WETLANDS OF THE DARLING SYSTEM

WETLANDS IN CONSERVATION RESERVES AND NATIONAL PARKS

By Karen Majer

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DEPARTMENT OF CONSERVATION AND ENVIRONMENT

Cover: Lake Joondalup, Shire of Wanneroo, showing fringing vegetation of Jointed Twig Rush, Bulrush and Swamp Paper-bark. Inset on right : White Ibis.

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Department of
Conservation and
Environment
Western Australia.

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FOREWORD

The importance of conservation of wetlands in Western Australia has been recognized by the Western Australian Environmental Protection Authority (E.P.A.) in putting forward recommendations on conservation reserves (National Parks and Nature Reserves) in Western Australia [1,2,3].

In the course of the E.P.A.'s consideration of its Conservation Through Reserves Committee's (C.T.R.C.) proposals for reserves, and the formulation of recommendations, it became clear that the extent and nature of current allocation of reserves on wetland areas was not known; information on the distribution and types of surviving wetlands was inadequate; the ownership and vesting of wetland reserves was diverse, and, in consequence the use of their resources was potentially haphazard; the current status of management of wetland reserves, whilst varying with vesting authorities, localities and other factors, was generally inadequate. Virtually no formal management plans were known to exist and management tended to be of an ad hoc nature.

Recognizing that many of the wetland reserves are vested, and that the responsibility for management lies with the authority in which they are vested, the E.P.A. believed that it would be desirable to create a consistent pattern of allocation and development of wetland reserve resources. To achieve this there was the need to co-ordinate the approach to the development of management plans for wetland reserves, particularly in terms of overall management to cater for the differing demands made on such reserves.

As a result of these considerations the Wetlands Advisory Committee was convened in February, 1976, by the Department of Conservation and Environment, and was comprised of the following members :

Mrs. K. Majer (Chairperson)	Department of Conservation and Environment
Mr. N. Orr (Secretary)	Department of Conservation and Environment
Dr. N. Marchant	W.A. Herbarium
Dr. T. Riggert	Department of Fisheries and Wildlife
Dr. P.R. Wycherley	Kings Park and Botanic Gardens
Mr. R. Hiller	Town Planning Department
Mr. B. Bailey	Community Recreation Council

The terms of reference of the Wetlands Advisory Committee were to review and advise the E.P.A. on the desirable allocation of wetland reserve resources and the adequacy of their management.

The area selected for the initial one-year study was the region from Moore River to Bunbury, known as the Darling System or System 6 (Fig. 1). This area was chosen firstly because it presently contains about 76% of the State's population and is an area of intensive, and often competing, land - use which places a great deal of pressure on the wetlands. Secondly, it was felt that the information collected in the course of the study would form a useful input to the C.T.R.C. Committee, which was then initiating its consideration of the need for further conservation reserves in the Darling System.

The information collected by the Wetlands Advisory Committee between February, 1976 and July, 1977, and the resulting recommendations to the E.P.A. have, however, wider relevance than purely as an input to the Darling System Study. The purpose of this bulletin is to increase the accessibility of this data, and allow dissemination of relevant information to those who may find it of practical value in future planning for wetlands.

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1. INTRODUCTION

Reserves may be set aside under Section 29(1) of the Western Australian Land Act (1933) for a variety of purposes, including "...areas for conservation of timber, and indigenous flora or fauna;" (Section 29.1.(g)). These conservation reserves may include, or be adjacent to, all or part of a wetland area. The wetland may be the main feature of the reserve, or may be unrelated to the major purpose of the reserve. In either case, conservation reserves play a vital role in the protection of wetland resources. Similarly, wetlands may fall within National Parks, either being a major feature of the Park (for instance Lake Preston in Yalgorup National Park) or receiving protection in an area set aside to preserve some other feature (for instance the streams in the National Parks on the Darling Range and escarpment).

Wetlands in reserves for other purposes (for example recreation), or within Local or Regional Open Space, Water Catchment Areas, or State Forests are also often offered some degree of protection, and the management policies for these areas play a vital role in wetland conservation.

This booklet deals with conservation reserves and National Parks with wetland resources in the Darling System, (Fig. 1), the adequacy of reservation of various wetland types, and the adequacy of reserves in relation to protection of the wetland ecosystem[4].

2. CONSERVATION RESERVES

The gazetted purposes which have been defined for the purpose of this booklet as conservation reserves are listed in Table 1.

2.1 Perth Metropolitan Region

Conservation reserves including all or part of a wetland in the Perth Metropolitan Region are detailed in Table 2.

A total of 15 reserves are set aside for conservation on wetlands in the Perth Metropolitan Region. This represents a total area of 4,388 hectares (made up of reserves ranging from approximately 4 hectares to 1,991 hectares). (These figures exclude National Parks).

Of these reserves, four are situated on or adjacent to part of a lotic*wetland system (Helena River, Karnet Brook, Ellen Brook and unnamed creeks). Twelve reserves include all or part of eleven lentic** wetlands which can be described as follows***:

* Lotic: running water[5]
** Lentic: standing water[5]
*** Wetlands are classified according to the system developed by the Wetlands Advisory Committee[4] and detailed by Marchant[6]. For key to description of lentic wetlands see Table 2 (page 18).

6 fresh, permanent water bodies ranging from small (Blue Gum Lake) to large lakes (e.g. Lakes Thompson, Jandakot (Forrestdale), Jandabup and the wetland system part of which is reserved in Mary Carroll Park).

3 fresh, seasonal swamps (Ellen Brook reserve, Twin Swamps, unnamed swamp).

2 brackish, permanent lakes (Lakes Nowergup and Joondalup).

These figures suggest that the dominant wetland feature which has merited conservation to date is fresh (or brackish) permanent water. This is probably related to the understanding of the need for waterfowl drought refuges, and to a public acceptance of the desirability of permanent open water. The two seasonal fresh water areas, Ellen Brook Reserve and Twin Swamps, were set aside for the specific purpose of providing habitat for the Western short-necked turtle (Pseudemydura umbrina).

It is noted that conservation reserves on wetlands occur largely in the "outer" Metropolitan area i.e. Armadale-Kelmscott, Cockburn, Gosnells, Mundaring, Serpentine-Jarrahdale, Swan and Wanneroo (approximately one third in the Wanneroo Shire alone). Wetland reserves in "inner suburbs" are almost exclusively devoted to recreation, reflecting the demand for this use in areas of higher population density.

2.2 The Darling System Outside the Perth Metropolitan Region

Conservation reserves including, or adjacent to, wetlands in the Darling System outside the Perth Metropolitan Region are detailed in Table 3.

Thirty reserves are set aside for conservation purposes (excluding National Parks) on wetlands in this area, representing a total area of 5,142 hectares (reserves range from 2 to 1,019 hectares).

The types of wetlands represented in these conservation reserves are as follows :

14 reserves on parts of lotic systems (Blackwood River, Hotham River, Collie River, Falls Brook, Clarke Brook, Belaring Spring, Goonaring Spring, Anvil Gully, Moore River and unnamed creeks).

7 reserves on parts of estuarine systems (all on Peel/Harvey Estuary).

10 reserves on parts of 14 lentic wetlands

The lentic* wetlands comprise :

2 fresh, permanent lakes (Lake Bambun, Lake McLarty)

7 fresh, seasonal wetlands (including Lakes Nambung, Mungala, and Wallering Swamp, swamp north of Long Swamp). (Ranging in size from four small, to one medium, three large).

1 brackish, seasonal wetland (Yurine Swamp) (small).

1 saline, permanent; (Lake Wannamal) (large)

2 saline, seasonal wetlands (Lakes Chittering and Needonga) (large).

There is a striking deficiency of conservation reserves with permanent water. (This is discussed further in section 4.2.2).

3. NATIONAL PARKS

National Parks are defined for the present purpose as those areas reserved as National Parks regardless of their vesting as well as areas vested in the National Parks Authority.

National Parks including all or part of a wetland in the Darling System are detailed in Table 4.

Twenty two National Parks, totalling 39,607 hectares, in the Darling System (fourteen of these within the Perth Metropolitan Region) incorporate wetland areas.

The major wetlands included wholly or partly in National Parks are :

Lake Clifton

Lake Preston

Lake Cooloongup

Lake Walyungup

Avon River

Gingin Swamp Complex

The remainder comprise numerous creeks and river tributaries, particularly on the Darling Range and escarpment.

4. ADEQUACY OF RESERVATION OF WETLAND TYPES

4.1 Lotic Wetlands and Estuaries

The degree of protection of the major drainage complexes provided by land reservation appears to be related to two major factors :

* For key to description of lentic wetlands see table 2 (page 18).

(i) the proximity of the river system to densely populated areas;

(ii) the importance of the river system as a source of fresh water supply.

For example, close to densely populated Perth, the Helena and Canning Rivers have their catchments protected by State Forests and water catchment reserves, (managed by the Metropolitan Water Supply, Sewerage and Drainage Board and the Public Works Department as sources of water supply), and their lower reaches and the Swan River estuary fall within numerous recreation reserves under various management authorities (mainly Local Authorities and the Metropolitan Region Planning Authority). Reservation of land is also of a high order on rivers or estuaries in the population centres of the Peel-Harvey Inlet at Mandurah, Leschenault Inlet at Bunbury, Collie River at Collie and the Murray River at Pinjarra.

In areas of low population and where the river system is not presently being used as a major source of fresh water supply the banks of the majority of the rivers are largely unprotected by land reservation, for example Moore River, Gingin Brook, Wellesley, Brunswick and Preston Rivers. In the absence of such protection clearing often extends to the water's edge, with consequent degradation of foreshore vegetation and erosion problems.

Thus, for adequate protection of river foreshores, foreshore reserves should be set aside on rivers and streams which flow through privately owned land. This is the policy of the Town Planning Board, which often excises river foreshores as Public Open Space as a condition of subdivision of land fronting a watercourse.

The degree of protection (in terms of stability of the river banks, etc.) offered by the foreshore reserves is questionable. This will depend on several factors such as the size, vesting (if any) and management of each reserve.

Currently most foreshore reserves are fairly narrow and do not encompass all of the wetland vegetation.

It is recommended that the foreshore reserve should encompass at least the wetland vegetation, and preferably also a "buffer" zone to minimize the degrading effects of surrounding land use activities.

The desirable width of this buffer zone will depend on :

(i) the proposed use of the foreshore reserve (for example it may provide an area for human access in the form of walking trails, or back-up facilities for recreational activity where this is desirable);

(ii) the nature and intensity of the surrounding land use, and

(iii) the topography of the banks.

The importance of management of such foreshore reserves if they are to provide protection of the physical stability of the banks is stressed.

In terms of protection or preservation of a wetland system, lotic wetlands present a different problem to lentic in that they may flow over considerable distances and through areas of varying land use. Protection of water quality may thus involve management of a considerable catchment area, as well as the need for adequate foreshore reserves as discussed above. While parts of the catchments of some rivers are protected by Water Catchment Reserves or State Forests (e.g. Helena, Canning, Serpentine, Harvey, Murray, North and South Dandalup), water quality is often threatened by surrounding agricultural and urban development on the coastal plain.

4.2 Lentic Wetlands

The allocation of reserves (regardless of purpose but excluding drainage reserves) incorporating all or part of lentic wetlands in the Darling System is summarised in Table 5.

As the representation of different types of wetlands in reserves differs within and outside the Metropolitan Region, it will be necessary to discuss each area individually.

4.2.1 Perth Metropolitan Region

Within the Metropolitan Region there are thirty-seven lentic wetlands within or partially within reserves (other than drainage reserves), as follows :

10 large, fresh, permanent wetlands

3 large, fresh, seasonal

2 large, brackish, permanent

3 large, saline, permanent

1 medium, fresh, permanent

2 medium, fresh, seasonal

1 medium, brackish, permanent

12 small, fresh (3 permanent)

1 small, brackish

1 filled

1 not classified due to lack of information

There are also four reserves containing artificial wetlands, created by excavation (sometimes of a natural drainage depression) or by damming a watercourse as in the case of Lake Leschenaultia. Artificial wetlands are also situated in many areas of land owned or controlled by Local Authorities where they usually function as drainage compensating basins, often in conjunction with some degree of landscaping to create a scenic or recreational amenity.[7]

From the figures quoted above for reserves on lentic wetlands, it can be stated that :

- Most types of such wetlands are poorly represented in reserves in Perth. Of the few permanent water bodies (regardless of size, salinity and other characteristics) in Perth, twenty are partially included in reserves, but of these only ten are conservation reserves. In the case of the seventeen seasonal wetlands (such as swamps and winter-wet depressions), which have some reserved areas on them, only four are protected to any degree by conservation reserves.

- When the types of wetlands are categorised further, the inadequacy of their representation in reserves (particularly those reserves which would ensure their preservation) is clear, as is their inadequacy for satisfying the competing demands for their use. For example areas of permanent fresh water are of importance to wildlife for summer drought refuges and are also an attraction for recreational activities. Of the very few such areas surviving only fourteen are represented in reserves.

- The greatest deficiency is in the conservation of seasonal wetlands and their associated plant communities. The biological and other values of the latter areas have not been fully appreciated in the allocation of reserves.

4.2.2 The Darling System Outside the Perth Metropolitan Region

The allocation of reserves on lentic wetlands is as follows :

1 large, fresh permanent wetland

9 large, fresh, seasonal

1 large, brackish, seasonal

4 large, saline, permanent

3 large, saline, seasonal

3 medium, fresh, permanent

1 medium, fresh, seasonal

14 small, fresh

1 small, brackish

1 medium, saline, seasonal

2 not able to be classified on present information.

- As for the Metropolitan area, most types of lentic wetlands are poorly represented in any type of reserve; when the reserves which do not confer any protection on the wetland (e.g. drainage reserves) are deleted, the numbers are even lower.

- There is a particular lack of fresh, permanent water in reserves. Such areas are of prime importance as drought refuges for waterfowl and other wildlife, and any such areas must be given high priority for reservation.

- There is again a lack of protection of seasonal wetland areas. Only eleven seasonal wetlands are wholly or partly in conservation reserves. Of the remainder of the reserved seasonal wetlands many are in (or are crossed by) drainage reserves, which actually contribute to the destruction of the wetland rather than its preservation.

Both within and outside the Perth area there is a basic need for preservation of permanent, fresh water wetlands. This could be achieved by further reservation, particularly of such wetlands in Crown Land, and by evaluation of areas of permanent fresh water within reserves for outdated gazetted purposes (for example Resting Place for Travellers and Stock) with a view to changing the purpose, and vesting (if necessary) in a suitable management authority to ensure their preservation.

The value of existing fresh water areas both within reserves and on private land could be increased by appropriate management, or where necessary by rehabilitation. In this respect degraded areas (e.g. Carine and Herdsman Lakes) and man-made lakes created by mining and excavation (e.g. clay pits, tin mining area at Greenbushes, sand mining areas at Capel) could be rehabilitated to create permanent fresh water areas for recreation and wildlife, particularly waterfowl, and to maximize habitat diversity. An example of such an approach is the rehabilitation following mineral sands mining at Capel.[8]

Owners of permanent fresh water wetlands on private land, including farm dams, should be encourages to protect and to maximize the value of these areas.

In view of the very few seasonal wetlands falling within conservation reserves, further protection of such areas through reservation, and appropriate management of seasonal wetlands on privately owned land and on other types of reserves (e.g. Forests, Catchment areas), is desirable.

5. ADEQUACY OF RESERVES IN RELATION TO PROTECTION OF THE WETLAND ECOSYSTEM

While some reserves, particularly the larger flora and fauna reserves and National Parks, encompass an entire wetland area and possibly even all or part of its catchment area (e.g. Lakes Yonderup and Wilgarup and Loch McNess in the Yanchep National Park), (Fig. 2(a)), the majority of reserves are situated adjacent to a part of the wetland (e.g. most reserves on lotic systems) or cover only a small proportion of the wetland (e.g. 6627 on Lake Mealup, Fig. 2 (b)). In many cases the boundary of the reserve appears to have been defined on the basis of existing lot or location boundaries, rather than the vegetation boundaries of the wetland feature. Even where a reserve encompasses the entire open water area, it is common for the reservation to extend only to high water mark or include only a small area of foreshore. In these cases (e.g. Beermullah Lake) much of the fringing wetland vegetation, which constitutes a vital part of the wetland ecosystem, especially from the point of view of fauna habitats, is excluded from the reserve and from any protection it may offer (Fig. 2 (c)). This situation presents a management problem.

Examples of the relationship of reserve size to the wetland, including those mentioned above, are shown in Fig. 2.

In these cases it is difficult to define adequacy in terms of the size of the reserve, or the amount of foreshore included, as this will largely depend on the purpose of reservation, the use of the reserve, and the degree of impact of surrounding land use. A recreation reserve used as a base for boating, for instance, may require a larger bank area to provide for parking and launching facilities than one used for more passive pursuits such as picnicking. As a broad generalization it can be said that for conservation purposes, the foreshore reservation should cover

the extent of the wetland vegetation, plus at least 20 to 30 metres of surrounding land to act as a "buffer zone". This buffer area is important in minimizing the adverse effects of surrounding land uses, for example by taking up nutrients in agricultural runoff which would otherwise contribute to eutrophication of the wetland.

In general, very few wetlands, even those in conservation reserves, currently have this degree of protection. This should be taken into account in considering extension of existing, and acquisition of future, reserves for the conservation of wetland flora and fauna.

6. ACKNOWLEDGEMENTS

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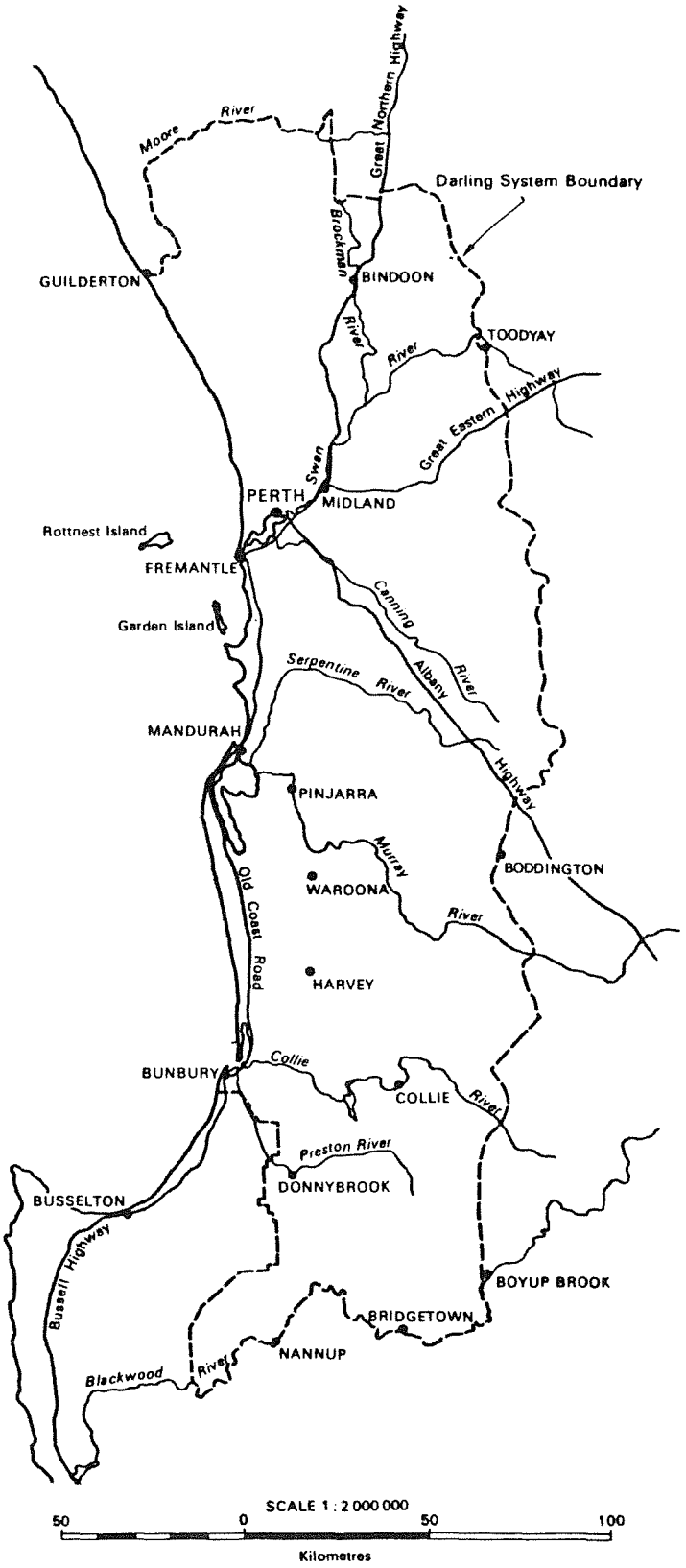
FIGURE 1: Area map for the Darling System as defined by the Conservation Through Reserves Committee of the Environmental Protection Authority.



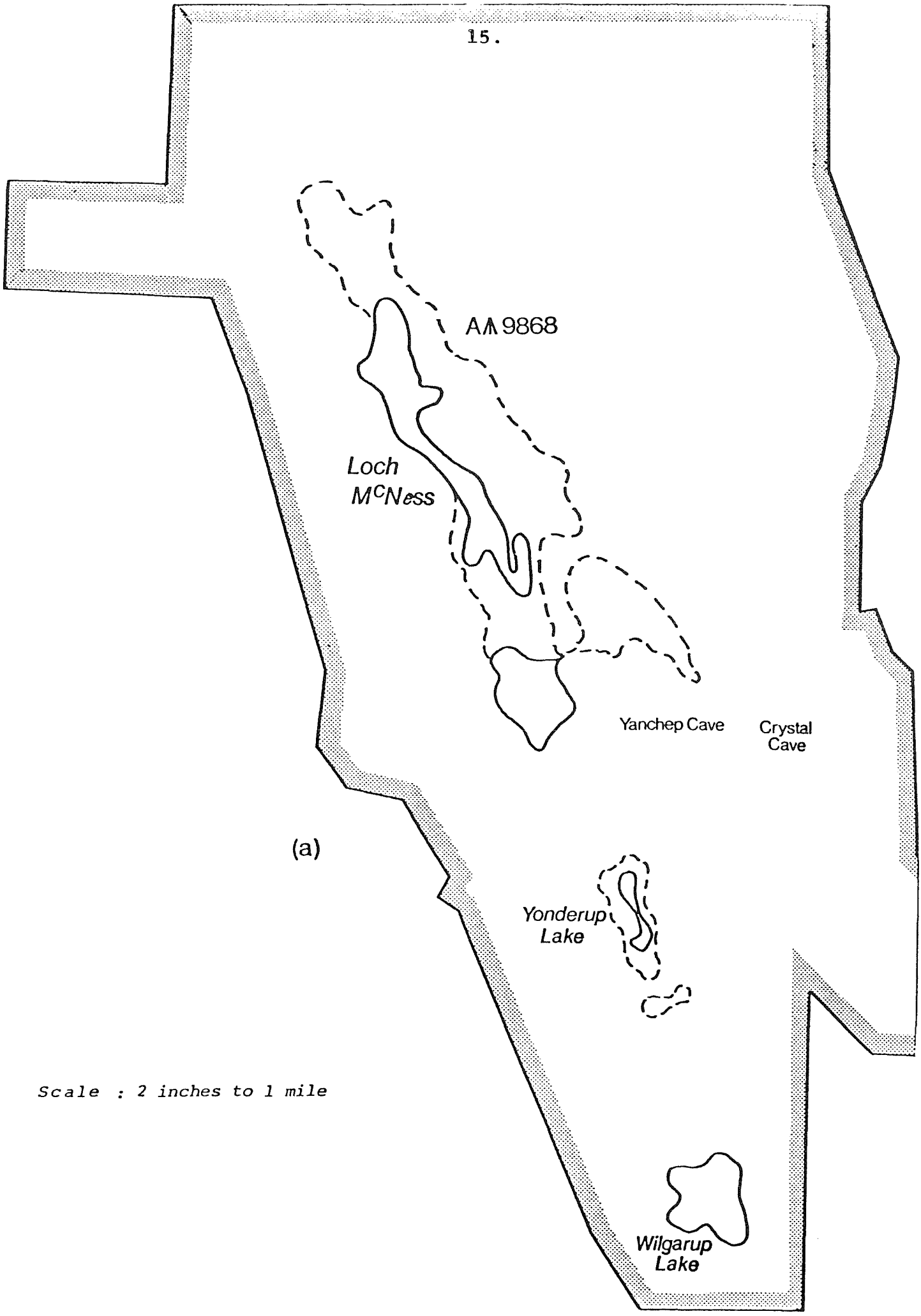


FIGURE 2 : Examples of the relationships of reserve size and situation to wetlands.

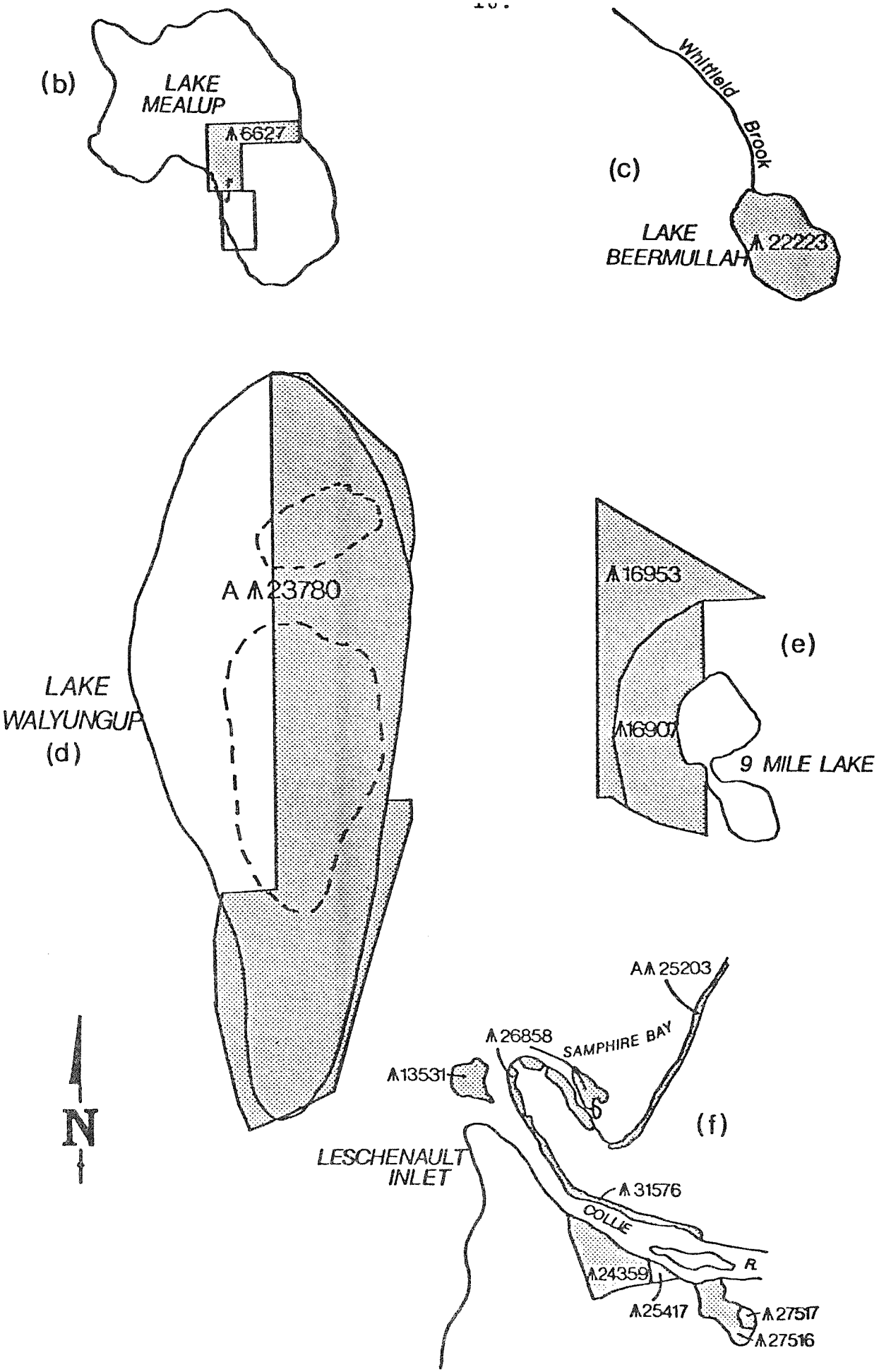


FIGURE 2 - Continued.

TABLE 1 PURPOSES OF CONSERVATION RESERVES IN THE DARLING SYSTEM INCLUDING, OR ADJACENT TO, WETLANDS.

CATEGORY	PURPOSE
Conservation Reserves	Preservation of flora
	Conservation of flora
	Camping and conservation of flora
	Conservation of fauna
	Sanctuary for fauna
	Flora and fauna sanctuary
	Flora and fauna
	Flora and fauna and recreation
	Conservation of flora and fauna
	Preservation of beauty spot
	Water and conservation of flora and aquatic life
	National park and native game
	Preservation of indigenous timber
	Government requirements and conservation of flora and fauna
	Protection and preservation of caves and for flora and for health and pleasure resort
	River foreshore
	Fauna conservation, research and drainage
	Bird sanctuary and park
	Recreation and bird sanctuary
	Recreation and conservation of fauna
National Parks	National park
	Recreation and national park
	National park and native game
	Protection and preservation of caves and flora and for health and pleasure resort
	Park, parkland

TABLE 2 Conservation reserves including, or adjacent to, all or part of a wetland in the Perth Metropolitan Region.

Key to descriptions of lentic wetlands*:

Saline:	>3000 mg/l (December)
Brackish:	1000-3000 mg/l (December)
Fresh:	<1000 mg/l (December)

Small:	<25 ha
Medium:	25-50 ha
Large:	>50 ha

Open:	Vegetative cover <25%
Semi-open:	Vegetative cover 25-60%
Semi-closed:	Vegetative cover 61-90%
Closed:	Vegetative cover >91%

Key to abbreviations:

ha	:	hectares
m^2	:	square metres
WAWA	:	Western Australian Wildlife Authority
w.p.l.	:	with power to lease
C/-	:	control of

Note: Reserve listings compiled before July, 1977.

* Based on wetland classification system adopted by Wetlands Advisory Committee[4], and detailed by Marchant[5].

TABLE 2 Conservation reserves including, or adjacent to, all or part of a wetland in the Perth Metropolitan Region.

LOCAL AUTHORITY	RESERVE NUMBER	PLAN	AREA	PURPOSE	VESTING	WETLAND	WETLAND TYPE	NOTES
ARMADALE-KELMSCOTT	'A'24781	341A/40	243.6208 ha	Flora & Fauna & Recreation	WAWA	Lake Jandakot	Large, fresh, permanent· semi-open vegetation cover.	
BASSENDEAN								No conservatic reserves on wetlands
BAYSWATER								No conservatic reserves on wetlands
BELMONT								No conservatic reserves on wetlands
CANNING								No conservatic reserves on wetlands
CLAREMONT								No conservatic reserves on wetlands
COCKBURN	'A'15556		503.6899 ha	Fauna conservation, Research & Drainage	WAWA	Thompson Lake	Large, fresh, permanent; semi-closed vegetation cover	
	29241		253.7379 ha	Conservation of Fauna (University Marsupial Research)	Fisheries Department	Lake Banganup	Fresh permanent; semi-closed vegetation cover	
COTTESLOE								No conservat reserves on wetlands
EAST FREMANTLE								No conservat reserves on wetlands
FREMANTLE								No conservat reserves on wetlands
GOSNELLS	'A'31993		8.6488 ha	Bird Sanctuary & Park	Gosnells	Unnamed Swamp	Large, fresh, permanent; semi-closed vegetation cover	Mary Carroll Park
KALAMUNDA								No conservatic reserves on wetlands
KWINANA								No conservati reserves on wetlands
MELVILLE	'A'25562		8.3289 ha	Recreation & Conservation of Fauna	Melville	Blue Gum Lake	Small, fresh, permanent; semi-open vegetation cover	Water levels artificially maintained

cont'd over.

TABLE 2 Conservation Reserves on Wetlands: Metropolitan (Cont'd)

LOCAL AUTHORITY	RESERVE NUMBER	PLAN	AREA	PURPOSE	VESTING	WETLAND	WETLAND TYPE	NOTES
MOSMAN								No conservatic reserves on wetlands
MUNDARING	20765		3.9735 ha	Recreation & Bird Sanctuary	Mundaring	Helena River	Lotic	
	'A'7537		1505.1329 ha	National Park & Native Game	National Parks Authority	Jane Brook	Lotic	
NEDLANDS								No conservatic reserves on wetlands
PEPPERMINT GROVE								No conservatic reserves on wetlands
PERTH								No conservatic reserves on wetlands
ROCKINGHAM								No conservatic reserves on wetlands
SERPENTINE JARRAHDALE	32202	341C/40	302.0000 ha	Conservation of Flora & Fauna		Karnet Brook	Lotic	
	23012	341D/40 & Mundijong Townsite	28.5631 ha	Flora		Unnamed swamp	Small, fresh, seasonal	
SOUTH PERTH								No conservatic reserves on wetlands
STIRLING								No conservatic reserves on wetlands
SWAN	'A'30191	28/80 (Toodyay 40-1)	1991.0534 ha	Conservation of Flora & Fauna	WAWA	Numerous creeks	Lotic	Also in Toody
	27620	1B/40	.67.1500 ha	Preservation of Fauna (Short-necked tortoise)	WAWA	Ellen Brook & Swamps	Small, fresh, Seasonal, clay-based swamps; semi-closed vegetation cover	Reserves for Western Short-necked turtle
	27621	IB/40	154.2779 ha	Preservation of Fauna (Short-necked tortoise)	WAWA	Twin Swamps	"	"

cont'd ove

TABLE 2 Conservation Reserves on Wetlands: Metropolitan (Cont'd)

LOCAL UTHORITY	RESERVE NUMBER	PLAN	AREA	PURPOSE	VESTING	WETLAND	WETLAND TYPE	NOTES
ANNEROO	7349	1A/40 (Yan-chep 40-2)	232.2896 ha	Conservation of Fauna	Minister for Fish-eries & Fauna	Lake Jandabup	Large, fresh, permanent; semi-closed vegetation cover	
	24581	28/80	116.5495 ha	Sanctuary for Fauna	National Parks Authority	Nowergup Lake	Medium, brack-ish, permanent; semi-open vegetation cover	
	'A'9868	28/80	2789.9559 ha	Protection & preservation of caves & Flora & for Health & Pleasure Resort	National Parks Authority	Loch McNess	Large, fresh, permanent; semi-closed vegetation cover	(modified)
						Yonde..up Lake	Medium, fresh, seasonal; semi-closed vegetation cover	Yanchep National Park
						Wilgarup Lake	Medium, fresh permanent	
	'A'21708	1A/40 (Yan-chep 40-4)	4.047 ha	Protection of Flora & Fauna		Malap Island, Lake Joondalup	Large, brack-ish permanent; semi-open vegetation cover	
	'A'31048	1A/40 (Yan-chep 40-4)	465.4 ha	Recreation & Conserv-ation of Flora & Fauna	Not vested. control of Wanneroo & WAWA	Lake Joondalup	See 21708	

TABLE 3 Conservation reserves including, or adjacent to, all or part of a wetland in the Darling System outside the Perth Metropolitan Region.

Note: Reserve listings compiled before July, 1977.

LOCAL AUTHORITY	RESERVE NUMBER	PLAN	AREA	PURPOSE	VESTING	WETLAND	WETLAND TYPE	NOTES
BEVERLEY								No conservati reserves on wetlands
BOYUP BROOK								No conservati reserves on wetlands
BRIDGETOWN-GREENBUSHES	'A'23515	439B/40 (Bridge-town)	5.6024 ha	Conservation of Flora	Bridgetown-Greenbushes	Blackwood River	Lotic	
BUNBURY								No conservati reserves on wetlands
BODDINGTON	23466	384A/40	4.8562 ha	Camping & Conservation of Flora	-	Hotham River	Lotic	
BROOKTON								No conservati reserves on wetlands
CHITTERING	29538	28/80	230.5089 ha	Conservation of Fauna	WAWA	Lake Chitt-ering Lake Needonga	Large, saline, seasonal	Part of Brockman Rive
COLLIE	15783	411C/40 (32.28)	17.4015 ha	Flora & Fauna Sanctuary	Collie	Collie River	Lotic	
DARDANUP								No conservati reserves on wetlands
DONNYBROOK-BALINGUP	'A'25446	414D/40	67.1546 ha	Conservation of Flora & Fauna	WAWA	Blackwood River	Lotic	
GINGIN	24257	28/80 (Gingin 40-4)	81.7465 ha	Conservation of Fauna	-	Bambun Nambun Mungala	Medium, fresh, permanent. Medium, fresh, seasonal. Small, fresh, seasonal	Three areas under one reserve numb Only Lake Bambun is fenced - oth grazed.
	26756	28/80 (Gingin 40-4)	19.2681 ha	Conservation of Flora & Fauna	WAWA	Wallering Swamp	Small, fresh, seasonal	Was once nesting site for straw necked ibis; disrupted by fire and grazing.
	31241	28/80 (Gingin 40-4)	337.0400 ha	Conservation of Flora & Fauna	WAWA	Unnamed Swamp	Large, fresh, seasonal	

cont'd over.

TABLE 3 (cont.):

Conservation Reserves on Wetlands : non-metropolitan

LOCAL AUTHORITY	RESERVE NUMBER	PLAN	AREA	PURPOSE	VESTING	WETLAND	WETLAND TYPE	NOTES
GINGIN (cont'd)	9676	31/80	29.6939 ha	Conservation of Flora & Fauna	WAWA	Yurine Swamp	Small, brackish seasonal; semi-closed vegetation cover.	
	'A'9838	31/80	80.9371 ha	Conservation of Flora & Fauna	WAWA	Wannamal Lake	Large, permanent; saline	
HARVEY	10745	383C/40	2.4281 ha	Preservation of Beauty Spot	-	Falls Brook Waterfall	Lotic	
	22797	383C/40	300.7547 ha	Conservation of Flora & Fauna	-	Falls Brook and other tributaries of Harvey River.	Lotic	
	12632	383C/40	40.4686 ha	Water & conservation of Flora & Aquatic Life	-	Unnamed Swamp	Small, fresh/ brackish, seasonal	
	'A'17456	383D/40	3.1464 ha	Preservation of Indigenous Timber	Harvey	Clarke Brook	Lotic	
	24472	383D/40 (Lake Preston NP)	36.9276 ha	Flora & Fauna	WAWA	Unnamed swamp, north of Long Swamp.	Small, fresh, seasonal, semi-closed vegetation cover	
	12049	383A/40, 383D/40	29.4196 ha	Water, Conservation of Flora & Aquatic Life	-	Unnamed Swamp	Large, fresh, seasonal, semi-open vegetation cover	
MANDURAH								No conservation reserves on wetlands
MURRAY	2707	380D/40	98.3386 ha	Government requirements & Conservation of Flora & Fauna	-	Peel Inlet	Estuary	
	'B'4990	380D/40 380A/40	139.2119 ha	Conservation of Flora & Fauna	WAWA	Peel Inlet	Estuary	
	'A'23756	380D/40	1019.0000 ha	Conservation of Flora & Fauna	WAWA	Harvey Estuary	Estuary	
	'B'24036	380D/40	343.4643 ha	Conservation of Flora & Fauna	WAWA	Austin Bay Reserve	Estuary	Nesting ground fc straw nec ed Ibis
	'A'24739	380D/40	40.4686 ha	Flora & Fauna	-	Harvey Estuary, Unnamed swamp & Lake McLarty	Estuary; Large, fresh seasonal; semi-closed vegetation cover. Large, fresh permanent; semi-open vegetation cover.	Only smal part of Lake McL rty fore- shore in- cluded i reserve.

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TABLE 3 (cont.):

Conservation Reserves on Wetlands : non-metropolitan

LOCAL AUTHORITY	RESERVE NUMBER	PLAN	AREA	PURPOSE	VESTING	WETLAND	WETLAND TYPE	NOTES
HARVEY (cont'd)	28087	380D/40	891.4522 ha	Conservation of Fauna	WAWA	Peel Inlet (Nerimba Cay)	Estuary	
	33749	380A/40	1.5602 ha	Recreation & Conserv-ation of Fauna	WAWA	Boodalin Island in Peel Inlet	Estuary	
NANNUP								No conservation reserves on wetlands
NORTHAM	32400	27D/40 & 2A/40	458.9000 ha	Conservation of Flora & Fauna	WAWA	Tributaries of Jimperding Brook	Lotic	
TOODYAY	19900	27A/40	87.2097 ha	Conservation of Flora	-	Unnamed creek	Lotic	
	22096	27A/40	386.0701 ha	Conservation of Flora & Fauna	WAWA	Unnamed creek	Lotic	
	529	27D/40 (Toodyay 40-4)	38.8767 ha	Conservation of Flora & Fauna	WAWA	Belaring Spring	Lotic	
	659	27D/40 (Toodyay 40-4)	52.6040 ha	Conservation of Flora & Fauna	WAWA	Goonaring Spring	Lotic	
	30306	32/80	39.2039 ha	Conservation of Flora & Fauna	WAWA	Anvil Gully	Lotic	
VICTORIA PLAINS	3345	31/80	258.9988 ha	Preservation of Flora	-	Moore River	Lotic	Partly outside System 6.
WANDERING								No conservation reserves on wetlands
WAROONA								No conservation reserves on wetlands
WEST ARTHUR								No conservation reserves on wetlands
WILLIAMS								No conservation reserves on wetlands
YORK								No conservation reserves on wetlands

TABLE 4 National Parks including all or part of a wetland in the Darling System.

Note: Reserve listings compiled before July, 1977.

LOCAL AUTHORITY	RESERVE NUMBER	PLAN	AREA	PURPOSE	VESTING	WETLAND	WETLAND TYPE	NOTES
KALAMUNDA	'A'21314		373.9425 ha	National Park	National Parks Authority	Tributaries of Helena River	Lotic	
	'A'22515		35.0100 ha	National Park	National Parks Authority	Lesmurdie Brook	Lotic	
	'A'26247		20.5131 ha	National Park	National Parks Authority	Lesmurdie Brook and Falls.	Lotic	
MUNDARING	'A'7537	1B/20, 1C/20	1505.1329 ha	National Park & Native Game	National Parks Authority	Jane Brook	Lotic	John Forrest National Park - dieback problem.
	'A'8164		4.5173 ha	National Park	National Parks Authority	Unnamed creeks	Lotic	Part of John Forrest National Park
	'A'2994	Perth 2000	7.7472 ha	Parklands	National Parks Authority wpl 21 yrs.	Jane Brook, Rocky Pool, Hope Falls	Lotic	Part of John Forrest National Park
	'A'2995	Perth 2000	60.9061 ha	Public Park	National Parks Authority	Unnamed creeks	Lotic	Part of John Forrest National Park
ROCKINGHAM	'A'24411	341D/40	424.9200 ha	National Park	Rockingham	Lake Cooloongup	Large, saline, permanent; open	
	'A'23780	341D/40	297.0697 ha	National Park	Rockingham	Lake Walyungup	Large, saline, permanent; open	
SERPENTINE-JARRAHDALE	28862	341C/40	635.0976 ha	National Park	c/- National Parks Authority	Serpentine River, Gooralong Brook, other creeks and Waterfall	Lotic	
SWAN	'A'30192	28/80	4430.4860 ha	National Park	National Parks Authority	Avon River and creeks	Lotic	Avon Valley National Park. Also in Toodyay
	2065	28/80 & 1/80	172.0863 ha	National Park	National Parks Authority	Avon River	Lotic	
	(Pt Swan Locs. 1316 & 2)	-	-	-	-	Avon River including Long Pool & Walyunga Pool	Lotic	Walyunga National Park (not declared).
WANNEROO	'A'9868	28/80 (Yanchep 40 sheet 1)	2789.9559 ha	Protection & Preservation of Caves & Flora and for Health & Pleasure Resort	National Parks Authority	Loch McNess	Large, fresh, permanent; semi-closed vegetation cover	Yanchep National Park

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TABLE 4 (cont.) :
National Parks on Wetlands in the Darling System.

LOCAL AUTHORITY	RESERVE NUMBER	PLAN	AREA	PURPOSE	VESTING	WETLAND	WETLAND TYPE	NOTES
WANNEROO (cont'd)						Yonderup Lake	Medium, fresh, seasonal; semi-closed vegetation cover.	
						Wilgarup Lake	Medium, fresh, permanent, semi-closed vegetation cover.	
BRIDGETOWN-GREENBUSHES	18447	439B/40 (Bridgetown)	46.6197 ha	Recreation & National Park	-	Unnamed tributaries of Blackwood River	Lotic	
GINGIN	28462	30/80 & 31/80	17542.5944 ha 5944 ha	National Park	National Parks Authority	Unnamed swamps near Moore River	Various types of lentic wetland represented, mainly in natural state	
MANDURAH	'A'12189	380D/40, 381C/40	1384.8090 ha	National Park	National Parks Authority	Lake Clifton & Harvey Estuary	Estuary	Only small part of Lal foreshore
	21271	-	519.7621 ha	National Park	National Parks Authority			
	'A'11710	380D/40 383A/40 381C/40	8917.4711 ha	National Park	National Parks Authority	Lake Clifton	Large, saline; permanent, open	Yalgorup National Park. (Problems with dune erosion).
						Boundary Lake	Large, saline, seasonal, semi-open vegetation cover.	
						Duck Pond	Medium, saline, seasonal, semi-closed vegetation cover.	
MURRAY	'A'20215	380A/40	78.5090 ha	National Park	Murray	Murray River Delta	Estuary	
TOODYAY	'A'30192							see Swan (Metro are
WAROONA	'A'22057	383A/40	359.7655 ha	National Park	National Parks Authority	Lake Preston	Large, saline, permanent; open.	

TABLE 5 Reserves (excluding drains) on Lentic and Artificial Wetlands in the Darling System (see Key, Table 2).

(a) Perth Metropolitan Region

RESERVE	PURPOSE*	WETLAND	WETLAND TYPE	COMMENTS
'A'1720	Kings Park	Ornamental lakes, Kings Park	Artificial	Excavated
23165	Recreation	Lake Leschenaultia	Artificial	Dammed Strean
18392	Public Use	Ornamental lake, Supreme Court Gardens	Artificial	Excavated
24209	Recreation	Ornamental lake, Bardon Park	Artificial	Excavated
27165 'A'24781	Recreation and Conservation	Lake Jandakot (Forrestdale)	Large, fresh, permanent; semi-open vegetation cover	
'A'8731	Recreation	Lake Monger	Large, fresh, permanent; open veg-etation cover	Modified
21868	Government Requirements	Herdsman Lake	Large, fresh, permanent; semi-closed vegetation cover	Drained, modified to closed vegetation cover.
'A'9868	National Park	Loch McNess	Large, fresh, permanent; semi-closed vegetation cover	Modified
'A'6208	Recreation	Bibra Lake	Large, fresh, permanent; open veg-atation cover	Modified for recreation a sanitary land fill.
'A'15556	Conservation	Thompson Lake	Large, fresh permanent; semi-closed vegetation cover	Fed by drains
29241	Conservation	Lake Banganup	fresh, permanent; semi-closed vegetation cover	

TABLE 5 (cont'd) : Reserves on Lentic and Artificial Wetlands

RESERVE	PURPOSE*	WETLAND	WETLAND TYPE	COMMENTS
7349 33193	Conservation and Recreation	Lake Jandabup	Large, fresh, permanent; semi-closed vegetation cover.	
'A' 31993	Recreation and Conservation	Lake in Mary Carroll Park	Large fresh, permanent; semi-closed vegetation cover.	
83999 27278 27279	Recreation	Gnangara Lake	Large, fresh permanent; open vegetation cover.	Modified
11598	Recreation	Lake Pinjar	Large, fresh, seasonal; closed vegetation cover.	Modified-drainage and landfill.
33581	Recreation	Unnamed swamp	Large, fresh, seasonal	
29919 28361	Recreation	Unnamed swamps connected to Mary Carroll Park	Large, fresh seasonal; semi-closed vegetation cover.	Infested with Salvinia.
'A' 9868	National Park	Wilgarup Lake	Medium, fresh, permanent; semi-closed vegetation cover.	
'A' 9868	National Park	Yonderup Lake	Medium, fresh, seasonal; semi-closed vegetation cover.	
1821	Public Use	Balannup Lake	Medium, fresh, seasonal; semi-closed vegetation cover.	
'A' 25562	Recreation and Conservation	Blue Gum Lake	Small, fresh, permanent; semi-open vegetation cover.	Levels artificially maintained
'A' 24862	Recreation	Unnamed Lake	Small, fresh, permanent; semi-closed vegetation cover.	Artificially permanent lake in Gosnells Golf Course.
19168	Recreation	Ornamental Lake, Hyde Park	Small, fresh, permanent.	Modified

TABLE 5 (cont.) : Reserves on Lentic and Artificial Wetlands.

RESERVE	PURPOSE*	WETLAND	WETLAND TYPE	COMMENTS
27621	Conservation	Twin Swamps	Small, fresh, seasonal; semi-closed vegetation cover	Habitat of Western short-necked turtle
27620	Conservation	Ellen Brook and Swamps	Small, fresh, seasonal; semi-closed vegetation cover	Habitat of Western short-necked turtle
8162	Water Supply	Little Badgerup Swamp	Small, fresh, seasonal; semi-closed vegetation cover	
21490	Water Supply	Little Coogee Flat	Small, fresh, seasonal; semi-closed vegetation cover	modified - in pine plantation
'A'9025	Recreation	Unnamed swamp	Small, fresh, seasonal; semi-closed vegetation cover	
27008	Government Requirements	Unnamed swamps	Small, fresh, seasonal	
23914	Public use (Townsite)	Unnamed swamp	Small, fresh, seasonal	
33649	Recreation	Unnamed swamp	Small, fresh, seasonal; semi-closed vegetation cover	Drained
23012	Conservation	Unnamed swamp	Small, fresh, seasonal	
'A'313 834 21176 'A'21708 'A'31048 32768 33206	Forests Recreation	Lake Joondalup	Large, brackish, permanent; semi-open vegetation cover	

TABLE 5 (cont'd) : Reserves on Lentic and Artificial Wetlands

RESERVE	PURPOSE*	WETLAND	WETLAND TYPE	COMMENTS
9458	Recreation	Lake Richmond	Large, brackish permanent; open vegetation cover.	
'A' 21708 8398	National Park Access	Nowergup Lake	Medium, brackish, permanent; semi-open vegetation cover.	
15810 6203	Water Supply	Manarin Lake	Small, brackish, seasonal; semi-closed vegetation cover.	
'A' 24411	National Park	Lake Cooloongup (White Lake)	Large, saline, permanent; open vegetation cover.	
'A' 23780	National Park	Lake Walyungup (Salt Lake)	Large, saline, permanent; open vegetation cover.	
30861	Recreation	Lake Coogee	Large,saline, permanent; semi-open vegetation cover	
24981	Recreation	Unnamed Swamp	?	Filled:Thorn Oval
26272	Recreation	Unnamed Swamp	?	
(b) Darling System Outside the Perth Metropolitan Region				
'A' 24739	Conservation	Lake McLarty	Large, fresh, permanent; semi-open vegetation cover.	
10416	Public Use (Church)	Long Swamp	Large, fresh, seasonal; semi-closed vegetation cover.	
6627	Water Supply	Lake Mealup	Large, fresh, seasonal; semi-closed vegetation cover.	

TABLE 5 (Cont.) : Reserves on Lentic and Artificial Wetlands.

RESERVE	PURPOSE*	WETLAND	WETLAND TYPE	COMMENTS
7502	Water Supply	Unnamed swamps near Peel Inlet	Large, fresh, seasonal; semi-closed vegetation cover	
31241	Conservation	Unnamed swamp	Large, fresh, seasonal	
'A'24739	Conservation	Unnamed swamp	Large, fresh, seasonal; semi-closed vegetation cover	
17318	Government Requirements	Dinjim Pools, Harvey River	Large, fresh seasonal	Pools in lotic system.
22199	Forestry	Unnamed swamp	Large, fresh seasonal; semi-closed vegetation cover	
12049	Conservation and Water Supply	Unnamed swamp	Large, fresh seasonal; semi-closed vegetation cover	
2517	Government Requirements	Wellesley River Flats	Large, fresh, (drained)	Associated with lotic system
24257	Conservation	Bambun Lake	Medium, fresh, permanent	
7322	Government Requirements	Nalyerin Lake (& swamps)	Medium, fresh permanent	
16907	Water Supply	9 Mile Lake	Medium, fresh permanent	
24257	Conservation	Nambun Lake	Medium, fresh, seasonal	
'A'680	Water Supply	8 Mile Spring	Small, fresh	
8367	Water Supply	Well	Small, fresh	
6039	Water Supply	Soak	Small, fresh	
10421	Water supply	Little Camelup Swamp	Small, fresh	

TABLE 5 (Cont.) : Reserves on Lentic and Artificial Wetlands

RESERVE	PURPOSE*	WETLAND	WETLAND TYPE	COMMENTS
12632	Conservation and Water supply	Unnamed swamp	Small, fresh seasonal	
30799	Water Supply	Unnamed swamp	Small, fresh	
13345	Water Supply	Soak	Small, fresh	
24257	Conservation	Mungala Lake	Small, fresh, seasonal	
26756	Conservation	Wallering Swamp	Small, fresh, seasonal	
24472	Conservation	Swamp north of Long Swamp	Small, fresh, seasonal semi-closed vegetation cover	
19269	Water Supply	Unnamed swamp	Small, fresh, seasonal; closed vegetation cover	
209	Water Supply	Barracca Spring and swamps	Small, fresh, seasonal	
15928	Water Supply	Sand Spring Well	Small, fresh seasonal	
1224	Recreation	Bartlett Well	Small, fresh, seasonal	
20366	Recreation	Lake Muckenburra	Large, brackish (saline), seasonal; open vegetation cover	
9676	Conservation	Yurine Swamp	Small, brackish seasonal; semi-closed vegetation cover	

TABLE 5 (Cont.) : Reserves on Lentic and Artificial Wetlands

RESERVE	PURPOSE*	WETLAND	WETLAND TYPE	COMMENTS
'A'11710 12198 28796 33285	National Park Recreation	Lake Clifton	Large, saline permanent; open vegetation cover	
24581	Conservation	Lake Wannamal	Large, saline permanent	
27458 'A'22057 'A'22091	National Park and Recreation	Lake Preston	Large, saline, permanent; open vegetation cover	
22223	Recreation	Beermullah Lake	Large, saline, permanent; open vegetation cover	Affected by Agriculture
'A'11710	National Park	Boundary Lake	Large, saline, seasonal	
'A'11710	National Park	Duck Pond	Medium, saline, seasonal	
29538	Conservation	Lake Chittering Lake Needonga (Part of Brockman River)	Both large, saline seasonal	
33784	Government Requirements	Unnamed swamp	Large ? seasonal	
25431	Government Requirements	Unnamed swamp adjacent to Lake Muckenburra	?	

* Gazetted purposes have been grouped under the general headings of Water Supply, Conservation, Recreation, National Parks, Government Requirements, Community or Public Use (Excluding recreation), Forestry (not including State Forests and Mining. The gazetted purposes grouped under these headings are detailed in another bulletin[9].

WETLANDS OF THE DARLING SYSTEM

Wetlands are areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries.

Bulletins in this series:

Wetlands in Recreation Reserves (Bulletin No. 59)

The Purposes and Vestings of Wetland Reserves (Bulletin No. 60)

Wetlands in Conservation Reserves and National Parks (Bulletin No. 61)

Wetland Reserves and their Management (Bulletin No. 62)