13

DEPARTMENT OF
FISHERIES AND FAUNA
WESTERN AUSTRALIA

REPORT No 13

Published by the Director of Fisheries and Fauna, Perth,
under the authority of the Hon. Minister for Fisheries and Fauna

Results of a Biological Survey of the Shire of Kent, Western Australia

BY

N. L. McKENZIE

PERTH
WESTERN AUSTRALIA

SEPTEMBER, 1973

Department of Fisheries and Fauna
108 Adelaide Terrace
Perth.

REPORT

Results of a Biological Survey of the Shire of Kent, Western Australia

by

N.L. McKenzie

September, 1973

37870/5/74-600-B198

CONTENTS

PREFACE

The Department of Fisheries and Fauna is responsible for the conservation of the native fauna in Western Australia. The main approach to this problem has been the creation of reserves for "The Conservation of Flora and Fauna". These reserves, known as "Wildlife Sanctuaries", are controlled by the Western Australian Wild Life Authority - a Statutory Authority serviced by the Department.

The object of the acquisition programme is to develop a reserve system which will include, as far as possible, a full and permanent cross-section of the State's native floral and faunal assemblages and, at the same time, provide for the controlled hunting of game species. The approach has been to set aside:

1. Large areas typical of the primitive environment and known to include a substantial variety of the plants and animals indigenous to the botanical district in which they occur.

2. Areas for each of the spectacular native species, for example the larger marsupials, or for the preservation of rare species which are not already adequately represented on the large reserves.

3. Areas of scientific importance such as places where animals or plants occur well outside their main geographic range.

4. Offshore islands to act as refuges for marine fauna such as seabirds and seals and to protect populations of terrestrial animals and plants isolated from mainland stocks for varying periods of time.

5. Wetlands which are important for the conservation of aquatic plants and animals. These reserves may include areas in which controlled hunting of waterfowl can take place.

6. Areas throughout regions of extensive clearing or alteration of the natural bushland. The aim of these sanctuaries is to permit the persistence of those species which can, to some extent, co-exist with European man and his agriculture, to add to the diversity of the landscape and retain its unique Australian character, and to provide places where people can observe or study native wildlife.

The existing system of sanctuaries in Western Australia has been created over many years. Although certain reserves have resulted from the report of the W.A. Sub-Committee of the Australian Academy of Sciences Committee into National Parks, most have resulted from the recommendations of biologists, surveyors, farmers, honorary wardens, shire councils or the Department's own staff. Many of the reserves were created because the land was of little agricultural value or because erosion would result if clearing continued. Others, although they were originally set aside for purposes such as stock routes, water reserves or camping reserves, have been changed to wildlife sanctuaries when their potential as conservation areas has been recognised.

More recently, as the Department of Fisheries and Fauna has been able to employ trained biologists and wardens, a more intensive approach to reservation has been adopted. There are four main approaches in the South West.

1. Detailed surveys have been made of large tracts of uncommitted land which still occur along the south coast and in the eastern wheatbelt. This approach has had the highest priority because it is much easier to conserver wildlife on large representative reserves than on a number of small discreet blocks.

2. Detailed surveys have also been made of existing wildlife sanctuaries in the wheatbelt. This has partly been done by the W.A. Museum survey unit with costs being met by the Department of Fisheries and Fauna.

3. A shire by shire survey of the wheatbelt was commenced in 1970 to examine the remaining Crown Land in this extensively cleared part of the State and recommend which areas should be retained as conservation reserves. This report is the second in the series of shire surveys.

4. Areas have been examined on an ad hoc basis when it appears that reservation might be possible. Areas in this category result from Lands Department recommendations, suggestions from interested people such as farmers and areas located by the District Fauna Wardens.

Four Criteria used for the assessment of potential reserves.

1. Size

A continental reserve in the South West Division is usually an island surrounded by farmland. Its edges are subjected to external pressures such as exposure to pesticides, herbicides and fertilizers, and invasion by rabbits, sheep, cats and other introduced animals. These influences soon change the character of the perimeter and, on small reserves, the entire area. The width of the "degredation perimeter" and the rate of its spread depend on such factors as frequency of fire, nature of the soils and plants, slope direction and the frequency of exposure to the agricultural chemicals used on surrounding farms.

On small reserves, where both the variety of species and the genetic pool of each species is small, there is less chance of retaining the full variety of plants and animals in the face of internal "catastrophies" such as fire.

Size therefore, must be considered in assessing a potential wildlife reserve. Experience in the wetter parts of the SW Division of Western Australia has shown that at least 2000 ha containing many habitats is needed before it is possible to preserve a wide variety of the larger marsupials such as bandicoots, tammars and woilies. However, since much smaller areas will protect lesser variety of species, it is difficult to put a lower limit on reserve size. The decision to acquire a small block is a compromise between its content and the problems and cost of its management. Usually, blocks of less than 100 ha are acquired only in special circumstances.

2. Content

To a large extent the value of a conservation reserve depends on the nature and diversity of its soils, plants and animals. The variability of the environment is important because many native animals are known to require different habitats for purposes of feeding and shelter. Furthermore, these habitat requirements often change from season to season.

This assessment is a time consuming task involving both vegetation and animal collection programmes.

3. Condition

Gravel pits, rubbish dumps and other signs of human interference are common features of uncleared land in the SW Division. Rubbish dumps reduce the aesthetic value of bushland; extensive gravel pits also modify water runoff characteristics and may cause permanent changes in vegetation because entire soil profiles are removed or disarranged.

Fire is recognised as a natural part of the ecosystem. Without occasional fires the seeds of many Western Australian native plants are not stimulated to germinate. If fires are too frequent the native plants are burnt before they are old enough to set seed and, when the store of seeds in the soil runs out, such species disappear and may be replaced by faster growing non-native crop grasses.

Introduced crop grasses and weeds tend to be highly productive; given suitable conditions they grow fast. Native plants, especially shrubs of the Myrtaceae and Proteaceae which dominate the understorey of much of the SW Division, are comparatively slow growing. During regeneration of disturbed native bushland, non-native grasses are often incorporated at the expense of the diversity of native vegetation. Disturbances such as long term use by sheep or rabbits can cause such effects.

4. Comparison

The similarity, or otherwise, of reserves already held in the vicinity must be considered to see if a proposed reserve will make a significant improvement to the reserve system.

The existing system of wildlife sanctuaries and national parks does not adequately cover the full variety of landforms, fauna and flora. Although it is no longer possible to provide suitable reserves in some developed parts of the South West, it is still possible to have good representative areas set aside in less developed parts of the State and the Department is working towards this goal.

INTRODUCTION

Kent Shire is a comparatively large shire situated in the southern wheatbelt of W.A. Plate 1. shows the shire boundaries and certain other relevant features.

(a) Area of Shire (including roads).	655,000 ha
(b) Area of Flora and Fauna Reserves,	
(i) vested in W.A.W.L.A.	97,500 ha
(ii) not vested or vested in other authorities	3,325 ha
(c) Area of Flora Reserves (excluding non-vegetated saline expanses of Lake Chinokup, North Lake Grace and South Lake Grace).	9,800 ha
(d) Area of other crown land considered for flora and fauna reservation.	3,490 ha
(e) Area of blocks adjacent to shire but outside the boundary.	
(i) Flora and Fauna Reserve vested in W.A.W.L.A.	1,780 ha
(ii) Flora Reserve	1,570 ha
(iii) Other crown land	2,510 ha
(f) Percent of shire under reservation for flora and fauna.	15.4 %
(g) Percent of shire under reservation for flora.	1.5 %

TABLE 1

Blocks of Crown Land in Shire of Kent Which Were Examined

Number	Purpose	Vesting	Area ha
A 25113	Flora and Fauna	W.A.W.L.A.	94300
29020	Flora and Fauna	W.A.W.L.A.	1530
29021	Flora and Fauna	W.A.W.L.A.	114
28667	F F, Water Picnic Ground	Minister of Water Supply	1320
29026	Flora and Fauna	W.A.W.L.A.	41
29022)	Flora and Fauna	W.A.W.L.A.	61
15296)	Water	Not Vested	61
29023)	Flora and Fauna	W.A.W.L.A.	1530
29024*)	Flora and Fauna	W.A.W.L.A.	1580
29025*)	Flora and Fauna	W.A.W.L.A.	207
28324	Flora and Fauna	Not Vested	1010
28468	Recreation	Not Vested	581
10129*	Water Supply	Minister of Water Supply	2510
27289)	Public Utility	Not Vested	390
-)	Vacant Crown Land	Not Vested	400
12627)	Water	Minister of Water Supply	122
-)	Vacant Crown Land	Not Vested	486
24589	Flora	Not Vested	1927
19167	Water	Minister of Water Supply	155
23218	Flora	Not Vested	122
-)	Chinocup Townsite		243
28395	Flora	Not Vested	7180
26802)*	Flora	Not Vested	1570
18803	F F, Water	Minister of Water Supply	1000
23219	Public Utility	Not Vested	260
20046	Timber	Not Vested	391
9219	Water and Public Utility	Minister of Water Supply	169
13448	Water	Not Vested	77
11519	Water	Minister of Water Supply	62
14522	Water Supply	Railways Department	340
26381	Flora	Not Vested	339

* Outside Shire Boundary

CLIMATE

The Atlas of Australian Resources includes the shire in a region of uncoordinated drainage and describes the climate as "inland temperate". Average rainfall and temperature figures are listed in the following tables.

Nyabing Average Rainfall Figures (Points) Over 59 years

Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1616	46	67	86	103	206	272	248	193	146	119	73	57

Pingrup Average Rainfall Figures (Points) Over 46 Years

Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1479	55	62	98	88	177	245	203	163	147	109	76	56

Lake Grace (Nearest Station) Temperatures (^{o}C) Over 10 Years

Month	Average Maximum	Average Minimum
January	32.2	14.4
April	23.4	10.8
July	14.8	5.3
October	22.9	8.3

The weather during the surveys ranged from very hot to cool with heavy showers.

SOIL UNITS IN NYABING-PINGRUP

Nine soil units are described in the C.S.I.R.O. publication "Atlas of Australian Soils". Five of these are considered important; the others are discussed below.

TABLE 2

Soil Surfaces Represented Within the Shire

Soil Unit	% of Shire	Area (ha) Currently Reserved for Flora and Fauna	Possible Area if Recommended Land is Acquired (ha)
S128	13	1,000	4,048
S129	1	-	810
S130	41	85,000	86,500
SV1	11	16,500	25,100
Uf3	26	-	2,710
Ms8	5	-	81
DD11	2	-	-
Va66	1	-	-
JJ16	0.1	-	-

Ms8 is a unit widely distributed in shires north of Nyabing-Pingrup. DD11 has a very limited distribution in the state although large areas of DD units (DD9 to DD17) occur in more inland regions. In a similar fashion, while it has only a very limited distribution in this shire, Va66 is extensive in shires of the central wheatbelt. Extensive areas of JJ16 are very uncommon in W.A. although isolated small areas are common throughout the wheatbelt of the south-west Land Division.

It is most important to realise that the above classification into units is based on dominant soil groups. This means that different units may share close affinities (for example S130, S129, S128).

The soil units are briefly described below. The descriptions are summarised from "Atlas of Australian Soils" and interpreted to describe conditions within this specific shire.

A. Hard-setting Loamy Soils with Yellow Clayey Subsoils.

S128: Broad flat valleys with small claypans and salt-lake remnants. Small areas of Va66 may be included.

S129: Plains flanking saline valleys. Some claypans and lakes with dunes and lunettes. Small areas of DD11 may be included.

S130: Gently undulating pediments with narrow ironstone gravel ridges (similar to units Uf3 and Ms8), some swamps and some lakes.

B. Loamy Soils of Minimal Development.

SV1: Saline valleys and salt lakes and their fringing areas. Few fresh-water lakes. Associated are various dunes and lunettes.

C. Hard-setting Loamy Soils with Mottled Yellow Clayey Subsoils.

Uf3: Dissected plateaux at high elevation having an undulating to rolling ridge and slope relief with some steep bluffs adjacent to drainage ways and some swamps.

Va66: Gently undulating to rolling terraine with some ridges and uneven slopes. There is variable presence of lateritic mesas and buttes and granitic tors and bosses. There are strong similarities with Ms8, S128 and JJ16.

D. Earths.

Ms8: Gently sloping to gently undulating plateau areas or uplands with long and very gentle slopes and, in places, abrupt erosional scarps. Small areas of JJ16, Va66 and S128 may be included.

E. Brown Calcareous Earths.

DD11: Very gently undulating plains sloping upwards from the eastern side of saline valleys. Small areas of JJ16, X17 and S129 are included.

F. Sand Soils with an Unbleached "A" Horizon.

JJ16: Broken terraine characterized by rock outcrops (granitic bosses and tors) which may cover very large areas within the unit. Small areas of Va66 and Ms8 may be included.

Approximate outlines of the various soil units have been included in Plate 1.

FLORA OF KENT

The flora has been separated into formations based on the structure, height and crown-cover of the associations (Appendix 3).

Surveys were only undertaken on blocks of uncleared crown land which were of substantial size (greater than 80 hectares) and met the other requirements of potential reserves for the conservation of flora and fauna, discussed in the General Introduction.

A block by block description of the vegetation is included in Appendix 1 while a formation description is included in Table 3. The diversity of the different associations recognised within the various formations is summarised in Table 4. Obviously, the species composition of associations is variable (see Appendix 2).

Both table 3 and Table 4 include reserve recommendations which would improve the reserved coverage of native vegetation. If all the proposed Flora and Fauna Reserves are created the resulting coverage (association diversity) will be far more complete. Priorities will be placed on the different proposals in the final discussion.

TABLE 3

Vegetation and Soil Coverage of the Reserves and Crown Lands that were Assessed

Reserve Number	Soil Surfaces on Blocks						Formations Represented on Blocks (See Appendix 1 for species)															
	S128	S129	S130	SV1	Uf3	Ms8	Open Forest	Woodland	Open Woodland	Low Closed Forest	Low Open Forest	Low Woodland	Closed Scrub	Open Scrub	Tall Shrubland	Tall Open Shrubland	Closed Heath	Open Heath	Low Shrubland	Low Open Shrubland	Swamp Complex	Lithic Complex
A 25113			X	X				X		X	X		X	X	X			X	X			X
29020			X					X							X	X		X				X
29021			X											X	X			X				
28667(includes 29026)			X					X		X				X	X			X				
29022			X																			X
15296			O																			O
29023				X				X							X			X				X
29024				X											X			X				X
29025				X							X				X			X				X
28324)			X					X						X	X	X			X			
28468)				R															R			
10129		R	R	R				R						R	R			R			R	
27289)					O																	
Salt Lake)				O															O			
12627)				O																		
Lake Joy)				O															O			
24589	R				R					R		R		R	R		R	R				
19167			O	O																		
23218				O	O																	

TABLE 3 (Cont.)

Reserve Number	Soil Surfaces On Blocks						Formations Represented on Blocks (See Appendix 1 for species)																
	S128	S129	S130	SV1	Uf3	Ms8	Open Forest	Woodland	Open Woodland	Low Closed Forest	Low Open Forest	Low Woodland	Closed Scrub	Open Scrub	Tall Shrubland	Tall Open Shrubland	Closed Heath	Open Heath	Low Shrubland	Low Open Shrubland	Swamp Complex	Lithic Complex
Chinocup Townsite																						
28395 } 26802 }	R			R	R			R						R		R		R	R	R	R	
18803	X							X	X		X	X	X	X		X	X	X				
23219					O									O								
20046	R					R					R							R				
9219	R						R	R				R		R		R		R				
13448	O											O							O			
11519	O											O							O			
14522	R				R		R	R				R		R								
26381					O			O							O			O				
Totals: Flora and Fauna Reserves	X		X	X				X	X	X	X	X	X	X	X	X	X	X	X			X
Totals: Crown Land other than F F Reserves	O	O	O	O	O	O	O	O		O	O	O		O	O	O	O	O	O	O	O	O
Recommendations for Flora and Fauna Reservation.	R	R	R	R	R	R	R	R			R	R		R	R	R	R	R	R	R	R	

KEY:-
R - Recommended for Flora and Fauna Reservation
O - Not Recommended
X - Already reserved for the Conservation of Flora and Fauna

TABLE 4

Species Composition

Formation	Alternative Associations Within Each Formation (Appendix 2)	Recommendation	Reserves on Which the Associations are Represented
Open Forest	1	R	14522
	2	R	9219
Woodland	1	X	29020
	2	X	A 25113 *
	3, 4 + 13	R	28395
	5-10	X	18803
	11	X	29023
	1, 12-15	X	28667
	16	R	9219
	17	R	10129
	18	R	14522
	19	X	28324
	20	O	26381
Open Woodland	1	X	18803
Low Closed Forest	1	O	24589
	2, 3	X	28667
	4	X	A 25113
Low Open Forest	1 + 2	X	A 25113
	3	R	20046
	4+5	X	18803
	6	X	29025
Low Woodland	1	R	13448, 11519 & 9219
	2	X	18803
	3	O	24589

TABLE 4 (Cont.)

Formation	Alternative Associations Within Each Formation (Appendix 2)	Recommendation	Reserves on Which the Associations are Represented
Closed Scrub	1 + 2	X	18803
	3 + 4	X	A 25113
Open Scrub	1 - 9	X	18803
	9	R	23219, 28395
	10	X	14522
	11	R	10129
	12, 13 +5	R	28395
	14	X	28324
	15	O	28667
	16	X	28667, 29021 & 9219
	17, 18 +5	R	24589
	19	X	A 25113
Tall Shrubland	1	R	10129
	2	O	26381
	3-12	R	24589
	13 + 14	X	29020
	15 - 18	X	A 25113
	19 - 24	X	28324
	25 - 29	X	29025, 29024 29023
	30	X	28667 & 29021
Tall Open Shrubland	1	R	9219
	2 + 3	X	28324
	4	X	29020
	4 + 5	R	28395
	6 + 7	X	18803
Closed Heath	26	R	24589
	27	X	18803

TABLE 4 (Cont.)

Formation	Alternative Associations within each Formation (Appendix 2)	Recommendation	Reserves on Which the Associations are Represented
Open Heath	1+2	R	20046
	3	X	18803
	4	R	10129
	5-8	R	24589
	9-14	R	28395
	15+16	X	29020
	17+18	X	A 25113
	19-22	X	29025, 29024 29023
	23+24	X	28667 & 29021
	25	R	9219
	26	O	26381
Low Shrubland	1+2	R	28395
	3	X	12627, 27289, 28324 & 28468
	3+4	X	A 25113
	5	O	13448 & 11519
Low Open Shrubland	1	R	28395
Swamp Complex	1	R	28395
	2	R	10129
Lithic Complex	1	X	29020, 29021
	2	X	29023, 29024 & 29025
	3	X	A 25113
	4	O	15296

KEY:

R - Recommended for Flora and Fauna reservation
O - Not recommended
X - Already reserved for the Conservation of Flora and Fauna

* A 25113 - Detailed descriptions are available in Kitchener (1971).

FAUNA OF KENT

Initially, the blocks were assessed in terms of potential value for flora and fauna conservation. The criteria important in this assessment have been discussed in the "General Introduction". The best areas were selected (four Flora and Fauna Reserves and one Flora Reserve) and detailed fauna surveys were subsequently undertaken. A fauna survey had already been completed on Lake Magenta Wildlife Sanctuary.

1. Lake Cairlocup Flora and Fauna Reserve (⍓ 28324) and the adjacent Recreation Reserve (⍓ 28468) to the east.

2. Lake Bryde Flora and Fauna Reserve System (⍓ 28667, ⍓ 29021, ⍓ 29026, ⍓ 29023, ⍓ 29024, and ⍓ 29025 - the last two reserves being outside the shire boundary.

3. Lake Magenta Wildlife Sanctuary. (A ⍓ 25113).

4. Chinocup Water Supply and Flora and Fauna Reserve (⍓ 18803).

5. Lake Chinokup - Lake Grace South - Lake Grace North Flora Reserves (⍓ 28395 and ⍓ 26802 — the latter and some of the former being outside the shire boundary) and Chinocup Townsite Reserve.

General shire information was drawn from the records of the Western Australian Museum and from opportunistic collections made by the field staff during the period of the shire survey.

The fauna lists from the existing Flora and Fauna Reserves and the Chinokup-Grace Flora Reserve cover almost the full range of animals which could be expected from the shire (Table 5). Only two of the mammals known from the Kent Shire have not been captured on at least one of the five areas examined in detail. These are the Red-tailed Wambenger (Phascogale calura) and the Wuhl-Wuhl (Antechinomys spenceri). Both species are generally regarded as having low densities and as being relatively difficult to capture.

Three of the mammals occurring on the Lake Chinokup-Lake Grace Reserve are of special importance to conservation. The White-tailed Dunnart (Sminthopsis granulipes) is regarded (Ride, 1970) as one of "the rare ones". During the period from 1925 to 1965 there are only nine records of this small marsupial carnivore. Pseudomys albocinereus (the Ashy-grey Mouse) has never before been captured so far inland. All recent records of this animal have been restricted to the coastal areas of the South West and Bernier and Dorre Islands in Shark Bay. The Western Mouse (Pseudomys occidentalis) is recognised as a rare and threatened species by the House of Representatives Select Committee on Wildlife Conservation in their 1972 report, and by the Australian Fauna Authorities Conference. It has been declared "rare and likely to become extinct" under the Fauna Conservation Act of Western Australia.

Dr. G. Storr, Curator of Vertebrates at the Western Australian Museum, has provided a list of the reptiles and amphibia he would expect to occur in the Nyabing-Pingrup Shire. In Table 5 this list is compared with the species actually collected during the fauna surveys of the five areas considered most suitable for the purposes of wildlife conservation.

Only two of the forty species of reptile predicted were not recorded. The legless-lizard, Lialis burtonis, is difficult to capture because of its cryptic habit. The other species not collected was the Carpet Snake (Python spilotes).

Seven amphibian species were expected. Only one species, Myobatrachus gouldii, was not collected. This subterranean frog is seldom seen because it normally ventures onto the surface only after a period of heavy rain.

CONCLUSIONS AND RECOMMENDATIONS

The flora, fauna and soil assessments have shown that suitable areas of the majority of important wildlife associations are present on crown land. It should therefore be possible to provide a comprehensive system of reserves for the conservation of flora and fauna within the shire of Kent. At the present time many of these areas are already wildlife reserves and the following list includes those blocks considered necessary to provide for the future requirements of wildlife conservation in the shire. The list includes comments on the relative importance (priority) of each proposal. See Table 6.

To facilitate management of the reserve system, it is suggested that all the reserves be vested in a single body — the Western Australian Wildlife Authority. Areas considered most important have been recommended for "A Class" status.

There are two difficulties relevant to these acquisitions. The first relates to the salt lakes associated with reserve No. 26802 (Priority 1). It is proposed that Lake Chinokup, Lake Grace South, Lake Grace North, Chinocup townsite, ↑28395 and ↑26802 all be included in an "A Class" reserve for the Conservation of Flora and vested in the W.A.W.L.A. The difficulty concerns the series of mining claims on Lake Grace North. Considering the nature of the lake bottom, there is no reason why the exclusion of the western section of this lake would detract from the value of the proposed reserve. A suggested northern boundary for this reserve is included in Appendix 4.

The second difficulty involves reserve No. 18803. This land has been vested in the Minister of Water Supplies and its purposes include both "Water" and "Conservation of Flora and Fauna". It is the author's considered opinion that "A Class" status is highly desirable in this case as the area is undoubtedly very valuable to wildlife. If it is not possible to transfer the vesting order to the W.A.W.L.A., an assurance should be sought that this authority be notified before the condition of this land is changed in any way.

TABLE 5

FAUNA

Species	Areas Selected for Fauna Surveys						Gen. Shire Records
	Lake Cairlocup System	Lake Bryde System	Lake Magenta Sanctuary	Chinocup F&F Reserve	Lake Chinokup–Lake Grace System (continuous with)	North Lake Grace System	
MAMMALS:							
Macropus fuliginosus	X	X	X	X	X	X	X
M. irma	X	X	X	X	X	X	X
M. eugenii				?			
Trichosurus vulpecula				X			X
Cercartetus concinnus			?				X
Tarsipes spencerae	?		X				
Phascogale calura							X
Sminthopsis crassicaudata	X			?			
S. granulipes						X	
Antechinomys spenceri							X
Myrmecobius fasciatus				?			
Notomys mitchellii			X		X		
Pseudomys occidentalis					X		X
P. albocinereus						X	
Nyctophilus geoffroyi						X	X
Eptesicus pumilis			X	X	X		X
Chalinolobus gouldii	?	?		X		X	X
Tadarida australis							X
Tachyglossus aculeatus	X	X	X	X			
Canis familiaris		?	X		?		
Mus musculus	X	X	X	X	X	X	
Vulpes vulpes	X	X	X	X	X	X	X
Felis catus	X	X	X	X			
Oryctolagus cuniculus	X	X	X	X	X	X	X

N.B. X - confirmed identification of extant species.

? - sighting or indirect evidence

TABLE 5 (Cont.)

Species	Areas Selected for Fauna Surveys							Gen. Shire Records
	Lake Cairlocup System	Lake Bryde System	Lake Magenta Sanctuary	Chinocup F∧F Reserve	Lake Chinokup-Lake Grace System (continuous with)	North Lake Grace System		
BIRDS:								
Emu	X	X	X			X		X
Pelican					X			
Little Grebe		X			X			
White-faced heron	X	X			X			
Black swan	X	X			X			X
Mountain duck	X	X	X		X			X
Black duck	X	X			X			
Grey teal	X	X			X			
Pink-eared duck					X			
White-eyed duck		X						
Wood duck	X	X			X			
Whistling eagle		X	X					
Australian goshawk	X	X	X		X			
Australian little eagle			X					
Wedge-tailed eagle	X	X	X		X	X		X
Little falcon		X			X			
Nankeen kestrel	X	X	X		X			X
Brown hawk	X	X	X		X	X		X
Mallee fowl			X		X			
Little quail		X?	X					
Dusky moorhen					X			
Coot		X			X			
Bustard			X					X
Banded plover	X				X	X		
Red-capped dotterel			X					
Black-fronted dotterel		X						
Avocet					X			
Common bronzewing		X	X		X	X		
Brush bronzewing		X						X
Purple-crowned lorikeet	X	X	X		X	X		X
White-tailed black cockatoo								X
Galah					X			X
Regent parrots	X	X	X					
Western Rosella		X	X		X			X

TABLE 5 (Cont.)

Species	Areas Selected for Fauna Surveys						Gen. Shire Records
	Lake Cairlocup System	Lake Bryde System	Lake Magenta Sanctuary	Chinocup F&F Reserve	Lake Chinokup-Lake Grace System (continuous with)	North Lake Grace System	
BIRDS:							
Port lincoln parrot	X	X	X		X	X	X
Elegant parrot		X			X		
Fan-tailed cuckoo	X						
Boobook owl					X	X	
Tawny frogmouth	X	X	X		X	X	
Owlet nightjar					X	X	X
Spotted nightjar					X		
Laughing kookaburra		X	X		X		
Rainbow bee-eater	X	X	X		X	X	X
Welcome swallow					X	X	
Tree martin	X	X	X		X		
Australian pipit	X	X			X	X	X
Black-faced cuckoo-shrike	X	X	X		X	X	X
Southern scrub-robin		X	X		X	X	
White-browed babbler	X	X	X		X	X	X
Blue-breasted wren			X			X	
Western warbler	X	X			X		
Weebill			X		X	X	X
Brown thornbill	X	X	X		X	X	X
Chestnut-rumped thornbill		X	X				
Yellow-rumped thornbill	X	X	X		X	X	
Spotted scrub-wren	X	X	X		X		
Redthroat						X	
Mallee heath-wren		X	X			X	
Field wren	X	X	X		X		
White-fronted chat	X	X			X		
Brown-tailed flycatcher	X	X	X		X	X	
Scarlet robin						X	
Red-capped robin	X	X	X			X	
Hooded robin	X						
Western yellow robin		X	X				
Grey fantail	X	X	X		X		
Willie wagtail	X	X			X	X	X
Restless flycatcher	X	X				X	

TABLE 5 (Cont.)

Species	Areas Selected for Fauna Surveys							Gen. Shire Records
	Lake Cairlocup System	Lake Bryde (including Lakeland NR) System	Lake Magenta Sanctuary	Chinocup F↖F Reserve	Lake Chinokup-Lake Grace System (continuous with)		North Lake Grace System	
BIRDS:								
Golden whistler		X	X		X			
Rufous whistler		X	X					
Gilbert whistler	X	X						
Western shrike-thrush			X		X		X	
Crested bell-bird			X					
Black-capped sitella	X	X			X		X	
Rufous tree-creeper		X	X					
Mistletoe bird		X						
Striated pardalote	X	X	X		X		X	X
Western silvereye	X	X			X		X	
Brown honeyeater			X		X			
Singing honeyeater					X			
Purple-gaped honeyeater		X	X		X			
Yellow-plumed honeyeater			X		X			X
White-eared honeyeater	X	X	X		X		X	X
Brown-headed honeyeater		X	X		X			
New Holland honeyeater	X							
White-cheeked honeyeater					X			
White-fronted honeyeater	X				X			
Tawny-crowned honeyeater		X	X		X			
Yellow-throated miner	X	X	X		X			
Spiny-cheeked honeyeater	X	X						
Little wattle-bird							X	X
Red wattle bird		X	X					X
Magpie lark		X			X			X
Black-faced wood-swallow		X					X	
Dusky wood-swallow	X		X		X			
Grey Currawong	X	X	X		X		X	
Grey butcher-bird	X	X	X					
Western magpie	X	X	X				X	X
Australian raven	X	X	X		X		X	X
Australian crow		X?						

TABLE 5 (Cont.)

Species	Areas Selected for Fauna Surveys						Gen. Shire Records
		Lake Cairlocup System	Lake Bryde System	Lake Magenta Sanctuary	Chinocup F⅄F Reserve	Lake Chinokup-Lake Grace System (continuous with) North Lake Grace System	
REPTILES:							
Geckoes.							
Crenadactylus ocellatus		X	X	X			
Diplodactylus maini			X		X		
D. spinigerus			X				
D. vittatus			X				
Gehyra variegata					X	X	
Oedura reticulata						X	
Phyllodactylus marmoratus			X	X		X	
Phyllurus milii			X				
Legless Lizards							
Aprasia repens			X				
Delma "fraseri"		X	X	?			
Lialis burtonis							
Pygopus lepidopodus					X		
Dragons.							
Amphibolurus adelaidensis		X					
A. cristatus		X	X				
A. maculatus	X		X	X	X	X	
A. minor			X		X	X	
A. salinarum			X			X	
Skinks.							
Cryptoblepharus plagiocephalus	X	X	X	X		X	
Ctenotus gemmula			X				
C. impar			X		X		
C. schomburgkii			X				
C. labillardieri			X				
Egernia multiscutata			X		X		
E. nitida			X	X			
Hemiergis initialis	X		X	X	X		
H. peronii	X		X				
Lerista distinguenda			X	X	X		

TABLE 5 (Cont.)

Species	Areas Selected for Fauna Surveys						Gen. Shire Records
	Lake Cairlocup System	Lake Bryde System	Lake Magenta Sanctuary	Chinocup F&F Reserve	Lake Chinokup-Lake Grace System (continuous with)	North Lake Grace System	
REPTILES:							
Minetia greyii			X	X	X	X	
Morethia obscura	X	X		X	X	X	
M. anomala			X				
Teliqua occipitalis		X			X		
T. rugosa	X	X	X	X	X	X	X
Goannas.							
Varanus gouldii	X	X	X	X	X	X	X
Blind Snakes.							
Ramphotyphlops australis			X				
Pythons.							
Python spilotes							
Front-fanged Snakes.							
Brachyaspis curta			X				
Demansia affinis	X	X	X	X	X	X	
Pseudechis australis			X				
Denisonia gouldii			X		X	X	
Vermicella bertholdi					X		

TABLE 5 (Cont.)

Species	Areas Selected for Fauna Surveys						Gen. Shire Records
	Lake Cairlocup System	Lake Bryde System	Lake Magenta Sanctuary	Chinocup F↖F Reserve	Lake Chinokup-Lake Grace System (continuous with)	North Lake Grace System	
AMPHIBIANS:							
Crinia pseudinsignifera			X				
Heleioporus albopunctatus		?	X				
Limnodynastes dorsalis		X	X	?			
Myobatrachus gouldii							
Neobatrachus pelobatoides			?				X
Pseudophryne guentheri			X				
Litoria cyclorhyncha		X	X	X			

N.B. X - definite identification of a collected specimen.

? - juvenile specimen, genus identification only.

TABLE 6

RECOMMENDATIONS*

	Number	Comments	Priority
1.	A⍓25113	Very large. Diverse flora representative of eastern end of shire. A detailed report on this reserve has been prepared by the Western Australian Museum.	Retain
2.	⍓29020	Adequate size. Flora is distinct from A⍓25113 Fauna is not known.	Retain
3.	⍓29021	Adjoins ⍓28667	Retain
4.	⍓28667	Adequate size. Flora and fauna are representative of the shire. Part of a fresh-water lake system.	Priority 2 Retain and seek vesting in W.A.W.L.A.
5.	⍓29026	Adjoins ⍓28667. Contains a small fresh-water lake.	Retain
6.	⍓29022	Lithic Complex.	Retain
7.	⍓15296	Adjoins ⍓29022. Not otherwise important.	Not required.
8.	⍓29023	Close to ⍓28667	Retain.
9.	⍓29024	Adequate size.	
10.	⍓29025	A system of salt and freshwater lakes. Flora and Fauna is representative of shire.	
11.	⍓28324	Adequate size. Only proven location of the marsupial carnivore Sminthopsis crassicaudata in the shire.	Priority 2. Seek vesting order in W.A.W.L.A. and "A" Class status.
12.	⍓28468	Adjoins ⍓28324 although there is a greater emphasis towards woodland formations.	Priority 2. Request that it be vested in W.A.W.L.A. after inclusion in ⍓28324.

TABLE 6 (Cont.)

	Number	Comments	Priority
13.	⅄ 10129	Adequate area supporting an interesting and distinct flora not recorded elsewhere in the shire. Only suitable area of S129 landscape available in the shire. There was a diverse bird fauna.	Priority 2. Request change to Conservation of Flora and Fauna, vesting in W.A.W.L.A. and "A" Class status.
14.	⅄24589	Several of the formations and many of the plant species represented on this block do not occur in a suitable location elsewhere in the shire. Unfortunately the shape is complex and the boundary vs. area ratio is poor.	Priority 3. Request purposes be changed to Conservation of Flora and Fauna, vested in W.A.W.L.A.
15.	⅄28395		
16.	⅄26802		
17.	Chinocup Townsite Lk Chinokup) Lake Grace (South) Lake Grace (North)	A large area of interesting and diverse vegetation not found on A⅄25113. It includes large sections of a drainage system and the diverse fauna includes two species of mammals considered rare and likely to become extinct. A detailed report on the flora and fauna of this system will be prepared elsewhere. This is an ideal area in which to create a reserve for the future conservation of these animals. Consult Appendix 4 for details of the ~~their~~ this recommended northern boundary of proposal.	Priority 1. 1. Change purposes to Conservation of Flora and Fauna. 2. Combine the blocks into a single reserve. 3. Vest the resulting reserve in W.A.W.L.A. and declare it "A" Class. 4. Include the saline lakes in the reserve.
18.	⅄18803	An adequate area of good quality associations containing species and formations complementing those found on the nearby ⅄28395, ⅄26802 and Chinocup Townsite Blocks. The fauna is also quite distinct and includes a surprising variety of species.	Priority 2. Seek "A" Class status and vesting in W.A.W.L.A.
19.	⅄20046	An area of mallet (E. astringens) on a landscape unit not found on reserves elsewhere in the shire.	Priority 3. Already recommended as a Flora and Fauna Reserve vested in W.A.W.L.A.

TABLE 6 (Cont.)

	Number	Comments	Priority
20.	↑9219	A small yet diverse area more typical of the western half of the shire and supporting a vegetation of mainly low-level landscape elements.	Priority 4. Request that the purposes be changed to Conservation of Flora and Fauna and that the reserve be vested in W.A.W.L.A.
21.	↑13448	Low woodland which has been degraded in the herbaceous strata. Recent salination of drainage lines has left tracts of dead vegetation. Many rabbit warrens were seen.	Not recommended.
22.	↑11519		
23.	↑14522	This is the only remaining large area of open forest in the shire. It is located near the western boundary.	Priority 2. Request change of purposes to Conservation of Flora and Fauna, vesting in W.A.W.L.A., and "A" Class status.
24.	↑26381	Another area representative of the western end of the shire. The Eucalyptus transcontinentalis association has not been conserved on any other proposal or reserve in the shire.	Priority 3. Request purposes be changed to Conservation of Flora and Fauna and it be vested in W.A.W.L.A.

*The location of each block listed in this table has been marked on "Plate 1".

Literature Cited.

Anon. (1969) An Index of Australian Bird Names - C.S.I.R.O. Division of Wildlife Research. Technical Paper No.20.

Anon. (1972) Wildlife Conservation - Report of the House of Representatives Select Committee on Wildlife Conservation. Australian Government Publishing Service, Canberra, A.C.T.

Butler, W.H. (1972) A Preliminary Survey of Chinocup Reserves, Lake Bryde Wildlife Sanctuaries, and Lake Cairlocup Wildlife Sanctuary. Unpublished Report. Prepared for the Department of Fisheries and Fauna, W.A.

Kitchener, D.J. (1972) Results of a Biological Survey of the Lake Magenta Reserve (Northern Region). W.A. Museum Biological Survey Unit Report No.1. Unpublished.

Northcote, K.H., Bettenay, E., Churchward, H.M. and McArthur, W.M. (1967) Atlas of Australian Soils. Sheet 5. C.S.I.R.O. Published in Association with Melbourne University Press.

Ride, W.D.L. (1970) A Guide to the Native Mammals of Australia. Oxford University Press, Melbourne.

Specht, R.L. (1970) Vegetation. In "Australian Environment". 4th Ed. (Ed. G.W. Leeper). pp 44-67 C.S.I.R.O. Melbourne University Press.

Acknowledgements

I am grateful for the assistance in both the field and the laboratory, of Mr. W.K. Youngson, Mr. F. Riffey, and Mr. K. Morris (temporary) all of the Department of Fisheries and Fauna.

I also wish to acknowledge the assistance of the Western Australian Museum and the Western Australian Herbarium for providing identification of the animal and plant collections respectively.

The author is especially grateful for Mr. K. Morris's honorary field assistance in February, 1973, for Dr. Glen Storr's comments on the reptiles and amphibians, and for Dr. A.A. Burbidge's suggestions during the preparation of this report.

APPENDIX 1

Vegetation Transects

↑29020

1. Woodland

Eucalyptus occidentalis Endl. (10-15m)
Eucalyptus salmonophloia F. Muell. (10-20m)
Melaleuca hamulosa Turcz.
Melaleuca uncinata R. Br.
Melaleuca pentagona Labill.

2. Tall Shrubland

Eucalyptus ? foecunda Schau. (1.5-2m)
Melaleuca uncinata R. Br.
Lepidosperma viscidum R. Br.

3. Open Heath

emergent Eucalyptus ? astringens Maiden. (1-2m)

4. Open Heath

Hakea falcata R. Br. (1m)
Petrophile divaricata R. Br. (1m)
Calothamnus quadrifidus R. Br. (1m)
and other Proteaceae/Myrtaceae (1m)

5. Open Heath with Emergent Mallee

Eucalyptus leptocalyx Blakely (3m)
and 0.5 - 0.25m Proteaceae/Myrtaceae

6. Tall Shrubland

Eucalyptus oleosa F. Muell. (5m)
Eucalyptus anceps(R. Br.) Blakely (5m)

Melaleuca uncinata R. Br.

Hakea sp.

Melaleuca depauperata Turcz

7. Tall Open Shrubland & Lithic Complex

Eucalyptus ? astringens Maiden. (5m)

Grevillea hookerana Meisn. (1-1.5m)

Hakea subsulcata Meisn.

Isopogon teretifolius R. Br.

Melaleuca ? cuneata Turcz

Dryandra sp.

8. Tall Open Shrubland

Banksia prionotes Lindl. (4m)

Petrophile ericifolia R. Br. (1-2m)

Hakea sp.

Eremaea pauciflora (Endl.) Druce

Hakea trifurcata (Sm.) R. Br.

Leptospermum sp.

Dryandra cuneata R. Br.

9. Tall Shrubland

Eucalyptus ? astringens Maiden (5-6m)

Eucalyptus anceps (R. Br.) Blakely (1-2m)

Melaleuca pentagona Labill. (1m)

Hakea trifurcata (Sm) R. Br. (1m)

Isopogon buxifolius R. Br. (1m)

Petrophile squamata R. Br. (0.5-1m)

Hakea corymbosa R. Br. (1m)

Banksia violacea C.A. Gardn.

28667, 29021

1. Tall Shrubland

Eucalyptus ? spathulata Hook.
Eucalyptus leptocalyx Blakely
Melaleuca uncinata R. Br.

2. Open Heath

Eucalyptus ? astringens Maiden (1-2m) emergent
Proteaceae/Myrtaceae (1m)

3. Woodland

Eucalyptus salmonophloia (13m)
Melaleuca adnata Turcz. (1-1.5m)

4. Woodland

Eucalyptus occidentalis var occidentalis Endl.
Atriplex vesicavia Benth. (0.5m)
Chaenopodiaceae mats (decumbent)

5. Open Scrub

Eucalyptus anceps (R. Br.) Blakely
Eucalyptus foecunda Schau.
Callitris roei Endl.

6. Low Closed Forest

Eucalyptus occidentalis var occidentalis Endl. (5-6m)
Eucalyptus sp. (mallet) 5-6m)
Melaleuca acuminata F. Muell.
Melaleuca lateriflora Benth

7. Open Heath (1.5m)

Melaleuca lateriflora Benth
Melaleuca uncinata R. Br.
Exocarpus aphyllus R. Br.
Eucalyptus spathulata Hook. (emergent mallee)

8. Woodland

Eucalyptus occidentalis var *occidentalis* Endl.
Eucalyptus salmonophloia F. Muell.
Melaleuca hamulosa Turcz. (1-2m)
Melaleuca uncinata R. Br.
Melaleuca ? *pentagona* Labill.

9. Open Scrub

Eucalyptus anceps (R. Br.) Blakely
Eucalyptus foecunda Schau.
Callitris roei Endl.

10. Woodland (10-15m)

Eucalyptus salmonophloia F. Muell.
Eucalyptus anceps (R. Br.) Blakely (5m)

11. Woodland (12-16m)

Eucalyptus salmonophloia F. Muell.
Eucalyptus sp. (8m)
Melaleuca pauciflora (5m)

12. Open Scrub (3-4m)

Eucalyptus foecunda Schau.
Eucalyptus sp.
Melaleuca ? *subtrigona* Schau.

Melaleuca uncinata R. Br.

Gastrolobium reticulatum (Meisn.) Benth.

13. Low Closed Forest (10–12m)

Eucalyptus floctoniae Maiden (10-12m)

Melaleuca depauperata Turcz.

Beaufortia micrantha Schau.

↑29025, ↑29024, ↑29023

1. Open Heath (1m)

emergent Grevillea eriostachya Lindl. (2-3m)

Beaufortia micrantha Schau.

Isopogon scabriusculus Meisn.

Grevillea pritzellii Diels.

Casuarina acutivalvis F. Muell.

Callitris preissii Miq. ssp. verrucosa (A. Cunn. ex Endl.) J. Gardn.

Leucopogon corynocarpus Sond.

Leucopogon woodsii F. Muell.

Melaleuca ? cuneata Turcz.

3. Low Open Forest

Eucalyptus floctoniae Meisn. (4–10m) } 30%
Eucalyptus salubris F. Muell (6m) }

Daviesia acantacona F. Muell

Melaleuca cuticularis Labill. } 50%
Melaleuca corynocarpa Herbert }

4. Tall Shrubland

Eucalyptus redunca Schau. (3m)

Eucalyptus eremophila (Diels.) Maiden (3m)

Hakea multilineata Meisn. (2-3m)

Melaleuca uncinata R. Br. (1m)

Leptomeria preissiana (Miq.) D.C.

6. Open Heath

emergent mallee

Eucalyptus uncinata Turcz. (2-2.5m)

Grevillea pritzelii Diels.

Beaufortia micrantha Schau.

Isopogon scabriusculus Meisn.

Melaleuca ? cuneata Turcz

Callitris roei Endl.

Hakea falcata R. Br.

Adenanthos flavidiflora F. Muell.

Melaleuca ? pungens Schau.

Banksia violacea C.A. Gardn.

7. Tall Shrubland

Eucalyptus redunca Schau. (2m)

Eucalyptus eremophila (Diels.) Maiden (1.5m)

Melaleuca uncinata R. Br.

Kuzea sp.

Melaleuca ? scabra R. Br.

8. Tall Shrubland

Eucalyptus oleosa F. Muell.

Eucalyptus pileata Blakely (3m)

Melaleuca uncinata R. Br. (1.5m)

Melaleuca ? scabra R. Br. (0.5m)

Melaleuca holosericea Schau. (0.5m)

9. Woodland

Eucalyptus salmonophloia

Eucalyptus pileata Blakely (3-4m)

Melaleuca uncinata R. Br. (2m)

Melaleuca adnata Turcz. (1.5m)

Melaleuca acuminata F. Muell. (2m)

10. Open Heath (0.5 - 1.5m)

Beaufortia micrantha Schau.

Hakea falcata R. Br.

Melaleuca cuneata Turcz.

11. Lithic Complex

Lepidosperma brunonianum (Nees.)

Acacia sp. (2m)

↑28324, ↑28468

1. Tall Shrubland

Eucalyptus astringens Maiden (4m)

Petrophile ericifolia R. Br. (1m)

Eremaea pauciflora (Endl.) Druce. (1-1.5m)

Isopogon buxifolius R. Br. (1m)

Leptospermum erubescens Schau. (1-1.5m)

2. Tall Shrubland

Eucalyptus astringens Maiden (3-4m)

Eucalyptus redunca Schau. (3-4m)

Isopogon buxifolius R. Br. (1m)

Hakea sp. (1m)

Hakea corymbosa R. Br. (1m)

Leptospermum erubescens Schau. (1m)

3. Tall Shrubland

Eucalyptus astringens Maiden (3-4m)

Eucalyptus redunca Schau. (3-4m)

Isopogon buxifolius R. Br. (1m)

Hakea sp. (1m)

Hakea corymbosa R. Br. (1m)

Leptospermum erubescens Schau. (1m)

Melaleuca uncinata R. Br.

4. Tall Shrubland

Eucalyptus astringens Maiden (3-4m)

Eucalyptus redunca Schau. (3-4m)

Isopogon buxifolius R. Br. (1m)

Hakea sp.(1m)

Hakea corymbosa R. Br. (1m)

Leptospermum erubescens Schau. (1m)

Callitris drummondii (Parl.) F. Muell.

5. Tall Open Shrubland

Acacia sp. (3-4m)

Acacia sp. (3-4m)

6. Low Open Shrubland

Melaleuca cuticularis Labill.

Isopogon buxifolius R. Br.

Melaleuca aff subtrigona Turcz. (2-5m)

7. Woodland

Eucalyptus salmonophloia F. Muell. (15m)

Eucalyptus kondininensis Maiden & Blakely (12m)

Eucalyptus occidentalis Endl. (12m)

Santalum acuminatum (R. Br.) D.C. (2-3m) sparse clumps

Pittosporum phylliraeoides D.C. (2-3m) sparse clumps

Exocarpus aphyllus R. Br.

8. Tall Shrubland

Eucalyptus uncinata (Turcz.)
Eucalyptus ancepts (R.Br.) Blakely
Melaleuca uncinata R. Br. (1-1.5m)
Melaleuca depauperata Turcz. (1m)

9. Open Heath

Isopogon buxifolius R. Br. (1m) emergent
Melaleuca affin *subtrigona* Turcz. (0.5m)
Melaleuca sp. (0.25-0.5m)
Hakea sp.
Petrophile squamata R.Br. (0.25-0.5m)

10. Tall Shrubland

Eucalyptus uncinata Turcz.
Eucalyptus anceps (R.Br.) Blakely
Leptomeria preissiana (Miq.) D.C.
Melaleuca depauperata Turcz. (1m)

11. Tall Shrubland

Eucalyptus astringens Maiden (3-4m)
Leptospermum erubescens Schau.
Callitris drummondii (Parl) F.Muell. } (1.5-2m) sparse and emergent
Hakea corymbosa R.Br.
Melaleuca aff. *subtrigona* Turcz.
Melaleuca uncinata R. Br. } dominants (0.5m)

12. Tall Shrubland

Eucalyptus astringens Maiden
Eucalyptus reduncа Schau. } (3-4m)
Hakea sp.
Isopogon buxifolius R.Br.
Proteaceae/Myrtaceae (0.5m)

13. Tall Shrubland

Eucalyptus astringens Maiden (3-4m)
Leptospermum erubescens Schau. } (1.5-2m) sparse
Callitris drummondii (Parl) F. Muell } and emergent
Hakea corymbosa R.Br. }
Melaleuca aff. subtrigona Turcz. }
Melaleuca uncinata R. Br. } dominants (0.5m)
Eucalyptus redunca Schau. (upper storey)
Verticordia nitens (Lindl.) Schau. (understorey)

14. Tall Open Shrubland

Melaleuca uncinata R. Br.
Leptospermum erubescens Schau.
Paperbarks (occasional) (5m)
Melaleuca cuticularis Labill. }
Melaleuca thyoides Labill. } (2.5m)
Chenopodiaceae

15. Chenopodiaceae round edges of salt-lake basins.

A 10129

1. Open Scrub

Eucalyptus spathulata Hook.
Eucalyptus leptocalyx Blakely
Melaleuca uncinata R. Br.
Melaleuca holosericea Schau
Exocarpos aphyllus R. Br.
Isopogon buxifolius R. Br.

2. Tall Shrubland (4m)

Eucalyptus foecunda Schau.
Eucalyptus ridgidula Maiden.

Exocarpus sparteus R.Br.
Acacia nitidula Benth
Gastrolobium reticulatum (Meisn.) Benth.
Isopogon buxifolius R. Br.
Melaleuca uncinata R.Br.
Dryandra calophylla R.Br.

3. Open Heath

Emergent mallee - Eucalyptus anceps (R.Br. ex Maiden) Blakely
Acacia sp.
Isopogon buxifolius R.Br.
Hakea trifurcata (Sm) R.Br.
Hakea prostrata R. Br.
Exocarpus sparteus R.Br.
Regelia inops Schau.
Daviesia brevifolia Lindl.
Hakea corymbosa R.Br.
Dryandra calophylla R.Br.
Ghania trifida Labill.
Platysace deflexa Turcz

4. Swamp Complex

Gahnia trifida Labill.
Melaleuca cuticularis Labill. (3m)

5. Woodland

Eucalyptus occidentalis var occidentalis Endl.
Melaleuca lateriflora Benth. (1m)
Acacia sp.

A 24589

1. Open Heath

Eucalyptus incrassata Labill

Banksia cayleyi R.Br. (2.5m)
Melaleuca uncinata R.Br.
Isopogon buxifolius R.Br.
Hakea sp.
Grevillea pritzelii Diels.
Melaleuca ? scabra Diels. (0.5-1.5m)

2. Open Scrub

Mallee (3-4m)
Melaleuca uncinata R.Br.

3. Open Heath

Eucalyptus redunca Schau.
Dryandra cirsioides Meisn.
Hakea baxteri R.Br.
Hakea platysperma Hook.
Hakea trifurcata (Sm) R.Br.
Hakea lehmanniana Meisn.
Melaleuca Affin. pungens Schau.
Casuarina humilus
Eremaea pauciflora (Endl.) Druce

4. Open Scrub

Lambertia inermis R.Br.
Petrophile squamata R.Br.
Hakea trifurcata (Sm.) R.Br.
Hakea platysperma Hook.
Isopogon teretifolius R.Br.
Petrophile trifida R.Br.
Melaleuca scabra R.Br.

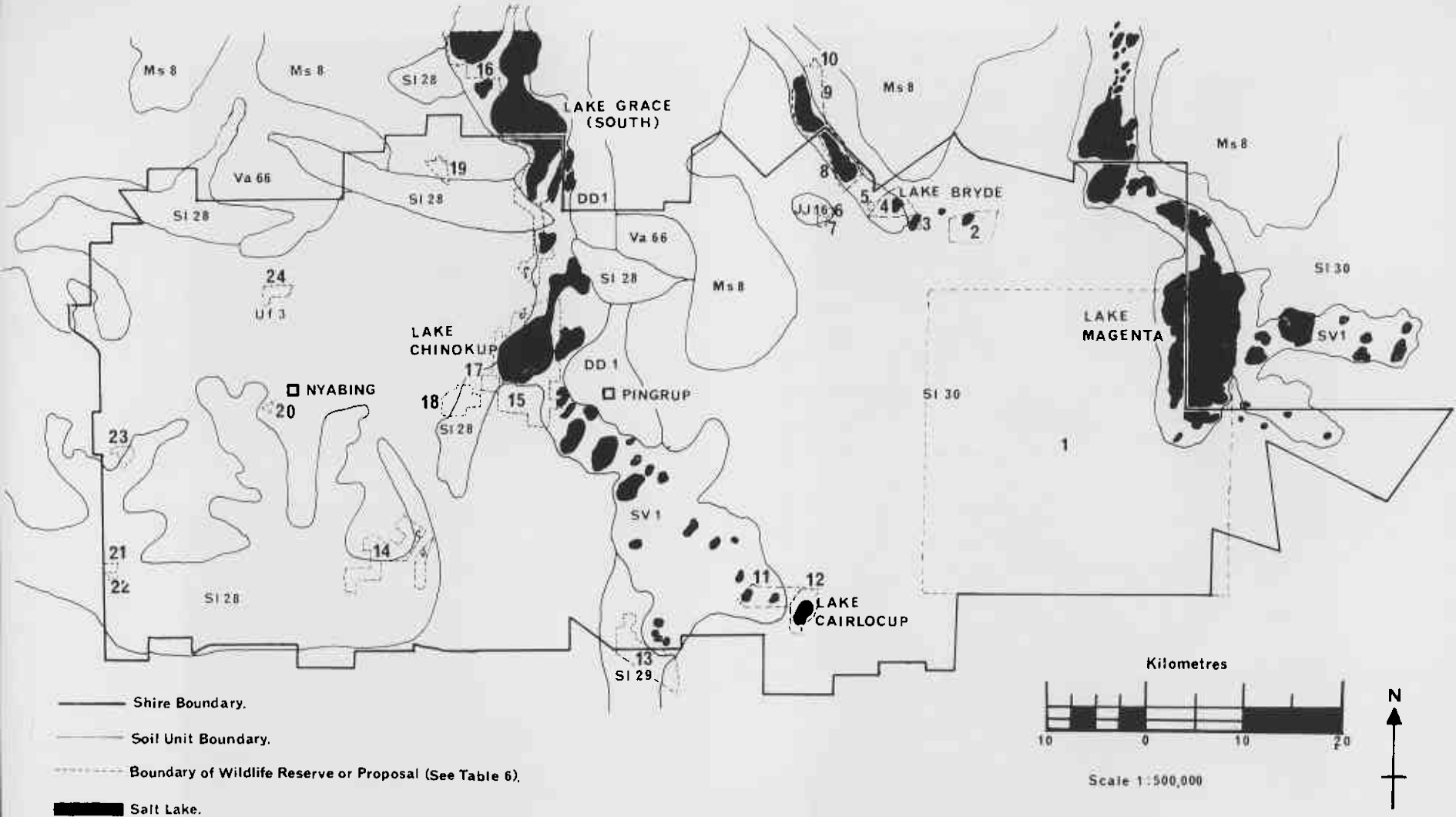


PLATE 1. NYABING-PINGRUP SOIL UNITS.

Extracted From "Atlas of Australian Soils, Sheet 5."

Photo 1 Woodland

Photo 2 Open Heath

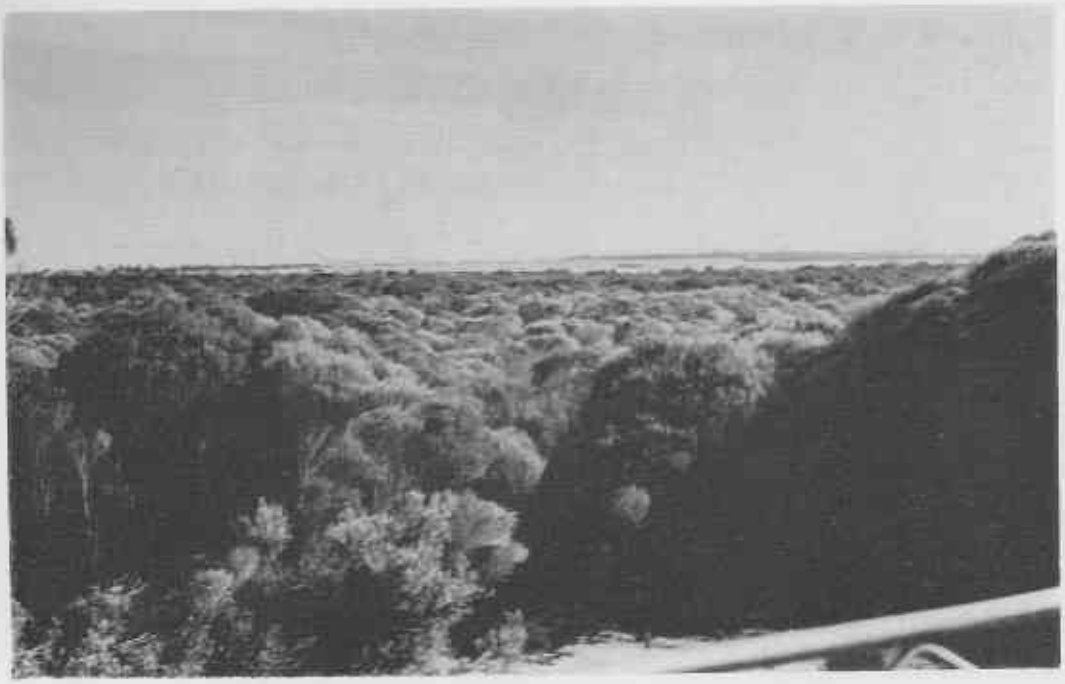


Photo 3 High Shrubland

Photo 4 Open Scrub

5. Open Heath

Acacia sp. (2.5m)
Calothamnus quadrifidus R.Br.
Isopogon buxifolius R.Br.
Hakea incrassata R. Br.
Petrophile divaricata R. Br.
Eremaea pauciflora (Endl.) Druce

6. Tall Shrubland

Eucalyptus anceps R.Br.
Melaleuca lateriflora Benth.
Melaleuca adnata Turcz.

7. Tall Shrubland

Two species of Mallee
Melaleuca pentagona Labill.
Gastrolobium reticulatum (Meisn) Benth.

8. Open Scrub

Eucalyptus redunca Schau. (5-6m)
Eucalyptus incrassata Labill.
Callitris drummondii (Parlat.) F. Muell.
Melaleuca sp.
Isopogon sp.
Dryandra cirsioides Meisn.
Exocarpus sp.
Santalum sp.

9. Open Heath

Eucalyptus incrassata Labill.
Petrophile divaricata R. Br.
Hakea platysperma (Hook.

Hakea trifurcata (Sm.) R.Br.
Dryandra sp.
Calothanmus quadrifidus R.Br.
Grevillea pritzellii Diels.
Petrophile squamata R.Br.
Callitris drummondii (Parlat.) F.Muell.
Banksia cayleyi R.Br.

10. Closed Heath

Leptospermum erubescens Schau.
Hakea trifurcata (Sm.) R.Br. (2.5-3m)
Calothamnus quadrifidus R.Br.
Grevillea pritzellii Diels.
Banksia cayleyi R.Br.
Eremaea pauciflora (Endl.) Druce.
Dryandra sp.
Phyllota dasyphylla Turcz.

↑ 24589

1. Low Woodland

Eucalyptus salubris (10m)
Eucalyptus platypus var platypus Hook.
Melaleuca lateriflora Benth.

2. Low Closed Forest

Eucalyptus platypus var platypus Hook. (7m)

3. Open Scrub & Tall Shrubland

Mallee
Melaleuca uncinata R. Br.

4. Open Heath

Hakea sp. (several)

Isopogon buxifolius R.Br.

↑28395

1. Open Scrub (4m)

Eucalyptus redunca Schau.

Eucalyptus anceps R.Br.

Melaleuca uncinata R.Br. (1m)

2. Tall Shrubland (4-5m)

Eucalyptus redunca Schau.

Eucalyptus leptocalyx Blakely

Santalum sp. (5m)

Melaleuca sp. (2m)

Melaleuca uncinata R.Br. (2m)

Isopogon buxifolius R.Br. (1.5m)

3. Low Shrubland (2m)

Eucalyptus angustissima F. Muell

Melaleuca sp. (1m)

Isopogon buxifolius R. Br. (1m)

4. Tall Open Shrubland

3. plus areas of 2.

5. Open Heath (2m)

Conostephium drummondii (Stschegl.) C.A. Gard.

Melaleuca sp.

Melaleuca eleuthrostachya F. Muell.

Melaleuca affin scabra R.Br.

6. Open Heath (1-2m)

Leptospermum podanthum (F.Muell.) Diels
Regelia inops Schau.

7. Low Shrubland (0.3m)

Chaenopodiaceae in decumbent mats.

8. Tall Shrubland (2-3m)

Eucalyptus angustissima F. Muell.
Eucalyptus redunca Schau.
Leptospermum erubescens Schau. (1-2m)
Melaleuca pentagona Labill.

9. Tall Shrubland (2-3m)

Melaleuca lateriflora Benth.
Melaleuca sp.

10. Open Heath (1m)

Eremaea pauciflora (Endl) Druce.
Regelia inops Schau.
Leptospermum erubescens Schau.
Banksia baueri R.Br.
Adenanthos cuneata Labill.

11. Tall Open Shrubland (4m)

Eucalyptus leptocalyx Blakely
Beaufortia micrantha Schau. (1m)
Eremaea pauciflora (Endl) Druce.
Melaleuca sp.
Isopogon buxifolius R.Br.
Hakea sp.

12. Swamp Complex (1m)

Gahnia polyphylla Benth.
some Eucalyptus foecunda Schau. (2m)
Melaleuca sp.

13. Open Heath (1-2m)

sparse emergent Banksia prionotes Lindl. (4-5m)
Adenanthos cuneata Labill.
Banksia baueri R.Br.
Dryandra nivea R.Br.
Hakea corymbosa R.Br.
Styphelia tenuiflora Lindl.
Petrophila ericifolia R.Br.
Eremaea pauciflora (Endl) Druce.

14. Open Scrub

Eucalyptus leptocalyx Blakely (5m)
Eucalyptus foecunda Schau. (2m)
Bossiaea walkeri F. Muell.
Melaleuca sp.

15. Open Scrub (2-3m)

Eucalyptus foecunda Schau.
Gahnia polyphylla Benth.

16. Open Heath - Swamp Complex 9

Same as 12.
Areas of Melaleuca lateriflora Benth. (0.3m)

17. Low Shrubland

Chaenopodiaceae in decumbent mats.
Melaleuca thyoides Turcz. (1m)

18. Low Shrubland (0.5m)

Melaleuca uncinata R.Br.
Melaleuca lateriflora Benth.

19. Open Woodland (15-18m)

Eucalyptus salmonophloia F. Muell
Eucalyptus annulata Benth. (6-8m)
Eucalyptus platypus var platypus Hook. (3-5m)

20. Tall Shrubland

Eucalyptus platypus var platypus Hook. (3-5m)
Melaleuca uncinata R.Br.
Melaleuca lateriflora Benth.

21. Open Woodland (15-18m)

Eucalyptus salmonophloia F. Muell.
Eucalyptus annulata Benth. (6-8m)
Melaleuca cuticularis Labill. (2m)
Melaleuca acuminata F. Muell. (2m)

22. Open Scrub (2-3m)

Eucalyptus redunca Schau.
Melaleuca uncinata R.Br. (1-1.5m)

23. Open Heath (1-2m)

Melaleuca uncinata R.Br.
Melaleuca lateriflora Benth.
Melaleuca sp.

24. Open Heath (2m)

Melaleuca thyoides Turcz.
some Chaenopodiaceae mats.

25. Tall Shrubland (3-4m)

Eucalytus spathulata Hook.
Melaleuca uncinata R.Br. (2m)
Bossiaea walkeri F. Muell

26. Woodland (12-15m)

Eucalyptus sp.
Melaleuca uncinata R.Br. (2-3m)

27. Open Woodland

Eucalyptus occidentalis var *occidentalis* Endl.
Atriplex visicaria Benth.
Acacia nysophylla F. Muell.
Chaenopodiaceae mats.

28. Low Open Shrubland (2m)

Eucalyptus angustissima F. Muell.
Melaleuca aff. *scabra* R.Br. (0.5m)
Actinostrobus pyramidalis Miq. (2m)

29. Open Scrub (2-3m)

Melaleuca lateriflora Benth.

30. Woodland

Eucalyptus sp.

31. Tall Shrubland (2-3m)

Eucalyptus sp. (Mallee)
Isopogon buxifolius R.Br.
Regelia inops Schau.

32. Tall Shrubland

Banksia prionotes Lindl.
Isopogon buxifolius R.Br.
other Myrtaceae/Proteaceae (1m)

33. Tall Open Shrubland

Banksia prionotes Lindl.
Isopogon buxifolius R.Br.
other Myrtaceae/Proteaceae (1m)

34. Tall Shrubland

Eucalyptus sp. (Mallee)
Banksia prionotes Lindl.
Leptospermum sp.
Isopogon buxifolius R.Br.
various Myrtacea (1m)

↑18803

1. Open Scrub

Eucalyptus eremophila (Diels.) Maiden (3-4m)
Eucalyptus kondinensis Maiden and Blakely (3-4m)
Melaleuca acuminata F. Muell. (1-2m)

2. Closed Heath (1-2m)

Casuarina campestris Diels.
Dryandra sp.
Melaleuca affin scabra R.Br.
Hakea falcata R.Br.
Calothamnus quadrifidus R.Br.

3. Closed Heath (1-1.5m)

Melaleuca affin *scabra* R.Br.

Calothamnus quadrifidus R.Br.

4. Open Scrub

Eucalyptus eremophila (Diels) Maiden (3-4m)

Eucalyptus kondinensis Maiden and Blakely (3-4m)

Melaleuca adnata Turcz.

Melaleuca uncinata R.Br.

Acacia viscifolia Maiden and Blakely

5. Open Heath (1-2m)

Casuarina campestris Diels.

6. Tall Open Shrubland

Eucalyptus loxophleba sub *gratiae* (Benth. and Brooker)(5-6m)

Melaleuca uncinata R.Br. (1-1.5m)

Santalum sp. (2m)

7. Open Scrub

Eucalyptus loxophleba sub *gratiae* (Benth.and Brooker)(5-6m)

Melaleuca acuminata F. Muell.

8. Open Woodland

Eucalyptus salmonophloia F. Muell.

Eucalyptus gracilis F. Muell.

Eucalyptus eremophila (Diels.) Maiden

Melaleuca adnata Turcz.

9. Closed Scrub (3-4m)

Eucalyptus platypus var *platypus* Hook.

Eucalyptus annulata Benth. (Mallee form)

10. Open Scrub (4-6m)

Eucalyptus annulata Benth.
Eucalyptus oleosa F.Muell.
Eucalyptus platypus var platypus Hook. (2-3m)

11. Woodland (11-12m)

Eucalyptus oleosa F. Muell.
Eucalyptus salmonophloia F. Muell. (15m)
Eucalyptus platypus var platypus Hook. (5m)

12. Low Open Forest (11-12m)

Eucalyptus oleosa F. Muell.
Eucalyptus redunca Schau. (6-8m)
Eucalyptus platypus var platypus Hook. (5m)
Melaleuca acuminata F. Muell.
Melaleuca sp.

13. Low Open Forest (11-12m)

Eucalyptus oleosa F. Muell.
Eucalyptus ? astringens Maiden
Eucalyptus platypus var platypus Hook. (5-6m)

14. Woodland

Eucalyptus salmonophloia F. Muell.
Templtonia sulcata Benth. (0.5m)
Acacia sp. (2-3m)

16. Woodland

Eucalyptus salmonophloia F. Muell. (12-15m)

Eucalyptus loxophleba Benth. (10-12m)

Templetonia sulcata Benth.

17. Closed Scrub

Eucalyptus gracilis F. Muell. (3-4m)

Eucalyptus kondininensis Maiden & Blakely

Eucalyptus spathulata Hook. (3-4m)

Eucalyptus loxophleba Benth.

Melaleuca acuminata F. Muell.

Templetonia sulcata Benth. (1-1.5m)

18. Woodland

Eucalyptus loxophloeba Benth. (12-15m)

Eucalyptus oleosa F. Muell. (13-15m)

19. Closed Scrub

Eucalyptus loxophleba Benth. (12m)

Eucalyptus platypus var platypus Hook. (4-5m)

Melaleuca acuminata F. Muell.

20. Open Scrub

Eucalyptus redunca Schau. (3.5m)

Melaleuca laxiflora Turcz.

Melaleuca uncinata R.Br. (1-1.5m)

21. Open Scrub

Eucalyptus redunca Schau. (2-2.5m)

Dryandra sp. (1m)

Melaleuca sp. (1m)

Melaleuca affin scabra R.Br. (1m)

Leptospermum erubescens Schau.

23. Woodland

Eucalyptus oleosa F. Muell. (4.5-14m)
Melaleuca acuminata F. Muell.
Melaleuca pauperiflora F. Muell.
Hakea commutata F. Muell.

24. Open Scrub

Eucalyptus redunca Schau.
Melaleuca acuminata F. Muell (1-1.5m)

25. Low Woodland

Eucalyptus oleosa F. Muell. (10-14m)
Eucalyptus platypus var platypus Hook. (4-5m)
Melaleuca acuminata F. Muell. (1m)

26. Woodland

Eucalyptus platypus var platypus Hook. (10-11m)
Eucalyptus sp. (12-14m)
Eucalyptus salmonophloia F. Muell. (15-20m)

27. Woodland

Eucalyptus loxophleba Benth. (15m)
Eucalyptus oleosa F. Muell. (12-15m)
Eucalyptus platypus var platypus Hook. (3-4m)

28. Open Scrub

Eucalyptus redunca Schau. (3-4m)
Eucalyptus anceps R.Br. (Blakely)(3-4m)
Melaleuca uncinata R.Br. (1-2m)
Melaleuca sp. (1-2m)

29. Open Heath

Hakea platysperma Hook. (1-2m)
Hakea trifurcata (Sm.) R.Br. (1-2m)
Leptospermum erubescens Schau. (1-2m)
Grevillea sp. (1-2m)
Leptospermum roei Benth. (1-2m)
Hakea baxteri R. Br. (1-2m)
Petrophile ericifolia R.Br. (1-2m)
Eremaea pauciflora (Endl.) Druce. (1-2m)
Hakea sp.

↑23219

1. Open Scrub

Eucalyptus redunca Schau.
Eucalyptus anceps (R.Br.) Blakely
Melaleuca lateriflora R.Br.
Leptospermum sp.
Melaleuca uncinata R.Br.

↑ 20046

1. Open Heath

Lambertia inermis R.Br. (4.5m)
Hakea trifurcata (Sm.) R.Br. (0.5 - 0.75m)
Eremaea pauciflora (Endl.) Druce
Hakea falcata R.Br.
Hakea baxteria R.Br.
Dryandra cuneata R.Br.
Leptospermum erubescens Schau.

2. Open Heath

Eucalyptus falcata Turcz. (3-4m)
Eucalyptus albida Maiden & Blakely (3-4m)
Dryandra cirsioides Meisn. (1-1.5m)
Hakea platysperma Hook.
Gastrolobium spinosum Benth.
Casuarina humilis
Banksia sphaerocarpa R.Br.
Isopogon teretifolius R.Br.
Melaleuca pungens Schau.
Melaleuca scabra R.Br.

3. Tall Shrubland

As in 2. - more Mallee

4. Low Open Forest

Eucalyptus astringens Maiden. (10m)
Melaleuca subtrigona Schau. (2m)
Dryandra cirsioides Meisn.

↑ 9219

1. Low Woodland

Eucalyptus loxophleba Benth. (6-7m)
Casuarina heugeliana Miq. (5-6m)
Acacia acuminata Benth. (5-6m)
Santalum spp.
sedges.

2. Tall Open Shrubland

Eucalyptus uncinata Turcz. (3m)

Calothamnus quadrifidus R.Br.
Hakea trifurcata (Sm.) R.Br.
Grevillea sp.
Leptospermum erubescens Schau.

3. Open Heath (1-2m)

Calothamnus quadrifidus R.Br.
Hakea trifurcata (Sm.) R.Br.
Casuarina humilis
Casuarina campestris Diels.
Isopogon teretifolius R.Br.
Hakea falcata Turcz.
Eremea pauciflora (Endl.) Druce
sedges.

4. Tall Shrubland

Eucalyptus sp. (mallee)
Melaleuca uncinata R.Br.
sedges.

5. Woodland & Open Forest

Eucalyptus salmonophloia F. Muell.
Eucalyptus occidentalis Endl.
Melaleuca pungens Schau. (2-3m)
Acacia acuminata Benth. (3-4m)
Casuarina huegeliana Miq. (3-4m)
Eucalyptus loxophleba Benth. (4-5m)

6. Open Scrub

Eucalyptus foecunda Schau.
Eucalyptus redunca Schau. (3-4m)
Melaleuca uncinata R.Br.

Isopogon buxifolius R.Br.
Hakea trifurcata (Sm.) R.Br.
sedges.

A13448, A11519

1. Low Woodland

Eucalyptus loxophleba Benth. (5-6m)
Casuarina heugeliana Miq. (3-4m)
Acacia acuminata Benth. (3-5m)
herbaceous layer (disturbed)

2. Low Shrubland

Chaenopodaceae in low decumbent mats.
Paperbarks (few, 3-4m)
Melaleuca spp.

A14522

1. Woodland (18m)

Eucalyptus redunca var elata Schau.
Eucalyptus loxophleba Benth.
Casuarina heugeliana Miq.

2. Open Forest (18m-20m)

Eucalyptus redunca var elata Schau.
Eucalyptus loxophleba Benth.
Acacia acuminata Benth.
Xanthorrhoea reflexa Herbert
Melaleuca uncinata R.Br.
some Eucalyptus occidentalis Endl.

3. Open Scrub (3m)

Eucalyptus falcata Turcz.
Gastrolobium spinosum Benth.
Dryandra sp.
some Eucalyptus redunca var elata Schau.
some Eucalyptus loxophleba Benth.

↑ 26381

1. Tall Shrubland

Eucalyptus spathulata Hook. (2-4m)
Eucalyptus anceps (R.Br. ex. Maiden) Blakely (2-4m)
Eucalyptus transcontinentalis Maiden
Melaleuca uncinata R.Br.
Isopogon buxifolius R.Br.
Melaleuca lateriflora Benth. var acutifolia Benth.
Exocarpus aphyllus R.Br.

2. Open Heath

sparse emergent mallee's of 1.
Melaleuca uncinata R.Br.

3. Woodland

Eucalyptus salmonophloia F. Muell.
Melaleuca uncinata R.Br.

APPENDIX 2

Variability of Vegetation Formations

Woodland

1. *Eucalyptus occidentalis*
   Eucalyptus salmonophloia
   Melaleuca hamulosa
   Melaleuca uncinata
   Melaleuca pentagona

2. *Eucalyptus occidentalis*
   Eucalyptus salmonophloia
   Daviesia nematophylla
   Melaleuca adnata
   Hakea commutata
   Cassina arcuata

3. *Eucalyptus sp.*
   Melaleuca uncinata

4. *Eucalyptus* sp.
   Eucalyptus sp. (mallet)

5. *Eucalyptus oleosa*
   Eucalyptus salmonophloia
   Eucalyptus platypus

6. *Eucalyptus salmonophloia*
   Templetonia sulcata
   Acacia sp.

7. Eucalyptus salmonophloia
Eucalyptus loxophleba
Templetonia sulcata

8. Eucalyptus loxophleba
Eucalyptus oleosa
Eucalyptus platypus var platypus

9. Eucalyptus loxophleba
Eucalyptus oleosa

10. Eucalyptus oleosa
Melaleuca acuminata
Melaleuca pauperiflora
Hakea commutata

11. Eucalyptus salmonophloia
Eucalyptus pileata
Melaleuca uncinata
Melaleuca adnata
Melaleuca acuminata

12. Eucalyptus salmonophloia
Melaleuca adnata

13. Eucalyptus occidentalis var occidentalis
Atriplex cf versicavia
Chaenopodaceae

14. Eucalyptus salmonophloia
Eucalyptus anceps

15. Eucalyptus salmonophloia
Eucalyptus sp.
Melaleuca pauperiflora

16. Eucalyptus salmonophloia
Eucalyptus occidentalis var occidentalis
Melaleuca aff. pungens
Acacia acuminata

17. Eucalyptus occidentalis var occidentalis
Melaleuca lateriflora
Acacia sp.

18. Eucalyptus var elata
Eucalyptus loxophleba
Casuarina heugeliana

19. Eucalyptus kondininensis
Eucalyptus salmonophloia
Eucalyptus occidentalis var occidentalis
Santalum acuminatum
Pittosporum phillyraeoides
Exocarpus aphyllus

20. Eucalyptus salmonophloia
Melaleuca uncinata

Low Woodland

1. Eucalyptus loxophleba
Casuarina heugeliana
Acacia acuminata
Santalum sp.
Sedges

2. Eucalyptus oleosa
Eucalyptus platypus var platypus
Melaleuca acuminata

3. Eucalyptus salubris
Eucalyptus platypus var platypus
Melaleuca lateriflora

Open Woodland

1. Eucalyptus salmonophloia
Eucalyptus annulata
Eucalyptus platypus var platypus
Melaleuca ? cuticularis
Melaleuca acuminata

2. Eucalytpus salmonophloia
Eucalyptus gracilis
Eucalyptus eremophila
Melaleuca adnata

Open Forest

1. Eucalyptus occidentalis
Eucalyptus redunca var alata
Eucalyptus loxophleba
Acacia acuminata
Melaleuca uncinata
Xanthorrhoea reflexa

2. Eucalyptus occidentalis
Eucalyptus loxophleba
Casuarina heugeliana
Acacia acuminata
Melaleuca aff. pungens

Low Open Forest

1. Eucalyptus angulosa
   Eucalyptus kondininensis
   Coleanthera myrtoides
   Daviesia acanthocona
   Beyeria brevifolia

2. Eucalyptus redunca
   Coleanthera myrtoides
   Phebalium tuberculosum
   Melaleuca laxiflora
   Dodonaea amblyophylla
   Beyeria brevifolia

3. Eucalytpus astringens
   Melaleuca subtrigona
   Dryandra cirsioides

4. Eucalyptus redunca
   Melaleuca acuminata
   Melaleuca sp.

5. Eucalyptus salmonophloia
   Acacia sp.
   Templetonia sulcata

6. Eucalyptus floktoniae
   Eucalyptus salubris
   Daviesia acanthocona
   Melaleuca cuticularis
   Melaleuca corynocarpa

Low Closed Forest

1. Eucalyptus platypus var platypus

2. Eucalyptus occidentalis var occidentalis
   Eucalyptus sp.
   Melaleuca acuminata
   Melaleuca lateriflora

3. Eucalyptus floktoniae
   Melaleuca depauperata
   Beaufortia micrantha

4. Eucalyptus sp.
   Exocarpus aphyllus
   Hakea incrassata
   Daviesia nematophylla
   Cryptandra sp.
   Grevillea patenteloba
   Melaleuca adnata
   Spyridium sp.

Tall Shrubland

1. Eucalyptus foecunda
   Eucalyptus ridgidula
   Exocarpus spartens
   Acacia ritidula
   Gastrolobium reticulatum
   Isopogon buxifolius
   Melaleuca uncinata
   Dryandra calophylla

2. Eucalyptus spathulata
   Eucalyptus anceps
   Eucalyptus transcontinentalis
   Isopogon buxifolius
   Melaleuca ? lateriflora
   Exocarpus aphyllus

3. Eucalyptus anceps
   Melaleuca lateriflora
   Melaleuca adnata

4. Eucalyptus spp.
   Melaleuca pentagona
   Gastrolobium reticulatum
   Lepidosperma viscidum

5. Eucalyptus redunca
   Eucalyptus leptocalyx
   Santalum sp.
   Melaleuca sp.
   Melaleuca uncinata
   Isopogon buxifolius

6. Eucalyptus angustissima
   Eucalyptus reduhca
   Leptospermum erubescens
   Melaleuca pentagona

7. Melaleuca sp.
   Melaleuca lateriflora

8. Eucalyptus platypus var platypus
Melaleuca uncinata
Melaleuca lateriflora

9. Eucalyptus spathulata
Melaleuca uncinata
Bossiaea walkeri

10. Eucalyptus sp.
Isopogon buxifolius
Regelia inops

11. Banksia prionotes
Myrtacea & Proteacea
Isopogon buxifolius

12. Eucalyptus sp.
Banksia prionotes
Myrtacea
Leptospermum sp.
Isopogon buxifolius

13. Eucalyptus oleosa
Eucalyptus anceps
Melaleuca uncinata
Hakea sp.
Melaleuca depauperata

14. Eucalyptus ? astringens
Eucalyptus anceps
Melaleuca pentagona
Hakea trifurcata
Isopogon buxifolius

Petrophila squamata
Hakea corymbosa
Banksia violacea

15. Eucalyptus falcata
Melaleuca uncinata
Melaleuca adnata
Melaleuca spicigera
Spyridium cordatum

16. Eucalyptus longicornis
Melaleuca lateriflora
Melaleuca uncinata
Exocarpus aphyllus
Cryptandra sp.
Grevillea pectinata
Daviesia acanthocona

17. Eucalyptus redunca
Eucalyptus occidentalis
Melaleuca uncinata
Leucopogon sp.
Beaufortia schaueri
Hakea dolichostyla
Gastrolobium crassifolium
Banksia media
Isopogon buxifolius
Hakea multilineata

18. Eucalyptus anceps
Eucalyptus foecunda
Eucalyptus eremophila

Eucalyptus spathulata
Melaleuca uncinata

19. Eucalyptus astringens
Petrophila ericifolia
Eremaea panciflora
Isopogon buxifolius
Leptospermum erubescens

20. Eucalyptus astringens
Eucalyptus redunca
Isopogon buxifolius
Hakea sp.
Hakea corymbosa
Leptospermum erubescens

21. Eucalyptus astringens
Eucalyptus redunca
Isopogon buxifolius
Hakea sp.
Hakea corymbosa
Leptospermum erubescens
Melaleuca uncinata

22. Eucalyptus astringens
Eucalyptus redunca
Isopogon buxifolius
Hakea sp.
Hakea corymbosa
Leptospermum erubescens
Callitris drummondii

23. Eucalyptus uncinata
Eucalyptus anceps
Melaleuca depauperata
Leptomeria preissiana
Melaleuca uncinata

24. Eucalyptus astringens
Leptospermum erubescens
Callitris drummondii
Hakea corymbosa
Melaleuca aff subtrigona
Melaleuca uncinata

25. Eucalyptus redunca
Eucalyptus eremophila
Hakea multilineata
Melaleuca uncinata
Leptomeria preissiana

26. Eucalyptus redunca
Eucalyptus eremophila
Beaufortia micrantha
Isopogon scabriusculus
Grevillea pritzelii
Casuarina acutivalvis
Callitris preissii Miq ssp. verrucosa

27. Leucopogon corynocarpus
Leucopogon woodsii
Melaleuca ? cuneata

28. Eucalyptus reduncа
Eucalyptus eremophila
Melaleuca uncinata
Kunzea sp.
Melaleuca ? scabra

29. Eucalyptus oleosa
Eucalyptus pileata
Melaleuca uncinata
Melaleuca ? scabra
Melaleuca holosericea

30. Eucalyptus ? spathulata
Eucalyptus leptocalyx
Melaleuca uncinata

Tall Open Shrubland

1. Eucalyptus uncinata
Calothamnus quadrifidus
Hakea trifurcata
Grevillea sp.
Leptospermum erubescens

2. Acacia sp.
Acacia sp.

3. Melaleuca uncinata
Leptospermum erubescens
Melaleuca cuticularis
Melaleuca thyoides

4. Banksia prionotes
Petrophila ericifolia
Hakea sp.
Eremaea pauciflora
Hakea trifurcata
Leptospermum erubescens
Dryandra cuneata

5. Eucalyptus leptocalyx
Beaufortia micrantha
Eremaea pauciflora
Melaleuca sp.
Isopogon buxifolius
Hakea sp.

6. Eucalyptus loxophleba
Melaleuca uncinata
Santalum sp.

7. Eucalyptus loxophleba
Melaleuca uncinata
Santalum sp.
Casuarina campestris

Low Shrubland

1. Eucalyptus angustissima
Melaleuca sp.
Melaleuca uncinata
Isopogon buxifolius
Santalum sp.

2. Sparse Chenopodiaceae

3. Chenopodiaceae round salt lake basins.

4. Eucalyptus spathulata
   Melaleuca thyoides

5. Paperbarks & other Melaleuca spp.
   Vegetation principally Chaenopodiaceae

Low Open Shrubland

1. Eucalyptus angustissima
   Melaleuca aff scabra
   Actinostrobus pyramidalis

Open Scrub

1. Eucalyptus eremophila
   Eucalyptus kondininensis
   Melaleuca acuminata

2. Eucalyptus eremophila
   Eucalyptus kondininensis
   Melaleuca acuminata
   Melaleuca adnata
   Melaleuca uncinata
   Acacia viscifolia

3. Eucalyptus loxophleba sub gratiae
   Melaleuca acuminata

4. Eucalyptus annulata
   Eucalyptus oleosa
   Eucalyptus platypus var platypus
   Melaleuca pauperiflora

5. Eucalyptus redunca
Melaleuca laxiflora
Melaleuca uncinata

6. Eucalyptus redunca
Dryandra sp.
Melaleuca sp.
Melaleuca affin scabra

7. Eucalyptus redunca
Melaleuca sp.
Melaleuca affin scabra
Leptospermum erubescens

8. Eucalyptus redunca
Melaleuca acuminata

9. Eucalyptus redunca
Eucalyptus anceps
Melaleuca sp.
Melaleuca uncinata

10. Eucalyptus redunca
Eucalyptus falcata
Gastrolobium spinosum
Xanthorrhoea reflexa

11. Eucalyptus spathulata
Eucalyptus leptocalyx
Melaleuca uncinata
Melaleuca sp.
Melaleuca holosericea

Exocarpus aphyllus
Isopogon buxifolius

12. Eucalyptus leptocalyx
Eucalyptus foecunda
Bossiaea walkeri
Melaleuca sp.
Rushes

13. Melaleuca lateriflora

14. Eucalyptus redunca
Eucalyptus astringens
Leptospermum erubescens
Callitris drummondii
Hakea corymbosa
Melaleuca subtrigona
Melaleuca uncinata
Verticordia nitens

15. Eucalyptus anceps
Eucalyptus foecunda
Melaleuca depauperata
Melaleuca uncinata
Callitris roei

16. Eucalyptus foecunda
Eucalyptus sp.
Melaleuca ? subtrigona
Melaleuca uncinata
Gastorlobium reticulatum

17. Lambertia inermis
Petrophila squamata
Hakea trifurcata
Hakea platyspermum
Isopogon teretifolius
Petrophila trifida
Melaleuca scabra

18. Eucalyptus redunca
Eucalyptus incrassata
Callitris drummondii
Melaleuca sp.
Isopogon sp.
Dryandra cirsioides
Santalum sp.

19. Eucalyptus spathulata
Eucalyptus annulata puncinata ?? Eucalyptus scyphocalyx
Grevillea pectinata
Hakea commutata
Melaleuca lateriflora
Melaleuca uncinata

20. Eucalyptus falcata
Gastrolobium spinosum
Dryandra sp.

Closed Scrub

1. Eucalyptus platypus var platypus
Eucalyptus annulata

2. Eucalyptus gracilis
Eucalyptus kondininensis
Eucalyptus spathulata
Eucalyptus loxophleba
Melaleuca acuminata
Tempeltonia sulcata

3. Eucalyptus platypus var platypus
Eucalyptus flocktoniae
Exocarpus aphyllus
Melaleuca undulata
Grevillea pectinata
Hakea incrassata
Glischrocargon aureum
Acacia glaucoptera

4. Eucalyptus platypus var platypus
Exocarpus aphyllus
Melaleuca undulata
Grevillea pectinata

Open Heath

1. Lambertia inermis
Hakea trifurcata
Eremaea pauciflora
Hakea falcata
Dryandra cuneata
Leptospermum erubescens

2. Eucalyptus falcata
Eucalyptus albida
Dryandra cirsioides

Hakea platysperma
Gastrolobium spinosum
Casuarina humilis
Banksia sphaerocarpa
Isopogon tertifolius
Melaleuca pungens
Melaleuca scabra
Casuarina campestris

3. Hakea trifurcata
Hakea platysperma
Leptospermum erubescens
Grevillea sp.
Leptospermum roei
Hakea baxteri
Petrophile ericifolia
Eremaea pauciflora
Hakea sp.

4. Eucalyptus anceps
Acacia sp.
Isopogon buxifolius
Hakea trifurcata
Hakea prostrata
Hakea corymbosa
Hakea sp.
Exocarpus sparteus
Regelia inops
Daviesia brevifolia
Dryandra calophylla
Ghania trifida
Platysace deflexa

5. Eucalyptus incrassata
Banksia cayleyi
Melaleuca uncinata
Isopogon buxifolius
Hakea sp.
Grevillea pritzelii
Melaleuca ? scabra

6. Eucalyptus reduncа
Lambertia inermis
Petrophila squamata
Hakea trifurcata
Hakea platyspermum
Melaleuca aff pungens
Casuarina humilis
Eremaea pauciflora

7. Acacia sp.
Calothamnus quadrifidus
Isopogon buxifolius
Hakea incrassata
Petrophila divaricata
Callitris drummondii
Eremaea pauciflora

8. Eucalyptus incrassata
Petrophila divaricata
Hakea platyspermum
Hakea trifurcata
Dryandra sp.
Calothamnus quadrifidus
Grevillea pritzellii
Petrophila squamata
Callitris drummondii

Banksia cayleyi

9. Conostephium drummondii
Melaleuca sp.
Melaleuca eleutherastachya
Melaleuca affin scabra

10. Leptospermum podanthum
Regelia inops

11. Eremaea pauciflora
Regelia inops
Leptospermum erubescens
Banksia baueri
Adenanthos cuneata

12. Banksia prionotes
Adenanthos cuneata
Banksia baueri
Dryandra nivea
Hakea corymbosa
Styphelia tenuiflora
Petrophila ericifolia
Eremaea pauciflora

13. Melaleuca uncinata
Melaleuca lateriflora
Melaleuca sp.

14. Melaleuca thyoides
Chaenopodiaceae

15. Hakea falcata
Petrophile divaricata
Calothamnus quadrifidus
Proteaceae & Myrtaceae

16. Eucalyptus leptocalyx
Proteaceae & Myrtaceae

17. Eucalyptus tetragona
Eucalyptus uncinata
Dryandra cuneata
Petrophila teretifolia
Hakea prostrata
Hakea falcuta
Latrobea abnormis
Dryandra pteridifolia
Melaleuca lateralis
Casuarina pinaster
Adenanthos flavidiflora

18. Eucalyptus tetragona
Eucalyptus uncinata
Melaleuca urceolaris
Melaleuca cuticularis
Beafortia schaueri
Hakea dolichostyla
Hakea multilineata
Hakea commutata
Latrobea abnormis
Dryandra pteridifolia
Casuarina pinaster

19. Grevillea eriostachya
Beaufortia micrantha
Isopogon scabriusculus
Grevillea pritzellii
Casuarina actuivalvis
Callitris preissii Miq ssp. verrucosa

Leucopogon corynocarpus
Leucopogon woodsii
Melaleuca ? cuneata

20. Eucalyptus uncinata
Grevillea pritzellii
Beaufortia micrantha
Isopogon scabruisculus
Melaleuca ? cuneata
Callitris roei
Hakea falcata
Adenanthos flavidiflora

21. Melaleuca ? pungens
Banksia violacea

22. Beaufortia micrantha
Hakea falcata
Melaleuca cuneata

23. Eucalyptus astringens
Proteaceae & Myrtaceae

24. Eucalyptus spathulata
Melaleuca lateriflora
Melaleuca uncinata
Exocarpus aphyllus

25. Casuarina campestris
Casuarina humilis
Isopogon teretifolius
Hakea falcata
Hakea trifurcata
Eremaea pauciflora
Calomthamnus quadrifidus
Grevillea sp.
Leptospermum erubescens

26. Eucalyptus spathulata
Eucalyptus anceps

Closed Heath

1. Leptospermum erubescens
Hakea trifurcata
Calothamnus quadrifidus
Grevillea pritzellii
Banksia cayleyi
Eremaea pauciflora
Dryandra sp.
Phyllota dasyphylla

2. Melaleuca sp.
Calothamnus quadrifidus

Swamp Complex

1. Eucalyptus foecunda
Ghania polyphylla
Melaleuca sp.
Melaleuca lateriflora

2. *Melaleuca cuticularis*
Melaleuca sp.
Ghania trifida

Lithic Complex

1. *Eucalyptus* ? *astringens*
Grevillea hookerana
Hakea subsulcata
Isopogon teretifolius
Melaleuca ? *cuneata*
Dryandra sp.

2. *Lepidosperma brunonianum*
Acacia sp.

APPENDIX 3

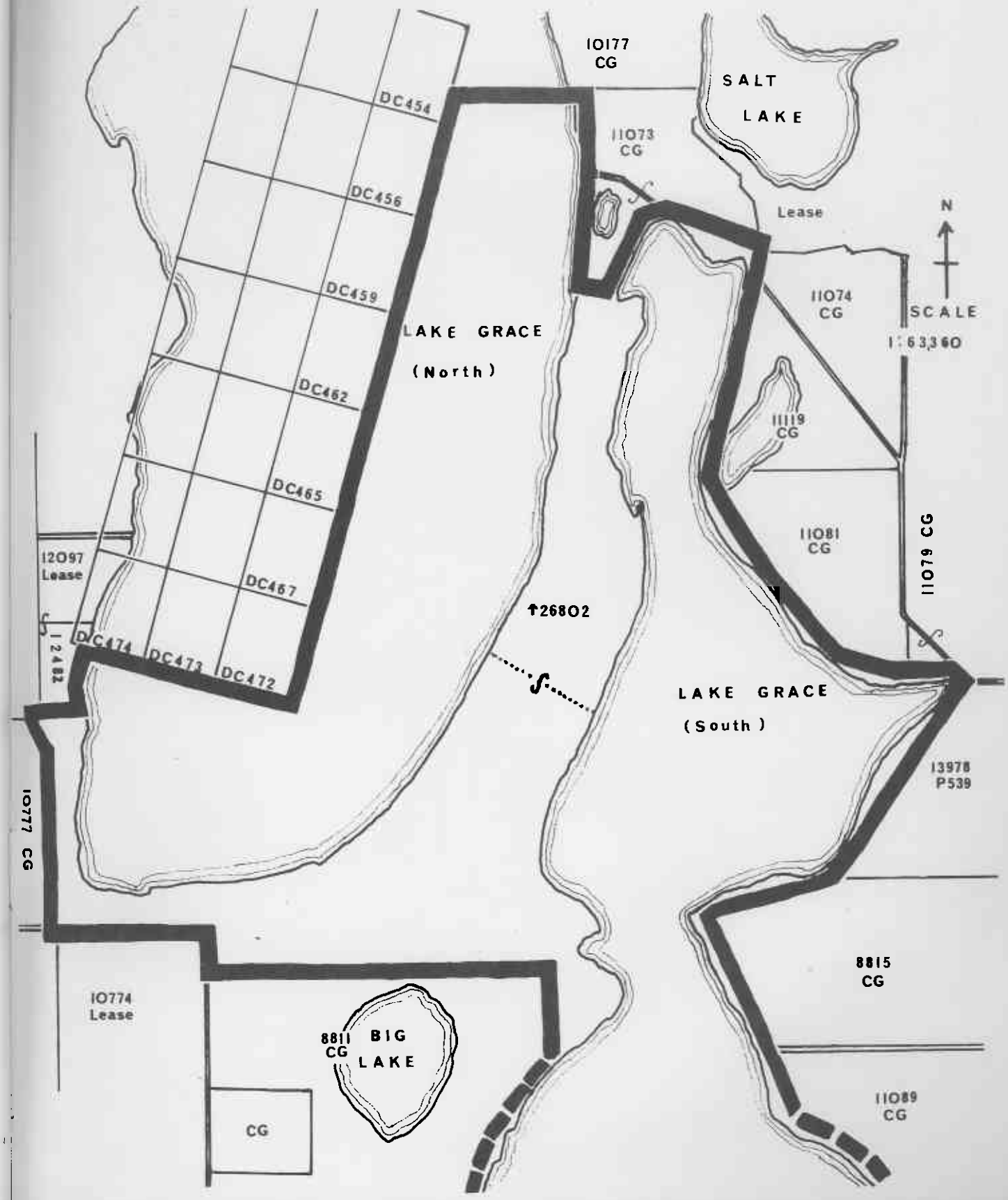
Description of Plant Formations *

Height	Density (Crown Cover) of Tallest Stratum			
	100-70%	70-30%	30-10%	10-0%
Trees 30m or more	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland
Trees 10m to 30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees 6m to 10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Shrubs 2m to 8m	Closed Scrub	Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 2m or less	Closed Heath	Open Heath	Low Shrubland	Low Open Shrubland
Herbs 2m or less	Continuous Grassland (Closed Tussock)	Tussock Grassland	Hummock Grassland	Open Hummock Grassland

*This terminology is derived from a system proposed by Specht (1970).

APPENDIX 4.

Northern Boundary of Lake Grace-Lake Chinocup Recommendation
Extracted from Lithographs 387/80 and 407/80



CORRIGENDUM

Department of Fisheries and Fauna - Western Australia
REPORT NO. 13
"Results of a Biological Survey of the Shire of Kent, Western Australia"
by N.L. McKenzie
September 1973

Page 12 — Reserve Number column - Chinocup Townsite
28395 and 26802 should be bracketed as follows:
28395)
26802)

Page 23 — Heading 'Areas Selected for Fauna Surveys'
All names (e.g. Lake Cairlocup System etc.) should be moved one column to the left.

Page 27 — Recommendation 17 - Comments column -
word 'their' at end of second last line should be substituted with the word 'this'.