.B., Campbell, T.D. and Hossfield, P.S. (1946). "Aborigines of the Lower South-East of South Australia." Records of the SA Museum VIII. 3: 445-502
- Smith, C. (1980). <u>The Boandik Tribe of South Australian</u> <u>Aborigines: a Sketch of their Habitats, Customs, Legends</u> and Language.

Tindale, M.B. (1974). <u>Aboriginal Tribes of Australia</u>. Australian National University Press, Canberra.

<u>Fauna</u>

Aitken, P (1975). "Two New Bat Records from South Australia with Field Key and Checklist to the Bats of the State." <u>South</u> <u>Australian Naturalist</u> 50: 9-15

Aitken, P (1983). "Mammals." In: <u>Natural History of the South</u> <u>East</u>. (Eds. Tyler, Twidale, Long and Holmes) Royal Society of South Australia: Adelaide.

Blakers, M., Davies, S.J.J.F., and Reilly, P.N. (1984). <u>The</u> <u>Atlas of Australian Birds</u>. Melbourne University Press, Melbourne.

Carrick, R (1959). "The food and feeding habits of the Straw-necked Ibis <u>Threskiornis spinicollis</u> (Jameson) and the White Ibis <u>T. Molucca</u>(Curvier) in Australia." <u>CSIRO</u> Wildlife Research, 4: 69-92.

Carrick, R. (1962). "Breeding, movements and conservation of ibises (Threskiornithidae) in Australia". <u>CSIRO Wildlife</u> <u>Research</u>, 7(1): 71-88.

- Casperson, K.D, (1980). Freckled Duck (<u>Stictonetta naevosa</u>) Mortality, Bool Lagoon Game Reserve, March 1980. Technical Memoranda, South Australian National Parks and Wildlife Service.
- Chessman, B.C. and Williams, W.D. (1974). "Distribution of fish in Inland Saline Waters in Victoria, Australia." <u>Australian Journal of Marine and Freshwater Research</u>, 25: 167-172.

- Close, D.H., Bonnin, J.M., Waterman, M.H. and Connell, D.J. (1982). "Breeding Waterbirds on the Salt Lagoon Island, South Australia" <u>Corella</u>, 6: 25-36.
- Coman, B.J. (1973). "The diet of Red Foxes, <u>Vulpes vulpes</u> L., in Victoria." <u>Australian Journal Zoology</u>, 21: 391-401.
- Coman, B.J. and Brunner, H. (1972). "Food habits of the feral house cat in Victoria." <u>Journal Wildlife</u> <u>Management</u> 36: 848-853.
- Condon, H.T. (1969). <u>A Handlist of the Birds of South</u> <u>Australia</u>. 3rd edition. South Australian Ornithologists Association, Adelaide.
- Corrick, A.H. (1980). "Freckled Duck on Lakes in the Western District, Victoria." <u>Australian Bird Watcher</u>, 8: 254-255.
- Frith, H.J. (1967). <u>Waterfowl in Australia</u>. Angus and Robertson, Sydney.
- Glover, G. (1971). "Bird Report, 1969-70." <u>South Australian</u> <u>Ornithologist</u> 26(1): 12-18.
- Glover, C.J.M. (1983). "Marine and Freshwater Fish." In: <u>Natural History of the South East</u>. Royal Society of South Australia, Adelaide.
- Jackson, P.D. and Williams, W.D. (1980). "Effects of Brown Trout, <u>Salmo trutta</u>, on the Distribution of Some Native Fishes in three areas of Southern Victoria." <u>Australian</u> <u>Marine and Freshwater Research</u>, 231: 61-67.
- Jaensch, R.P. (1982b). "Bool Lagoon: Premier Waterbird Refuge." South Australian Parks and Conservation, 5 (1): 10-13.
- Keast, A. (1959). "The reptiles of Australia." In: <u>Biogeography and Ecology in Australia</u>. (Eds. Keast, Crocker and Christian) Uitgeverij Dr. W. Junk, Den Hagg.
- Llewellyn, L.C. (1974). "Spawning, Development and Distribution of the Southern Pigmy Perch <u>Nanoperca</u> <u>australis australis</u> (Gunter) from Inland Waters in Eastern Australia." <u>Australian Journal of Marine and</u> Freshwater Research, 25: 121-149.
- Maeda, K. (1982). "Studies on the Classification of <u>Miniopterus</u> in Eurasia, Australia and Melanesia" <u>Honyuri Kagaku (Mammalian Science)</u>, Suppl. 1: -176.

2

McDowall, R.M. (ed) (1980). <u>Freshwater Fishes of South</u> <u>Eastern Australia</u>. Reed, Sydney.

- McNally, J. (1960) "The Biology of the Water Rat <u>Hydromys</u> <u>chrysogaster</u> Geoffroy (Muridae: Hydromyinae) in Victoria." <u>Australian Journal of Zoology</u>, 8: 170-11180.
- Mitchell Beazley (1974). <u>The World Atlas of Birds</u>. Mitchell Beazley, London.
- Parker, S.A., Eckert, H.J., Ragless, G.B., Cox. J.B. and Reid, N,C.H. (1979). "An <u>Annotated Checklist of the</u> <u>Birds of South Australia. Part One; Emus to Spoonbills</u>. South Australian Ornithological Association, Adelaide.
- Parker, S.A. Eckert, H.J., Ragless, G.B., (1985). "An <u>Annotated Checklist of the Birds of South Australia.</u> <u>Part Two (A) Waterfowl</u>." South Australian Ornithological Association, Adelaide.
- Pizzey, G. (1980). <u>A Field Guide to the Birds of Australia</u>. Collins, Sydney.
- Robinson, A.C., Delroy, L.B. and Jenkins, R.B. (1982). <u>Conservation and Management of the Cape Barren Goose</u>. National Parks and Wildlife Service, Department of Environment and Planning Special Publication No. 1. Government Printer, Adelaide.
- Royal Australasian Ornithologist Union (1983) 1983 population estimates of Freckled Duck (<u>Stictonetta</u> <u>naevosa</u>) in Australia. (Unpublished report).
- Scott, T.D., Glover, D.J.M. and Southcott, R.V. (1974). <u>The</u> <u>Marine and Freshwater Fishes of South Australia</u>. Government Printer, Adelaide.
- Thompson, M.B. (1983). "Murray River Tortoise, <u>emydura</u>, (<u>Chelodina</u>) Populations: the Effect of Egg Predation by the Red Fox. <u>Vulpes vulpes</u>. <u>Australian Wildlife</u> Research, 10(2).
- Thompson, M.B. and Tyler, M.J. (1983). "Reptiles and Amphibians." <u>Natural History of the South East</u>. Royal Society of South Australia: Adelaide.
- Tyler, M.J. (1978). <u>Amphibians of South Australia</u>. Government Printer, Adelaide.
- Waterman, M., Close, D. and Condon, D. (1971).
 "Straw-necked Ibis (<u>Threskiornis spinicollis</u>) in South
 Australia: Breeding Colonies and movements. "<u>South
 Australian Ornithologist</u>, 26(1): 7-11.

Watts, C.H.S. and Aslin, H.J. (1981). <u>The Rodents of</u> <u>Australia</u>. Angus and Robertson, London.

White, D.M. (1984). The status and distribution of the Brolga (<u>Grus rubicund</u>a) in Victoria, Australia. Paper prepared for the Ministry of Conservation, Fisheries and Wildlife Division, Serendip Wildlife Research Station.

<u>Flora</u>

- Aston, H.I. (1973). <u>Aquatic Plants of Australia</u>. Melbourne University Press, Melbourne.
- Black, J.M. (1963-1978). <u>Flora of South Australia</u>. Vol I-IV Government Printer, Adelaide.<u>General</u>
- Bridgewater, P.B., Rosser, C and deCorona, A (1981). The Saltmarsh Plants of Southern Australia. Botany Department, Monash University.
- Davies, R.J.P. (1982). <u>The Conservation of Major Plant</u> <u>Associations in South Australia</u>. Conservation Council of South Australia, Adelaide.
- Haslam, S.M. (1970). "The Performance of <u>Phragmites</u> <u>communis</u> Trin. in Relation to Water Supply." <u>Annals of</u> Botany, 34: 866-877.
- Haslam, S.M. (1973). "Some Aspects of the Life History and Autecology of <u>Phragmites communis</u> Trin. A review. " <u>Pol. Arch. Hydrobiol</u>, 20: 79-100.
- Prunster, R.W. (1940). "The Control of Cumbungi (<u>Typha</u> spp.) in Irrigation Channels. <u>Journal of CSIRO</u> (<u>Australia</u>), 13: 1-6.
- Prunster, R.W. (1941). "Germination conditions for <u>Typha</u> <u>muelleri</u> and its practical significance in irrigation and channel maintenance" <u>Journal of CSIRO (Australia)</u> 14: 129-136.
- Robb, L.G. (1979). The <u>Triglochin procera</u> Aggregate in Victoria. B. Sc. (Hons.) thesis, Univ. of Melbourne.
- Robb, L.G. and Ladiges, P.Y. (1981). "Morphological Forms and polypeidy in <u>Triglochin procera</u> agg. in Victoria. <u>Australian Journal of Botany</u>, 29: 639-651.
- Sena Gomes, A.R. and Koxlowski, T.T. (1980). "Responses of <u>Melaleuca quinquenervia</u> Seedlings to Flooding." <u>Physiol</u> Plant, 49(4): 373-377.

*

Specht, R.L. (1972). <u>The Vegetation of South Australia</u>. Government Printer, Adelaide.

Geology

- Cook, P.J., Colwell, J.B., Firman, J.B., Lindsay, J.M. Schwebel, D.A. and Von der Borch, C.C. (1977). "The Late Cainozoic Sequence of South East South Australia and Pleistocene Sealevel Changes." <u>BMB Journal of</u> <u>Australian Geology and Geophysics, 2: 81-88.</u>
- Ludbrook, N.H. (1980). <u>A Guide to the Geology and Mineral</u> <u>Resources of South Australia</u>. Department of Mines and Energy, Government Printer, Adelaide.
- Marker, M. (1975). <u>The Lower South-east of South Australia:</u> <u>a Karst Province</u>. University of Witwatersrand (South Africa) Department of Geographical Environmental Studies - Occasional Paper 13.
- Rogers, P.A. (1980). <u>Geology of the South East</u>. South Australian Department of Mines and Energy map series. Scale, 1:500,000.

Geomorphology

- Blackburn, G. (1952). <u>The Soils of the Kingston-Avenue</u> <u>Drainage Area, South Australia</u>. Soils and Land Use Series, 7. Division of Soils, CSIRO Melbourne.
- Blackburn, G. (1964). <u>The Soils of Counties MacDonnell and</u> <u>Robe, South Australia</u>. CSIRO Soils and Land Use Series, 45, Division of Soils, CSIRO, Melbourne.
- Campbell, E.M. (1967). The Morphology and Genesis of Lunettes in Southern South Australia. M.A. Thesis, University of Adelaide.
- Campbell, E.M. (1968). "Lunettes in Southern South Australia." <u>Transactions Royal Society of South</u> <u>Australia</u>, 92: 85-109.
- Stephens, C.G. and Crocker, R.L. (1946). "Composition and genesis of Lunettes." <u>Transactions of the Royal Society</u> of South Australia, 70: 302-312.

Twidale, C.R. (1976). <u>Analysis of Landforms</u>. Joh Wiley and Sons Aust. Pty. Ltd.

<u>History</u>

Proud, C. (1981). "The South-eastern District of South Australia in 1880 Adelaide." A series of articles produced in The Register.

Hunting

Braithwaite, L.W. and Norman, F.E. (1974). <u>The 1972 Open</u> <u>Season on Waterfowl in South-eastern Australia</u>. CSIRO Australian Division Wildlife Research Technical Paper No. 29.

- Braithwaite, L.W. and Norman, F.E. (1976). <u>The 1973 and 1974 Open Seasons on Waterfowl in South-eastern</u> <u>Australia</u>. Australian Division Wildlife Research Technical CSIRO Mem. 11.
- Braithwaite, L.W. and Norman, F.E. (1977). <u>The 1975 and</u> <u>1976 open seasons on waterfowl in South-eastern</u> <u>Australia</u>. CSIRO Aust. Div. Wild. Res. Tech. Mem. 11.

2

3

- Braithwaite, L.W. (1981). "Notes on some Implications of Selected Results from Opening Day Surveys." In: <u>Wildlife Management in the 80's</u>. (Ed. Riney) (Proceedings of Conference organised by Field and Game Federation of Australia and School of Environmental Science, Monash University).
- Corrick, A.H. (unpublished). Records of Freckled Duck in Victoria from December, 1980 to July 1981 and the Effect of the Duck Shooting Season on the Population. Unpubl. paper, Fisheries and Wildlife Division, Ministry for Conservation, Victorian Government.
- Craig, R.A. and Evans, C. (1984). Hunters and birdwatchers - human dimensions of waterfowl management. Unpublished manuscript, Roseworthy Agricultural College, Department of Extension and Education.

Delroy, L.B. (1983) "Future hunting seasons for duck in South Australia." <u>Field and Game News</u>, November, 1983.

Hydrology

- O'Driscoll, E.P.D. (1960). <u>The Hydrology of the Murray</u> <u>Basin Province in South Australia</u>. Bulletin of the Geological Survey of South Australia. 35.
- Shepherd, R.G. (1964). Report on Hydrology of Bool Lagoon Area, Hundred of Robertson. South Australian Department of Mines and Energy unpublished report 58/67.

Shepherd, R.G. (1975). "Hydrogeology of the South East Province." <u>Min. Res. Review</u>, 137: 83-89.

International Agreements and Conventions

Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment. (entered into force 1981).

Agreement between the Government of the Peoples' Republic of China and the Government of Australia fot the Protection of Migratory Birds and their Environment (signed by Australia in 1986, not ratified).

Convention on Wetlands of International Importance especially as Waterfowl Habitat (signed by Australia 8th May, 1974).

IUCN (1987), <u>Directory of Wetlands of International</u> Importance. The Union, Gland.

Recreation

- Bermingham, K (1961). <u>Gateway to the South East</u>. South Eastern Times, Millicent.
- South Australian Department of Tourism (1982). <u>South East</u> Visitor Survey 1982. The Department, Adelaide.
- South Australian Departmant of Tourism (1983). <u>Summary of</u> <u>South Australian Tourism statistics 1982/83</u>. The Department, Adelaide.
- South Australian Department of Tourism (1984). <u>Domestic</u> <u>travel in South Australia characteristics by region</u>. The Department, Adelaide.

Water Management

- Anderson, W.L. (1975). "Lead Poisoning in Waterfowl at Rice Lake, Illinois." Journal Wildlife Management, 39(2): 264-270.
- Feierabend, J.S. (1983). <u>Steel shot and lead poisoning in</u> <u>waterfowl</u>. Scientific and Technical Series O, U.S. National Wildlife Federation, An annotated bibliography of research 1976-1983.
- Olsen, P., Settle, H. and Swift, R. (1980). "Organochlorine Residues in Wings of Ducks in South-eastern Australia." Australian Wildlife Research, 7: 139-147.

- Rowley, D.K. (1982). <u>Bool Lagoon Lead Study</u>. Report to Department of Environment and plan., SA Government by AMDEL.
- South Australian Parliamentary Paper 89/1905. Drainage Works at Bool Lagoon.
- South Eastern Drainage Board (1981). <u>Environmental Impact</u> <u>Study on the effect of drainage in the South East of</u> <u>South Australia</u>. SEDB, Adelaide.
- South Eastern Drainage Board (1985). Operating manual for Bool Lagoon and Drain M. (Unpublished internal report).

Wetlands

- Briggs, S.V. (1981). "Freshwater Wetlands." In: Australian Vegetation. (Ed. Grove) Cambridge University Press, Cambridge.
- Briggs, S.V., Maher, M.T., and Carpenter, S.M. (1985). "Limnological studies of waterfowl habitat in south-western New South Wales I. Water Chemistry." <u>Australian Journal of Marine and Freshwater Research</u>, 36: 59-67.
- Delroy, L.B. Creation of Waterfowl Habitat in South Australia. Internal Report DE file GR2//950/00.
- International Waterfowl Research Bureau (1976). <u>Proceedings: International Conference on conservation</u> <u>of wetlands and waterfowl. Heiligenhafen. Germany, 2-6</u> <u>Dec., 1974</u>. IWRB Slimbridge, England.
- Jones, W. (1978). <u>The Wetlands of the South East of South</u> <u>Australia</u>. Nature Conservation Society of South Australia, Adelaide.

ð

