APPENDIX C, Attachment 2

DEPARTMENT OF
FISHERIES AND WILDLIFE
WESTERN AUSTRALIA

REPORT Nº 23

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The Management of Nature Reserves in Western Australia

BY
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AND
TREVOR EVANS

PERTH
WESTERN AUSTRALIA

1976

Department of Fisheries and Wildlife

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THE MANAGEMENT OF NATURE RESERVES IN WESTERN AUSTRALIA

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ABSTRACT

The number and area of Nature Reserves in Western Australia has grown rapidly in recent times. At 30 June 1975 there were 491 reserves with an area of 5 103 037 hectares. By 31 December 1975, with the inclusion of reserves for the Conservation of Flora in the definition of a Nature Reserve, there were 900 reserves totalling 5 317 965 ha. With the implementation of the Environmental Protection Authority's recommendations based on the Conservation Through Reserves Committee's Report on Systems 4, 8, 9, 10, 11 and 12 the Nature Reserve System will jump to 935 reserves with an area of 11 070 492 ha. Of these 368 reserves totalling 10 718 241 ha will be vested in the Western Australian Wildlife Authority.

Management of Nature Reserves by the Department of Fisheries and Wildlife has not kept pace with this growth. Only four reserves have management plans adopted by the Authority and on only 32 reserves have fire breaks been constructed. The lack of management of reserves in agricultural areas is placing an undue burden on adjoining landholders and leading to the deterioration of the reserves.

A plan for the development of more effective management is presented. It involves the stationing of reserve management teams in country towns, the location of resident officers on important reserves and the enlargement of complementary research.

I INTRODUCTION

Western Australia has a diverse flora and fauna, being the only State to include extensive areas of all the three main biogeographic regions of the continent. The south-west is particularly interesting; a large number of plants and some animals being found only in this region.

The conservation of the State's wildlife is the responsibility of the W.A. Wildlife Authority and the Department of Fisheries and Wildlife. Because the vast majority of animals and plants cannot persist outside their natural environment the main conservation technique has been the setting aside of a system of Nature Reserves.

In Western Australia a Nature Reserve is a reserve set aside under the Land Act for the Conservation of Indigenous Flora or Fauna. Nature Reserves include areas set aside solely for either or both of the above purposes as well as those set aside for a variety of other additional purposes.

In the 17 years between 1 July 1952 (when the Fauna Protection Act was proclaimed) and 30 June 1969, an average of 14 new reserves were created each year. The number and area of Nature Reserves has grown more rapidly since then (Table 1). The number grew dramatically in December 1975, since at this time reserves for the Conservation of Flora were first included in the definition of Nature Reserves. Of the additional 409 reserves added between 1 July and 31 December 1975, only 13 were for the Conservation of Fauna or Fauna and Flora, the remaining 396 were for Flora only. The number, and area, of Nature Reserves can be expected to increase dramatically again in the near future with the implementation of the Conservation Through Reserves Committee Report (Table 2).

Nature Reserves, like other Land Act Reserves, may be vested. Until December 1975, most Nature Reserves were vested in the W.A. Wildlife Authority and the majority of reserves with the Conservation of Fauna as one of their purposes still are. Some Nature Reserves are vested in other bodies, particularly those that are multipurpose reserves which include "Water" in their purpose, many of these being vested in the Minister for Water Supplies. Many reserves, especially those solely for the Conservation of Flora, are not vested.

Under the Wildlife Conservation Act Regulations the control of all Nature Reserves for the purposes of that Act, is automatically vested in the Western Australian Wildlife Authority.

II THE NEED FOR MANAGEMENT

The need for management of conservation reserves is now well accepted. Management falls into two main categories:

1. the management of animals and plants, either individually or as ecosystems, and

2. management in relation to people.

In much of Western Australia the use and control of fire is an important factor in both of the above.

To-day it is generally accepted that Nature Reserves should be subject to a management plan which lays down procedures for operations staff to follow rather than having them engaged in *ad hoc* work as pressures demand. A management plan should cover both the above aspects. The Wildlife Conservation Act provides that the Wildlife Authority shall prepare a management plan for any reserve classified under Section 12 of the Act.

Biological management is concerned with the maintenance of the natural environment and its ecosystems. It can include the management of particular populations of animals or plants, e.g. where there are rare or problem species, it can involve the manipulation of plant communities, e.g. with fire, or it can be the rehabilitation of disturbed or degraded country.

The biological management of a Nature Reserve needs to be based on a sound knowledge of the composition of the biota, the requirements of the various species, the effects of natural physical factors such as climatic variation and fire, the normal fluctuations in the numbers of the various species and the seral stages through which the ecosystems pass.

Where the aim of the reserve is to protect a single species it may be a comparatively simple task to work out its biology and ecology and devise a management plan to accommodate it. Where the aim is broader the task is harder (although making mistakes may be less catastrophic) and it is usually necessary to pick indicator species on which to concentrate a study.

As a precursor to any management plan it is desirable to have a biological survey of the reserve. A vegetation map should be prepared and animal and plant distributions tied to it where possible. Ideally, the biological survey should be an ongoing, rather than a once only, exercise, so that an understanding of the seral changes in the vegetation and its animal life can be built up and so that the effects of management can be documented.

Management in relation to people involves two main areas - the control and education of people visiting nature reserves and minimising the effect of reserves on surrounding property.

In Western Australia, the National Parks System is primarily concerned with catering for the recreational needs of people in conservation reserves. However, the Wildlife Authority also becomes involved in recreational, inspirational and educational use of its reserves to varying degrees. In general it does not provide specific facilities for the public such as roads, parking areas, barbecues, etc., although it has done this at one place - Two Peoples Bay - which had a history of fairly intensive recreational use before it was declared a Nature Reserve. Another significant recreational use on some reserves is duck shooting - areas under the Authority's control where this is permitted are termed "Game Reserves".

Minimising the effect of reserves on surrounding land involves such factors as the control of vermin and weeds and the reduction of the fire hazard in those parts of reserves adjacent to private property. Like any landholder in an area the Wildlife Authority should cooperate in fire control and other community projects associated with land use.

III PRESENT EFFORT

The Department of Fisheries and Wildlife, which services the W.A. Wildlife Authority, at present has three of its branches involved to some degree in reserve work.

A. ADMINISTRATION

The administrative and clerical staff at Head Office carry out most of the paper work associated with acquiring and looking after reserves. They are also responsible for the overall control and direction of the Wildlife Officers. One graduate, the Reserves Management Officer, is attached to Administration. As well as advising on technical matters relating to reserves he spends a lot of time liaising with Local Authorities on wildlife conservation and Nature Reserve matters.

B. WILDLIFE OFFICERS

There are some 25 Wildlife Officers stationed throughout the State. They are responsible for wildlife law enforcement, liaison, licensing, etc. in the various

districts. Part of their duties involves inspection of Nature Reserves, reporting on areas proposed for Nature Reserves and investigating matters which might affect Nature Reserves. Only one Wildlife Officer (stationed at Pingelly) has any fire-fighting equipment. Matters relating to Nature Reserves take up a relatively small proportion of the time of most Wildlife Officers; kangaroos, enforcement and licensing involve much more of their time.

C. WILDLIFE RESEARCH CENTRE

Staff at the W.A. Wildlife Research Centre are working in two main areas relating to Nature Reserves - Research and Operations.

Research staff are involved in both the selection and management of reserves. Biological Survey is the main technique used to acquire knowledge of the existing reserve system and to recommend additions to it. At present there are two full time staff (one a graduate) working full time on survey and they are supplemented from time to time by other staff. The Centre has evolved a close working relationship with both the W.A. Museum and the W.A. Herbarium. Assistance from the Museum is received in three areas.

1. The Museum identifies most of the animals collected by survey teams.

2. The Museum carries out surveys of reserves in the wheatbelt under contract to the Department. The Department pays all costs of this work except salaries.

3. From time to time Museum staff are attached to surveys organised by the Wildlife Research Centre.

The Herbarium provides similar assistance. It identifies plant collections for the Centre and Herbarium staff have assisted with survey work but it does not carry out contra surveys.

During the past few years Wildlife Research Centre staff have concentrated survey work in four main areas:

1. the fringes of the South-West Land Division adjacent to agricultural land,

2. a shire by shire survey of the agricultural districts,

3. islands, and

4. remote areas, especially the Kimberley and the deserts.

A considerable amount of time has been taken up on the past three years assisting the Environmental Protection Authority's Conservation Through Reserves Committee.

Research Staff are also studying reserve management problems and techniques. At present only two staff, both graduates, are employed on this work although technical assistance has been available on a part-time basis and from the operations staff. One of the graduates (the senior author of this report) spends much of his time on advice, administrative duties related to the running of the Wildlife Research Centre and assistance to the Conservation Through Reserves Committee. A technical assistant will be appointed to assist in this work in the near future. Studies which have been carried out over the past few years include the following:

1. population study of the Western Swamp Tortoise,

2. habitat management in the wheatbelt with an emphasis on the conservation of the Woylie, especially in relation to fire,

3. the effects of oil drilling on Barrow Island,

4. regeneration after a wildfire on Dorre Island,

5. regeneration after a wildfire on Middle Island, Recherche Archipelago,

6. re-introduction of wallabies to Dirk Hartog Island,

7. fire behaviour, and

8. successional studies in vegetation after fire.

The preparation of management plans for Nature Reserves is another responsibility of this group.

Operations work is concerned with putting management plans into effect and carrying out the day-to-day work associated with Nature Reserves. At present the

operations unit consists of 3 general division staff and a labourer. One Technical Officer is permanently stationed at the Two Peoples Bay Nature Reserve. Major areas of work include fire fighting, prescribed burning, firebreak and access track construction, public control and education, liaison, etc. Major plant used by the unit includes:

Perth	:	4 wheel drive 5 tonne truck 4 wheel drive fire fighting truck light tractor equipped with front-end loader, discs, blade, plough and carry all trailer for transporting tractor long wheel base four-wheel drive table top 3 two-way radios.
Two Peoples Bay	:	long wheel base four-wheel drive table top 4 wheel drive light tractor and implements 4 wheel trailer and fire fighting unit 1 two-way radio.

The major expenditure has been the construction of firebreaks. This work proceeded fiarly slowly until 1973/74 when a special grant was made for Fire Control on Reserves. Initially, this was for $10 000. In 1975/76 it was $20 000. A list of firebreaks which have been constructed is given in Table 3. Once firebreaks have been constructed they must be maintained. In some areas, e.g. on the coastal plain near Perth, this must be done annually. In other areas, e.g. on gravelly soils in the wheatbelt, maintenance is necessary only at five to ten year intervals. In 1975/76, 417 km of firebreaks were recleared by contract work at a cost of $3 800. A further 137 km was maintained by Operations Unit staff using Departmental equipment.

IV EFFECTIVENESS

As stated in the Introduction the Nature Reserve System (along with National Parks, natural State Forests, and other places of protected bushland such as Water Catchment areas) is the mainstay of wildlife conservation in Western Australia. The effectiveness of the system depends on two factors:

1. that viable samples of all major ecosystems and important species are included, and

2. that once set aside, the reserves continue to harbour the species they were created to protect.

While it is realistic to accept that most small reserves will lose a proportion of their original species due to them becoming an island in a sea of altered land, the loss can be kept to a minimum by management. Management will only be effective if:

1. it is based on a sound knowledge of the ecology of the plants and animals of each reserve,

2. sufficient staff and finance are available for the necessary work to be carried out, and

3. it is acceptable to the local community.

While progress has been made towards achieving these aims it is a fact that management has reached a satisfactory level on only a very few Nature Reserves. This is reflected by the small number of management plans adopted by the W.A. Wildlife Authority - four out of 331 reserves vested in it. Indeed, the Authority has not complied with Section 12D of the Wildlife Conservation Act, requiring it to prepare a management plan for any reserve classified under Section 12A, since about 40 reserves have been so classified. Firebreaking has been carried out on only 32 of the 331 reserves.

The preparation of management plans has been limited by three main factors:

1. the lack of sufficient research data, e.g. on the effects of prescribed burning on the flora and its associated fauna,

2. the lack of a management plan section to prepare the plans, and

3. the lack of sufficient staff and finance to implement the plans once they are adopted.

That the lack of adequate management is a concern of country communities is evidenced by the number of complaints received by the Department from time to time. These can be summarised by quoting part of the President's Address to the Pastoralists and Graziers Association of W.A. (Inc.) in February 1976. The President, Mr. P. B. Lefroy, states "Time is long overdue for developing a realistic policy for development of reserves entailing sound fencing, watering, fire control and cropping management programmes, so that a disproportionate share of the burden of conservation is then not borne by those landholders adjacent to reserves".

Inevitably, the lack of management of a reserve in agricultural areas will lead to the local community feeling antagonistic towards it. This may lead to a lack of interest as to its fate and, for example, the area may be totally and repeatedly burned. Efforts will be made to convert the reserve to a productive purpose and the Department will find it difficult to argue logically for its retention for nature conservation when it apparently does not care enough about the reserve to look after it.

The few staff available for this work and their central location in Perth also cause a number of problems. Personnel have been transferred from research to full time operations work in order to construct firebreaks and carry out other fire control procedures when finance for this was made available. This has had a detrimental effect on the level of research into reserve management techniques.

There is a limit to the length of firebreaks which the present staff and finance can maintain. As construction procedes the proportion of money spent on maintenance will rise. Firebreak construction and maintenance work is scattered throughout the south-west and travelling costs associated with planning and supervision are high. The location of staff in Perth also means that there is a long reaction time to a wildfire on an important wheatbelt Nature Reserve such as Tutanning - it takes a minimum of 4 hours from notification to get a fire-truck and team to this particular reserve, and many other reserves are considerably further from Perth.

Some Nature Reserves have particular problems of intensive local recreational use which require the stationing of a resident officer on them. So far, this has only been possible for one reserve - Two Peoples Bay, near Albany. This area is the only known locality of the very rare Noisy Scrub Bird. Before it was reserved it received a fairly high level of recreational use and it was agreed that such use could continue. The stationing of a resident officer has enabled the development of part of the reserve for passive recreation and education while ensuring that this did not interfere with the conservation of the Noisy Scrub Bird and other rare fauna.

Other reserves fall into this category. An example is Bernier and Dorre Islands, which contain a number of marsupials which are extinct on mainland Australia. Bernier receives considerable recreational use from Carnarvon and this needs supervision. Dorre, although declared a prohibited area, is still receiving some recreational use. A wildfire which burned out much of the island in October and November 1973 would have had much less effect had a resident officer been on hand.

The Wildlife Authority will shortly be given the responsibility of looking after the Dampier Archipelago. In its recommendations based on the CTRC report the EPA made it clear that the Authority should allow significant recreational use of a number of the islands while ensuring that the important wildlife and aboriginal sites are protected.

This provides a clear case for the stationing of a resident officer, equipped with a boat, to manage the area. Adequate supervision by the shore-based Wildlife Officer at Karratha will obviously not be possible considering his commitment to kangaroo management and other enforcement problems.

That the present level of management is inadequate in terms of international standards can be seen by examining the criteria laid down by the International Union for Conservation of Nature and National Resources (IUCN) for selecting reserves for inclusion in their United Nations List of National Parks and Equivalent Reserves (IUCN, 1975). As a guide for the "staff and budget

found likely to be sufficient under average conditions" (p.15) in areas where the population density is less than 50 inhabitants per square kilometre they suggest a minimum of one person working full time at the management and supervision of 10 000 ha. For Western Australian Nature Reserves this works out at 532 persons at present and 1107 after the implementations of the EPA recommendations.

Obviously these figures are out of proportion to the real situation in Western Australia where most large reserves are remote from the population. It would be more meaningful to consider only the agricultural areas of the south-west. Using the figures in Appendix II the IUCN criteria now suggest a staff of 36 - far below that actually employed.

V PROPOSAL

It is clear that increasing the present token effort in relation to the management of Nature Reserves will require new staff and more money. The provision of additional finance alone will not solve the problem due to the extremely large amount of work needed.

We believe that three types of input are needed:

1. The stationing of management teams in country towns near the reserves they will be managing.

2. The stationing of resident officers on selected important or intensively used reserves.

3. The enlargement of research effort.

A reserve management team should consist of a core of two public service officers with the addition of wages staff as necessary. As discussed above, the management of Nature Reserves should be based on a good knowledge of the natural environment and its ecosystems. The leader of a management tram should therefore be a person trained in ecology, preferably to an advanced level. He should be complemented by a Technical Officer knowledgeable in the practical aspects of fire control, the use of machinery, etc. Both types of people would require some training within the Department before taking up

their duties. Once such a team has been set up and equipped and a need for extra labour has been demonstrated, the team could be enlarged by adding locally recruited wages staff.

A resident officer should be same status as the Technical Officer in a reserve management team. If he is stationed in a district controlled by a reserve management team he would come under the control of the head of that team. Alternatively, he could be responsible to the Senior Technical Officer or head of reserve management in Perth.

We believe that three reserve management teams and two resident officers need to be appointed in the near future. The great need for management teams is in the agricultural areas of the south-west. The teams should therefore be based so that they are able to service these areas. The actual towns picked could depend on availability of housing but there is obvious benefit in stationing the teams in towns already manned by Wildlife Officers so that office accommodation could be shared. In this case the best towns would be Wongan Hills, Pingelly and Albany, although the last is not central with respect to the location of Nature Reserves and Katanning would be better. Moora could be an alternative to Wongan Hills. Fig. 1 shows that a considerable part of the "wheatbelt" would be within a radius of 100 km from Wongan, Pingelly and Katanning. A 150 km radius is also shown. Areas which would still be further than 150 km from any of these centres are the northern agricultural area inland from Geraldton, the Westonia-Yilgarn area east of Merredin and the south-eastern Wheatbelt east of Newdegate extending to Esperance. This could be solved at a later date by stationing teams at Geraldton, Merredin and Esperance. The area south of Bunbury and Busselton has few Nature Reserves and could be serviced from Wanneroo or Katanning. The more remote areas of the State would remain the responsibility of the existing team based at Wanneroo, who would also look after reserves in and around Perth.

The two proposed resident officers should be appointed to look after Bernier and Dorre Islands off Carnarvon and the Dampier Archipelago. In the first case it is essential that the officer reside on Bernier Island - trying to work the area from Carnarvon would be most inefficient. However, in the case of the Dampier Archipelago the officer could reside in Dampier or Karratha and work on the several islands from a mainland base, so long as he was properly equipped.

There is obvious benefit in appointing all these staff at one time to facilitate training. (This has been done in other Branches of the Department). It would enable a training school to be set up, coordinated by a senior officer. It would also save money on, and simplify, the purchasing of plant and equipment through bulk orders.

The costs of setting up and running three teams and two resident officers is given in Appendix I. This estimate does not include housing which, except for Bernier Island, would need to be provided by the Government Employees Housing Authority. The areas of work and the number and area of Nature Reserves to be managed by the three teams is given in Appendix II.

It can be seen that each of the three proposed teams would have between 172 and 211 reserves covering an area of approximately 110 000 ha to look after. Obviously it will take some considerable time before all reserves are adequately managed.

The present small research effort into reserve management techniques also needs to be expanded. This is necessary so that:

1. the preparation of management plans can keep pace with operations work,

2. proper guidelines can be laid down for the reserve management teams, and

3. management work can be monitored to ensure it is having the desired results.

The immediate need is for an animal ecologist to expand research into the habitat requirements of animals on Nature Reserves and document the effect of management procedures and wildfires on animals. Both this officer and the existing plant ecologist will need technical assistance. The estimated cost of these added staff is given in Appendix I.

VI CONCLUSION

Western Australia can be proud of its expanding system of Nature Reserves, a system which has few equals in the world. However, the State now needs to make a commitment to manage Nature Reserves to ensure the persistence of the plant and animal species they were set up to protect and to mitigate the effect of Nature Reserves on adjoining landholders.

Over the past seven years a small group of personnel within the Department of Fisheries and Wildlife has developed the basic techniques of reserve management and although further research and monitoring are needed, sufficient knowledge is available to start implementation on a much larger scale than is taking place at present. The lack of management of most Nature Reserves is placing a disproportionate burden on the local community.

The appointment of three management teams located in country towns (preferably Wongan Hills, Pingelly and Katanning) would go a long way towards solving this problem. In addition there are two important reserves - Bernier and Dorre Islands and the Dampier Archipelago - which are receiving intensive human use and require control by resident officers. Additional research work is also needed.

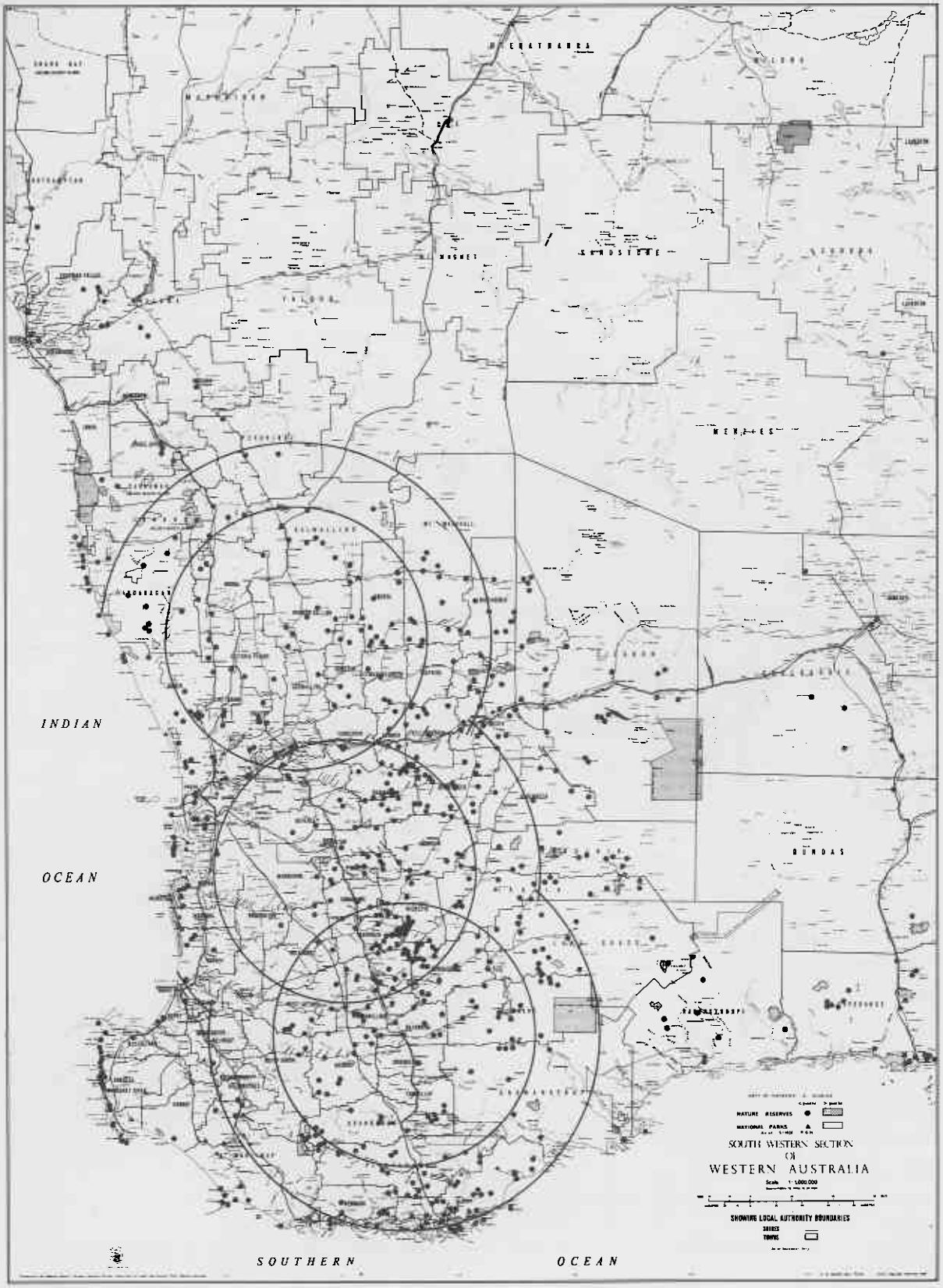
INDIAN
OCEAN
SOUTHERN
OCEAN
NATURE RESERVES
NATIONAL PARKS
SOUTH WESTERN SECTION
OF
WESTERN AUSTRALIA
SHOWING LOCAL AUTHORITY BOUNDARIES
SHIRES
TOWNS

TABLE 1.

NATURE RESERVES IN WESTERN AUSTRALIA

YEAR	TOTAL		VESTED IN W.A. WILDLIFE AUTHORITY	
	NUMBER	AREA (hectares)	NUMBER	AREA (hectares)
30 June				
1969	278	2 342 966	127	818 442
1970	315	2 100 318	156	867 362
1971	359	4 955 893	213	4 415 595
1972	404	5 077 224	242	4 533 944
1973	440	5 013 287	265	4 607 266
1974	454	5 033 935	281	4 626 617
1975	491	5 103 037	320	4 713 742
31 Dec				
1975	900	5 317 965	331	4 733 535

Area of Nature Reserves = 2.2% of State.

TABLE 2. CHANGES IN NATURE RESERVE SYSTEM AFTER IMPLEMENTATION OF EPA RECOMMENDATIONS ON SYSTEMS 4, 8, 9, 10, 11, 12.

Area	Name	Existing reserve vested WAWA	New reserve vested WAWA	Change in area (ha)
	Wheatbelt			
4.1	Wongan Hills		3	614
4.2	Dryandra		-3	-1 228
4.3	Boyagin		1(-part)	-37
4.5	Dragon Rocks		1	30 000 *ca*
4.7	Wetlands		7	23 688 *ca*
4.8	Others		2	22 130 *ca*
	Totals	-	14	75 172
	(less 3 reserves transferred to another Authority)			
	Pilbara			
8.1	Barrow I.	1		500
8.2	Monte Bellos		1	939
8.3	Lowendal Is.		1	245
8.4	Coastal I.		numerous	1 000 *ca*
8.5	Dampier Archipelago		1	13 500+
8.5	Coastal I.		2+	500 *ca*
8.13	Millstream		-1	-440
8.18	Collier Range		1	250 000 *ca*
	Totals	1	6+	266 244
	(less 1 reserve transferred to another Authority)			

TABLE 2 Cont'd.

Area	Name	Existing reserve vested WAWA	New reserve vested WAWA	Change in area (ha)
Central West Coast				
9.16	Hamelin Pool		1	200 000 *ca*
9.7	Islands		8(+?)	3 500 *ca*
	Totals		9+	203 500 *ca*
Murchison				
10.3	Lake Moore		1	200 000 *ca*
	Totals		1	200 000 *ca*
Goldfields				
11.3	Mt Manning Range		1	182 100
11.7	Yellowdine			28 500
11.9	South Yilgarn	1		-
	Totals	1	1	210 600
Deserts				
12.8	Lake Disappointment		1	356 400
12.9	Carnarvon Range		1	258 000
12.11	Gibson Desert		1	1 740 000

cont'd...

TABLE 2 Cont'd.

Area	Name	Existing reserve vested WAWA	New reserve vested WAWA	Change in area (ha)
	Deserts - cont'd.			
12.12	Mungilli Claypan		1	3 000
12.13	Baker Lake		1	1 052 880
12.15	Yeo Lake		1	350 000
12.16	Neale Junction		1	741 400
12.20	Plumridge Lakes		1	300 000
	Totals		8	4 801 680

GRAND TOTAL

2 existing nature reserves to be vested in WAWA = 231 120 ha

4 nature reserves to be transferred to other Authorities

- 2 at present vested in WAWA = 610 ha
- 2 not vested = 1 059 ha

39+ new nature reserves to be vested in WAWA = 5 757 196 ha

By adding these figures to situation at 31.12.75

Total = 935 Nature Reserves with an area of 11 073 492 ha

Vested in W.A. Wildlife Authority : 368
Nature Reserves totalling - 10 721 241 ha.

TABLE 3.

FIREBREAKS CONSTRUCTED OR PLANNED BY THE DEPARTMENT OF FISHERIES AND WILDLIFE UP TO 30 JUNE 1976.

RESERVE	LENGTH (km)
Austin Bay (2 reserves)	19
Avon Valley	19
Bendering	64
Boyagin	144
Bindoo Hill	10
Buntine (2 reserves)	72
Capamaura	48
Chiddarcooping	60
Clackline	20
East Yuna (2 reserves)	29
Ellen Brook	4
John's Well	19
Lake Magenta	275
Mt Caroline	6
Mt Westdale	32
North Tarin Rock	22
Nugadong	16
Pinjarrega Lake	75
Tarin Rock	40
Thomson Lake	21
Tutanning (2 reserves)	74
Tootanallup	13
Twin Swamps	10

cont'd...

TABLE 3 cont'd.

RESERVE	LENGTH (km)
Two Peoples Bay	35
Unicup Lake	29
Wanjarri	48
Wanneroo (Wildlife Research Centre)	6
Yornaning	11
	1 221 km

28 areas
(32 reserves)
average firebreak per reserve = 38.2 km.
average cost per kilometre (1975/76 = $40 approx.

APPENDIX I.

ESTIMATED COSTS OF SETTING UP AND RUNNING RESERVE MANAGEMENT TEAMS, RESIDENT OFFICERS AND RESEARCH STAFF.

1. OPERATIONS STAFF

A. SETTING UP

(i) Reserve Management Team

Equipment:	Four-wheel drive fire truck	$10 000	
	Tractor & implements	7 000	
	Trailer for tractor	3 000	
	Four-wheel drive tabletop	6 000	
	2 x two-way Radios (25W)	2 000	
	General	2 000	
			$30 000

(ii) Resident Officers

Equipment:	Four-wheel drive vehicle	6 000	
	Boat and Trailer	10 000	
	General	2 000	
	2 x Two-way Radios (100W)	3 000	
			$21 000

B. ANNUAL RUNNING

(i) Reserve Management Team

Starting Salaries:	R.O.Level 1, 3rd Year	10 185	
	T.O. GII 1/2	8 294	
			$18 500

cont'd...

APPENDIX I Cont'd.

		Brought Forward	$18 500
Maintenance:	Field Allowances	2 000	
	Vehicle Running	3 500	
	Rental Subsidy	1 000	
	Firebreak construction & Fire control	10 000	
			$16 500
			$35 000

(ii) Resident Officers

Starting Salary		8 294	
			$ 8 500
Maintenance:	Field Allowances	1 000	
	Vehicle Running & Maintenance	1 000	
	Boat Running & Maintenance	2 000	
	Rental Subsidy	500	
			$ 4 500
			$13 000

2. RESEARCH STAFF

SETTING UP

Four-wheel drive Vehicle	6 000	
Equipment	2 000	
		$ 8 000

cont'd...

APPENDIX I Cont'd.

ANNUAL RUNNING

Starting Salaries:	R.O.Level 1 3rd Year	$10 185	
	2 x T.O. G.II 1/2	16 588	
			$27 000
Maintenance:	Field Allowances	3 000	
	Vehicle Running and Maintenance	2 000	
	Research Equipment	2 000	
			$ 7 000
			$34 000

SUMMARY

SETTING UP	3 teams at $30 000	$90 000	
	2 resident officers at $21 000	42 000	
	Research	8 000	
		$ 140 000	
ANNUAL RUNNING	3 teams at $35 000	$ 105 000	
	2 resident officers at $13 000	26 000	
	Research	34 000	
		$ 165 000	

APPENDIX II PROPOSED MANAGEMENT DISTRICTS

District	Shires	RESERVES No. of Fauna	Area of Fauna (ha)	No. of Flora
Wanneroo	Chittering	1	230	2
	Gingin	7	5 130	2
	Harvey	4	425	1
	Metro Area	23	2 909	5
	Murray	7	2 540	0
	Northam	2	748	0
	Toodyay	4	2 299	4
	Warcona	0	0	0
	York	2	333	0
	No. of Shires = 9			
	TOTALS	50	14 614 ha	14
Wongan Hills	Coorow	7	18 988	1
	Cunderdin	1	24	0
	Dalwallinu	8	8 545	4
	Dandaragan	15	12 782	9
	Dowerin	6	1 106	1
	Goomalling	1	290	0
	Kellerberrin	6	1 557	5
	Koorda	3	850	8
	Merredin	7	7 627	9
	Moora	2	503	3
	Mt. Marshall	4	496	10
	Mukinbudin	5	1 547	4
	Tammin	4	555	2

cont'd...

APPENDIX II Cont'd.

District	Shires	RESERVES No. of Fauna	Area of Fauna (ha)	No. of Flora
Wongan Hills Cont'd.	Trayning	1	1 862	0
	Westonia	6	7 383	4
	Wongan-Ballidu	3	739	6
	Wyalkatchem	3	286	1
	Victoria Plains	3	313	2
	Yilgarn	12	216 709	4
	No. of Shires=19			
	TOTALS	97	282 162 ha	75
Pingelly	Beverley	4	3 954	2
	Boddington	1	630	0
	Brookton	5	7 742	0
	Bruce Rock	8	1 204	15
	Corrigin	4	679	3
	Cuballing	4	4 176	1
	Kondinin	11	11 545	6
	Kulin	16	10 873	6
	Lake Grace	13	19 972	8
	Narambeen	3	1 442	3
	Narrogin	21	6 269	1
	Pingelly	13	7 358	5
	Quarading	10	2 837	8
	Wandering	2	348	0
	Wickepin	15	2 806	3
	Williams	5	2 466	0
	No. of Shires=16			
	TOTALS	135	84 301	59

Cont'd...

APPENDIX II Cont'd.

District	Shires	RESERVES No. of Fauna	Area of Fauna (ha)	No. of Flora.
Katanning	Albany	18	9 490	12
	Boyup Brook	2	314	0
	Broomhill	2	10	0
	Cranbrook	17	10 224	1
	Denmark	1	73	8
	Dumbleyung	17	1 143	3
	Gnowangerup	8	8 111	5
	Katanning	8	5 312	1
	Kent	14	102 715	7
	Kojonup	10	1 655	3
	Manjimup	9	4 124	1
	Plantagenet	6	3 986	10
	Ravensthorpe	8	23 647	5
	Tambellup	2	798	0
	Wagin	18	5 312	1
	West Arthur	5	812	3
	Woodanilling	7	891	0
	No. of Shires=17.			
	TOTALS	145	175 700 ha	62

SUMMARY (Assumes 500 ha per Flora reserve)

Wanneroo District = Metropolitan Area + 8 Shires.

50 Fauna reserves	14 614 ha
14 Flora reserves	7 000 ha
64	21 614 ha

(Wanneroo will also manage reserves outside the Agricultural Areas).

cont'd...

APPENDIX II Cont'd.

Wongan District = 19 Shires.

97	Fauna reserves	282 162 ha
75	Flora reserves	37 500 ha
172		319 662 ha
	- Barker Lake	208 863 ha
		110 799 ha

Pingelly District = 16 Shires.

135	Fauna reserves	84 301 ha
59	Flora reserves	29 500 ha
194		113 801 ha

Katanning District = 17 Shires.

149	Fauna reserves	176 626 ha
62	Flora reserves	31 000 ha
211		207 626 ha
	- Lake Magenta	94 170 ha
		113 456 ha

(Barker Lake and Lake Magenta Nature Reserves are subtracted from the above figures since they are large and bias the average size of agriculture area reserves. Lake Magenta has already been firebreaked).

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