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1980 Review of Rainfall and Wetlands in the South-West of Western Australia

BY

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AND

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PERTH
WESTERN AUSTRALIA

1981

Department of Fisheries and Wildlife

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R E P O R T

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CONTENTS

	Page
ABSTRACT	5
I INTRODUCTION	5
II RAINFALL, WETLANDS AND WATERFOWL BREEDING	6
III DUCK SHOOTING SEASONS	6
IV VARIATIONS IN RAINFALL AND CONDITIONS FOR BREEDING	7
V ASSESSMENT OF CONDITIONS	8
VI USE OF RAINFALL DATA IN ASSESSMENT OF CONDITIONS	8
VII CONCLUSION	9
VIII ACKNOWLEDGEMENTS	10

FIGURES

	Page
1. Boundaries of the South-West and Eucla Land Divisions	11
2. Rainfall recorded in the south-west of W.A., 1980 and Normal	12
3. Distribution of Decile Range Numbers of Rainfall, 1980	13
4. Rainfall recorded monthly in Meteorological Districts of the south-west, 1980 and Normal	14
5. Rainfall recorded annually in Meteorological Districts of the south-west, 1913 to 1980, expressed as Percentage Departures from Normal	15
6. Change in depth of 62 gauged wetlands, 1979 to 1980	17
7. Change in depth of 26 gauged wetlands, 1978 to 1980	18
8. Depth of gauged wetlands, November 1980 . . .	19
9. Depth and salinity variations of gauged wetlands, 1978 to 1980	20

	Page
10. Location of gauged wetlands in relation to rainfall (Jan-Oct 1980)	23

TABLES

	Page
1. November depths and salinities of gauged wetlands, 1978, 1979 and 1980. ...	16

**1980 REVIEW OF RAINFALL AND WETLANDS
IN THE SOUTH-WEST OF WESTERN AUSTRALIA**

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ABSTRACT

An account is given of the biological principles involved in decisions concerning duck-shooting seasons in the south-west of Western Australia.

The conditions for waterfowl which prevailed during 1980 are described through the use of rainfall statistics and data obtained from the Department's wetland monitoring programme.

1980 was the fifth consecutive year of below-average rainfall in all five Meteorological Districts of the south-west. 1976 to 1980 was thus the south-west's driest five-year period since 1913 at least.

Low rainfall during 1980 resulted in a further decline in the condition of wetlands throughout most of the inland south-west. Few gauged wetlands increased in depth by more than 50 cm over winter, and most were dry by November. Few of those which did contain water in November were more than 30 cm deep. Many important waterfowl sites were dry or virtually dry throughout the year.

As a result of the very poor conditions for waterfowl during 1980, no duck-shooting season was declared for the summer of 1980-81.

I INTRODUCTION

This publication has been prepared for the duck-shooting community, and for others who share an interest, either professional or amateur, in the management of waterbirds and wetlands in Western Australia. The aims of the document are twofold:-

- i) To briefly explain the biological principles upon which decisions concerning duck-shooting seasons in the south-west of the State are based, and
- ii) To describe, by the use of graphs, table and diagrams, the conditions for waterfowl which prevailed during the 12 months prior to determination of the 1981 duck-shooting season.

The report relates only to the south-west of the State, that is, the South West and Eucla Land Divisions. A continuous open season applies in the remainder of the State, due to the vast areas and very small number of inhabitants involved, and to the difficulty of access to most breeding areas following rain. The report gives little attention to the eastern half of the Eucla Land Division (i.e. the Nullarbor Plain) as rainfall in this area is generally less than 250 mm per annum and wetlands are virtually non-existent.

II RAINFALL, WETLANDS AND WATERFOWL BREEDING

Rainfall in the south-west of Western Australia is markedly seasonal. On average, approximately 70% of the total annual rainfall occurs during the months May to September, with 35% being recorded during June and July. As a consequence the wetlands (swamps, lakes, rivers, etc.) of the south-west show marked seasonal variations in water area and depth, with water levels rising during the wetter months of winter and spring and then falling during summer and autumn when little rain occurs and evaporation rates are high.

Waterfowl breed when conditions are most favourable, that is, when food and water are most abundant. In the south-west of W.A. this occurs during spring and early summer, when water levels reach their peak and warm weather accelerates the growth of aquatic plants and animals.

Nest construction and egg-laying may commence as early as June, and continue until November or even December. For most species, however, peak nesting activity appears to be during August and September. Broods of ducklings are most commonly seen from September to November and the great majority of young birds are flying by January. Waterfowl numbers are thus at a peak early in the New Year. This is when duck-shooting seasons are held.

III DUCK SHOOTING SEASONS

Duck-shooting seasons are confined to January - March each year in order to minimise their impact on duck populations. This can be explained as follows:

Game-species of ducks are highly fecund, that is, they are capable of producing large numbers of offspring each year, provided conditions are favourable. (Single broods of five or

more ducklings are a common sight during spring and early summer). Consequently, at the end of each successful breeding season, duck numbers are swollen by the addition of new birds. As the summer-autumn dry season progresses, and conditions for waterbirds deteriorate, many birds die due to a variety of natural causes such as lack of food or water, predation and disease. Such deaths are referred to collectively as "natural mortality". First-year birds in particular, have a high rate of natural mortality, largely due to lack of experience in locating adequate resources. By holding the shooting season early in the year one is able to minimise the impact on duck populations since a significant proportion of the ducks killed are birds which would normally die anyway before the next breeding season. Thus shooter-induced mortality is timed to replace natural mortality, rather than add to it. It follows that, upon completion of breeding, the sooner the shooting season is held, the less the effect on the number of birds surviving to the following breeding season. The later the season, or the longer it extends, the greater the effect on numbers surviving to breed.

IV VARIATIONS IN RAINFALL AND CONDITIONS FOR BREEDING

Rainfall, of course, varies from year to year, and as a consequence so does the availability of water for breeding purposes. Thus in years of average or better-than-average rainfall, conditions for waterfowl breeding are usually good and the number of young produced is high; whereas, in years of exceptionally low rainfall, little surface water is available and production is greatly reduced.

Duck-season decisions must take these variable conditions into account. In Western Australia the practice now is to declare FULL SEASONS when conditions for breeding have been average or better-than-average, RESTRICTED SEASONS when conditions have been poor, and NO SEASONS when conditions have been particularly poor for a number of years. The principal objective of this system is to ensure that shooting does not cause a serious reduction in the size of the breeding stock during dry years or periods of prolonged drought. Specifications for FULL, RESTRICTED and NO SEASONS are as follows:-

	<u>FULL SEASON</u>	<u>RESTRICTED SEASON</u>	<u>NO SEASON</u>
Opening Date	2nd weekend in January	2nd weekend in January	-
Opening Day	Saturday	Sunday	-
Opening Time	6.00 <u>PM</u>	6.00 <u>AM</u>	-
Season Length	10 weeks	4 weeks	-
Bag Limit	10 birds of any game species	5 birds of any game species	-

V ASSESSMENT OF CONDITIONS

Prior to 1978 conditions for waterfowl breeding were assessed each year during ground and aerial surveys of important waterfowl sites. Water levels were recorded as dry, low, half full, high or full. Notes were also made of waterfowl numbers and, where possible, waterfowl breeding activity. In 1977 the authors decided that a more precise system of evaluation was required and so undertook a programme of installation of depth gauges on selected wetlands. Twenty-seven gauges were installed from November 1977 to December 1978, 29 in 1979, and a further 27 in 1980. More are proposed for 1981 and 1982.

The wetlands which have been gauged are distributed throughout the south-west of the State, mainly south of a line through Dongara, Merredin and Esperance. Most are Wetland Nature Reserves (including Game Reserves) vested in the Western Australian Wildlife Authority and managed by the Department of Fisheries and Wildlife. (In fact, it is now policy to install gauges only on wetland reserves so vested). The depth gauges permit precise monitoring of water levels and thus allow more meaningful comparisons of conditions to be made from one season to another. The gauges also make it possible to determine average rates of water loss during the annual dry season and thus enable us to forecast "dry-out" dates for individual wetlands or groups of wetlands each year.

A lack of pre-1978 data prevents us from being able to make precise comparisons of present-day water levels with those of earlier years. How then does one judge the normality, or otherwise, of present-day conditions? Since wetland condition and rainfall are intimately related we have turned to long-term annual rainfall data for this purpose.

VI USE OF RAINFALL DATA IN ASSESSMENT OF CONDITIONS

Annual District Average rainfall data for Western Australia are available¹ from as early as 1913. These data provide a convenient means for examining long-term trends in annual rainfall in each of the five Meteorological Districts of the south-west, and over the south-west of the State as a whole. They thus enable us to assess the degree of abnormality of rainfall in particular years or groups of years, from 1913 to the present. By this means we are able to consider how typical or atypical present conditions may be, when viewed over a long period of time, in this case 68 years.

District Average rainfall data do have one disadvantage however. By averaging rainfall over each Meteorological District, they fail to reveal the "patchiness" of rainfall within a District. This problem can be overcome through the use of data from individual weather stations to produce maps of rainfall distribution, as will be seen further on in this report.

¹From the Commonwealth Bureau of Meteorology, Department of Science and Environment.

VII CONCLUSION

As discussed above, controls on duck shooting in the south-west of Western Australia are considered necessary to protect game species from over-exploitation, particularly during dry years and periods of prolonged drought. These controls are achieved principally through the restriction of shooting to Full, Restricted or No Seasons, as appropriate. Rainfall data and wetland monitoring data are now used as a basis for determining the type of season to be declared each year.

The data contained in the remainder of this report (Figures 1-10, and Table 1) were presented to the November 1980 meeting of the W.A. Wildlife Authority's Bird Committee to assist members of that Committee in their consideration of the proposed 1981 duck-shooting season.

Following the Bird Committee meeting, the Minister for Fisheries and Wildlife, Mr Gordon Masters, announced that there would be no declared duck-shooting season for 1981 in the South-West and Eucla Land Divisions of the State. The full text of the Minister's media release was as follows:

The worst long-term dry spell on record in the South-West of Western Australia has brought a decision that there should be no declared duck-shooting season this year.

The Minister for Fisheries and Wildlife Mr Gordon Masters, said today he had reluctantly decided that there should be no shooting season for 1980/81 in the South West and Eucla Land Divisions.

"However, the open duck-shooting season throughout the remainder of the State will continue.

I am disappointed that such a decision has become necessary, but there is no practical alternative in the circumstances," Mr Masters said.

"I have carefully considered reports from the Director of Fisheries and Wildlife and a submission from the W.A. Field and Game Association before reaching my decision.

The over-riding factor is that 1980 was the fifth consecutive year of below average rainfall in all five meteorological divisions in the south west.

The period 1976 to 1980 inclusive has been the driest five-year period since district rainfall figures were first compiled in 1913.

This means that the size of natural waterbodies has been reduced dramatically with the prospect

that by next month most wetlands of the inland south-west are likely to be dry.

This would leave only a narrow strip along the lower west and south coasts holding water.

With the duck population crowded into such a limited area it would be irresponsible to permit a shooting season."

Mr Masters said the W.A. Field and Game Association had requested that a shooting season be declared for 1980/81.

The Minister said he understood the disappointment which their members would feel but added he was sure that they would understand the current situation.

Five consecutive years of below-average rainfall meant that special attention had to be paid to the care of the waterbird population and the maintenance of a sufficient stock of breeding birds.

VIII ACKNOWLEDGEMENTS

We would like to thank members of the West Australian Field and Game Association Inc. for the valuable contribution which they have provided by assisting in the monitoring of gauged wetlands of the south-west. We would also like to thank the Commonwealth Bureau of Meteorology for supplying rainfall data, Mr Don Smart of the Department of Lands and Surveys' Cartographic Branch for preparing the illustrations, Dr Andrew Burbidge for commenting on the manuscript, and Technical Officer Grant Pearson for his assistance in the monitoring programme.

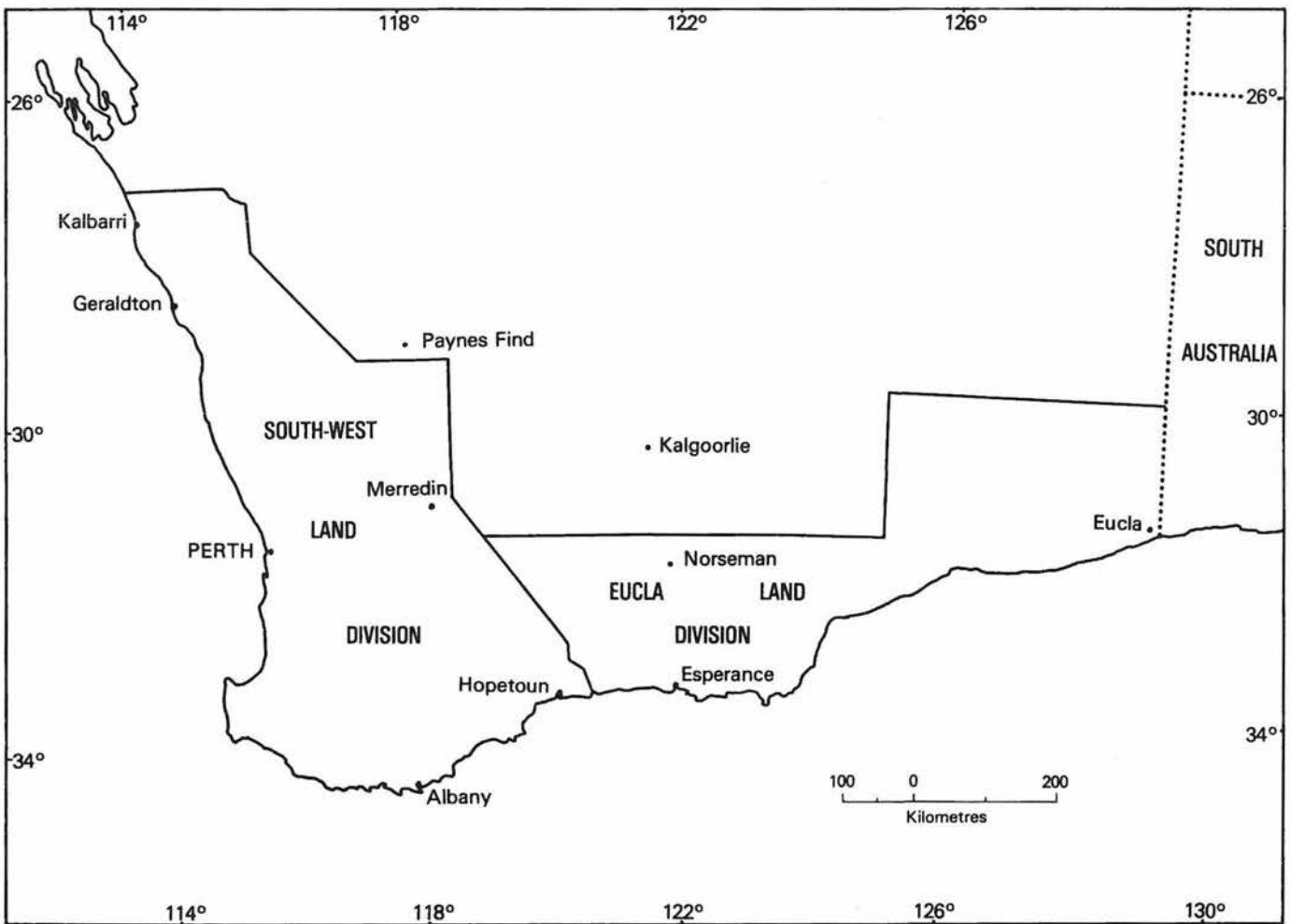
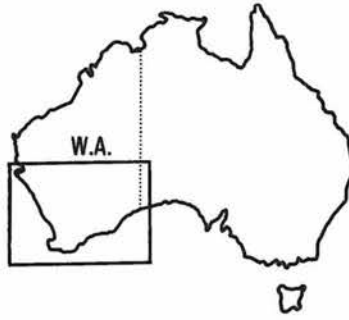
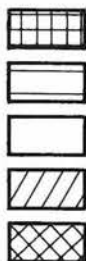


FIGURE 1. Boundaries of the South-West and Eucla Land Divisions.

DECILE RANGE

Description



1
2-3
4-7
8-9
10

VERY MUCH BELOW AVERAGE
MUCH BELOW AVERAGE—BELOW AVERAGE
AVERAGE
ABOVE AVERAGE—MUCH ABOVE AVERAGE
VERY MUCH ABOVE AVERAGE

EXPLANATION:

Decile range 1 is the range of the driest 10% of rainfalls which have been recorded for the January-October period. Decile 2 is the next driest 10% and so on. The middle 40% (Decile ranges 4-7) is considered "average".

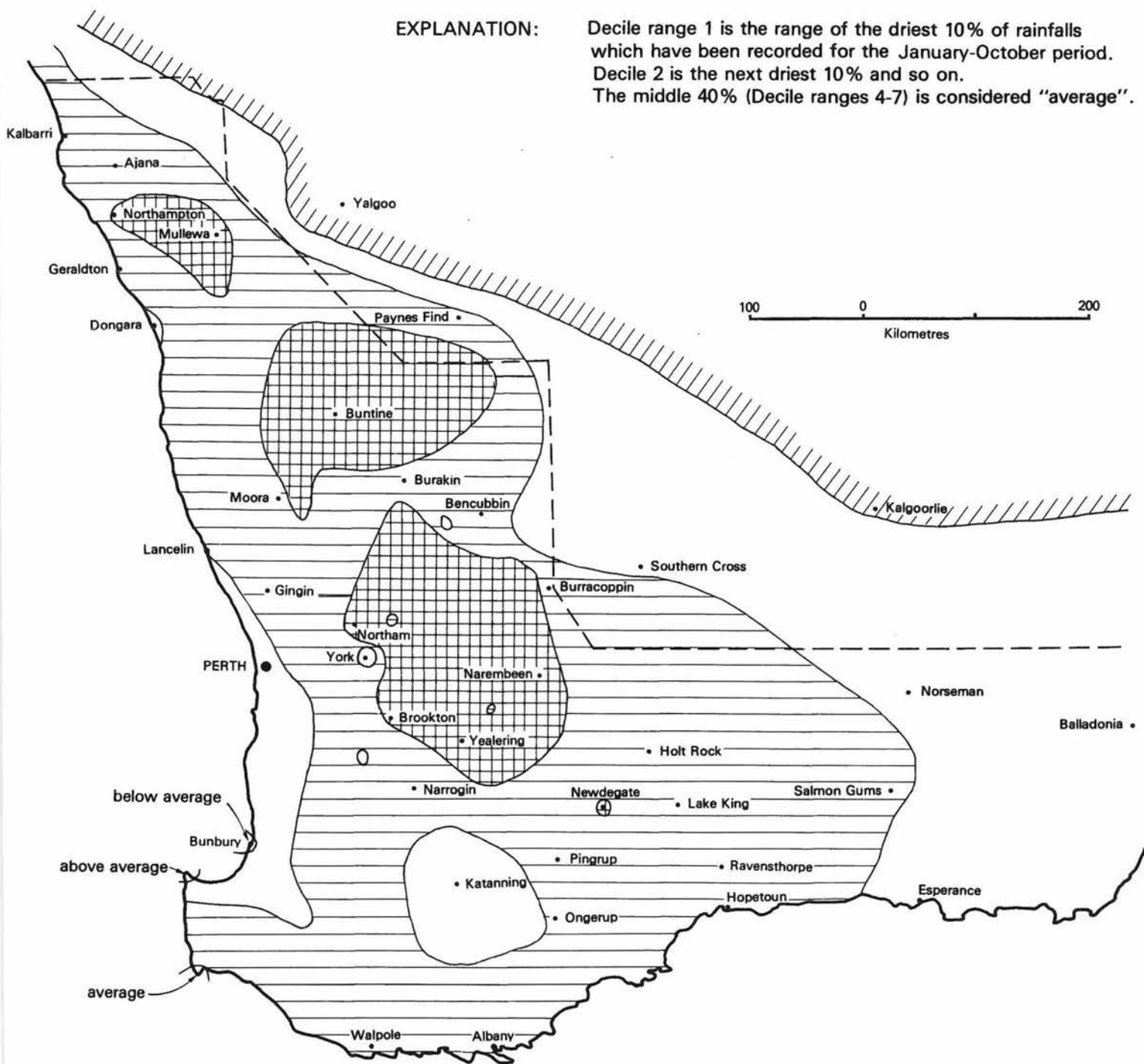


FIGURE 3. Distribution of Decile Range numbers of rainfall, Jan.-Oct. 1980

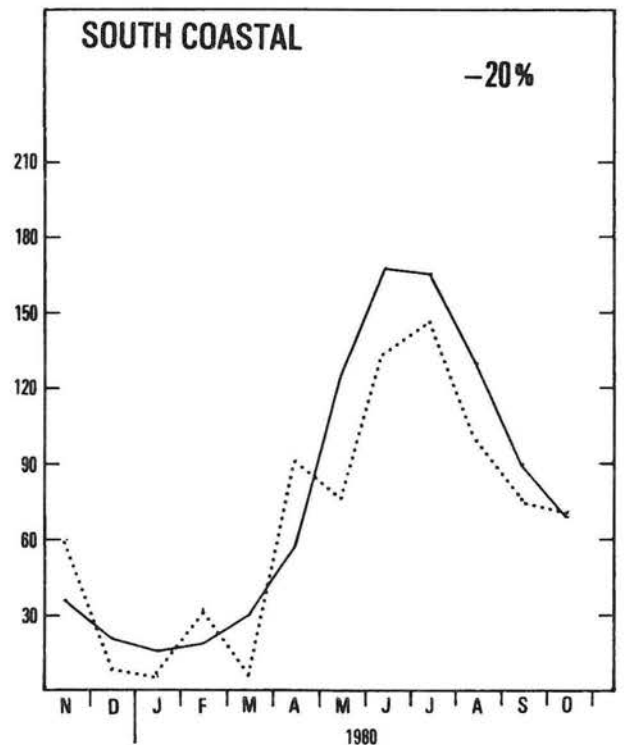
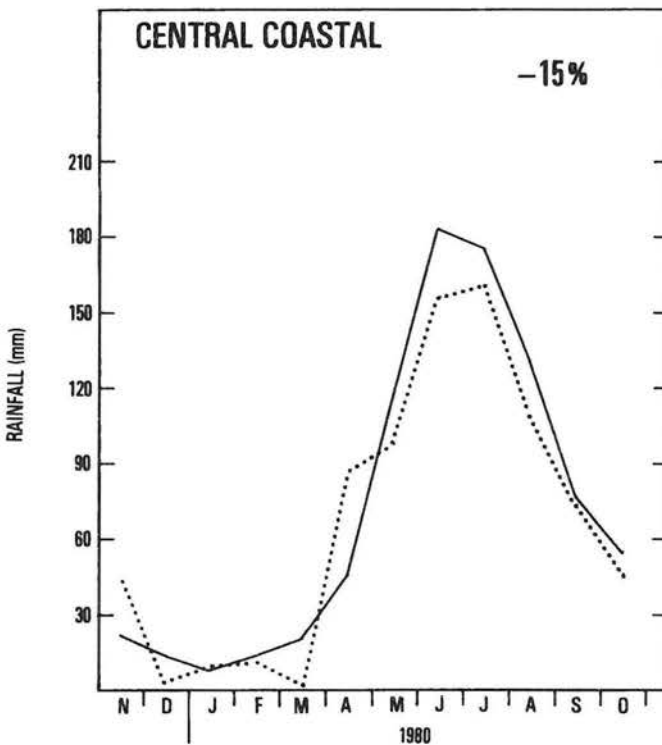
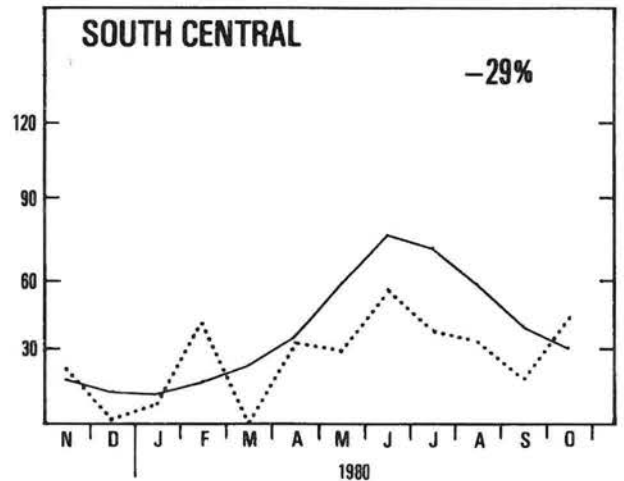
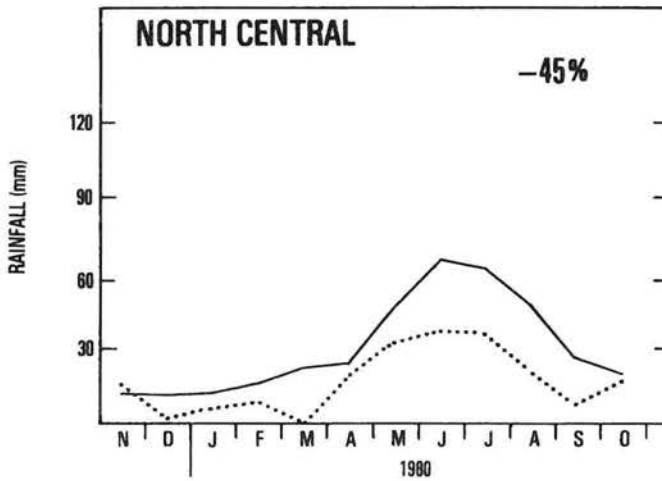
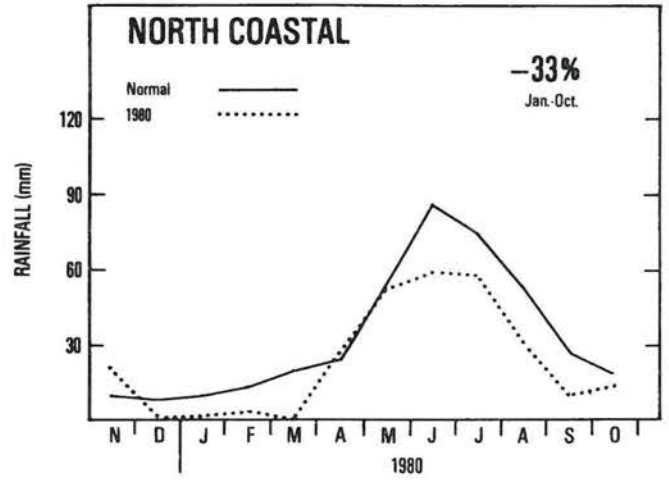
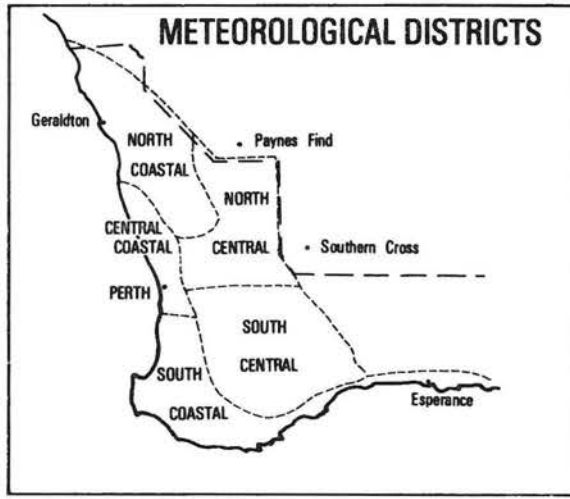


FIGURE 4
 Rainfall recorded monthly in each of the five Meteorological Districts of the south-west, November 1979 to October 1980 and November to October Normal. Percentage departures from Normal (Jan.-Oct.) for each Meteorological District are also shown.

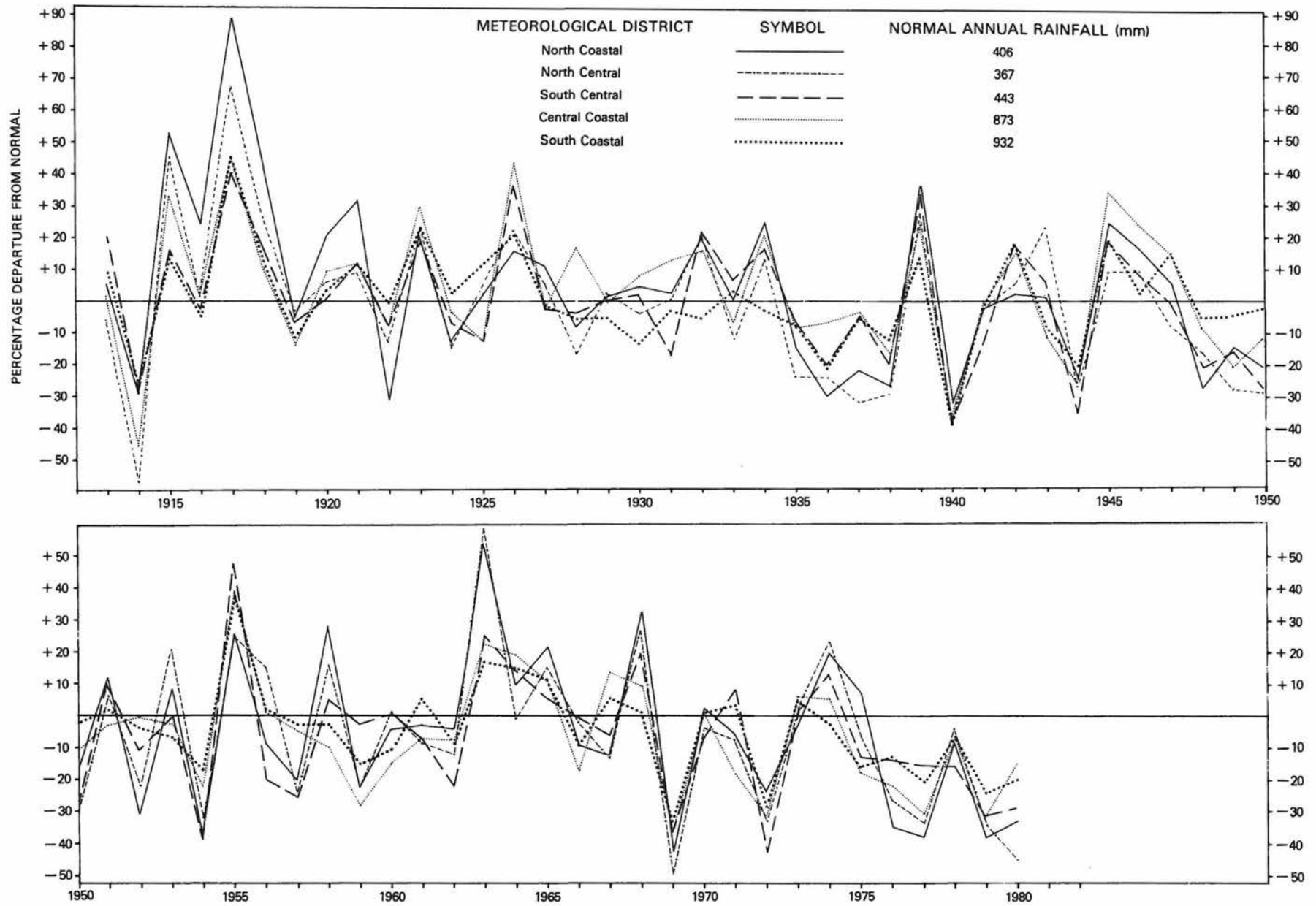


FIGURE 5 Rainfall recorded annually in each of the Meteorological Districts of the south-west, from 1913 to 1980, expressed as percentage departures from normal. Percentage departures from normal for 1980 are based on January-October rainfall. Normal rainfalls for this period are 93-96% of annual totals.

WETLAND NO.	WETLAND NAME	DEPTH (METRES)			SALINITY (PPT)		
		NOV 1978	NOV 1979	NOV 1980	NOV 1978	NOV 1979	NOV 1980
1	LOGUE		DRY	DRY			
2	EGANU	2.18	0.60	DRY	10	104	
3	PINJARREGA		1.10	DRY		112	
4	STREETS	0.04	DRY	DRY	14		
5	HINDS		DRY	DRY			
6	NINAN	0.25	0.23	DRY		340	
7	WALYORMOURING	0.03	0.03	DRY	85	204	
8	DOWERIN		DRY	DRY			
9	CAMPION		DRY	DRY			
10	NOONYING		0.85	DRY	4.9		
11	BEVERLEY	1.65	0.63	0.24	57	215	121
12	MEARS	1.74	0.72	DRY	6.6	28	
13	NONALLING*		DRY	0.88			14
14	BROWN		<0.16	DRY		111	
15	YEALERING	1.67	0.56	0.32	15	77	98
16	KONDININ		0.20	DRY		317	
17	DULBINNING		DRY	DRY			
18	TOOLIBIN	DRY	DRY	DRY			
19	WALBYRING		DRY	DRY			
20	TAARBLIN	DRY	DRY	DRY			
21	BOKAN		DRY	0.02			198
22	LITTLE WHITE		DRY	0.47			
23	BRYDE		DRY	DRY			
24	KWOBRUP		0.14	DRY		27	
25	COYRECUP	1.00	DRY	<0.13	7.2		
26	CASUARINA	DRY	DRY	<0.49			139
27	COOMELBERRUP	0.53	DRY	DRY	24		
28	COBLININE		0.91	1.27		80	65
29	DUMBLEYUNG		<0.13	0.13		236	351
30	GUNDARING	0.82	0.48	0.67	108	218	127
31	PARKEYERRING	0.49	DRY	<0.10	35		181
32	FLAGSTAFF		DRY	0.14			140
33	WARDERING	0.82	0.24	0.66	17	72	23
34	QUEEREARRUP	0.34	DRY	0.30	166		125
35	MARTINUP		DRY	0.24			44
36	TOWERINNING	1.69	0.81	0.54	14	33	46
37	KARAKIN		0.55	0.82		1.2	0.7
38	WANNAMAL	1.14	1.15	1.24	6.7	10	9
39	YURINE		1.01	0.66		1.2	1.9
40	GINGIN 31241		2.08	2.14		1.1	0.7
41	BAMBUN		2.27	2.31		1.2	1.4
42	NAMBUNG		DRY	0.07			25
43	MUNGALA		0.10	0.12		14	11
44	CHANDALA		0.74	0.82		1.2	1.8
45	CHITTERING	1.39	1.38	1.45	4.0	3.5	4.0
46	JANDABUP	1.35	1.25	1.22	0.3	0.3	0.2
47	JOONDALUP	3.01	2.87	2.88	0.9	0.9	0.8
48	THOMSONS	0.94	0.17	0.86	2.0	3.7	1.8
49	FORRESTDALE	0.92	0.30	0.79	2.0	4.5	1.7
50	MUIR		0.14	0.17			2.0
51	BYENUP	2.40	2.27	2.14	2.6	3.3	4.2
52	TORDIT-GARRUP	3.15	2.91	2.75	0.6	0.8	1.1
53	POORGINUP	0.55	0.53	0.55	0.3	0.3	0.1
54	KWORNICUP		0.41	0.26		18	26
55	PLANTAGENET 25386		0.73	0.48		100	179
56	MOATES		4.44	4.51		0.3	0.4
57	PLEASANT VIEW		2.20	1.52		0.2	0.3
58	JERDACUTTUP		2.41	<1.4		17	46
59	GORE		1.72	1.35		24	50
60	SHARK		2.40	2.25		1.0	1.4
61	WARDEN		1.53	<0.84		27	86
62	DUNDAS 33113		0.34	<0.09			310

TABLE 1 : November depths and salinities of gauged wetlands; 1978, 1979 and 1980.
Refer to Figure 10 (fold-out map) for locations.
Note that sea-water is approx. 35 parts per thousand, total soluble salts, and that the upper limit for fresh-water is generally considered to be 1.0 ppt.
*Damming of Nonalling's outlet contributed to this lake's increase in depth.

1979-1980 CHANGES IN WETLAND DEPTHS

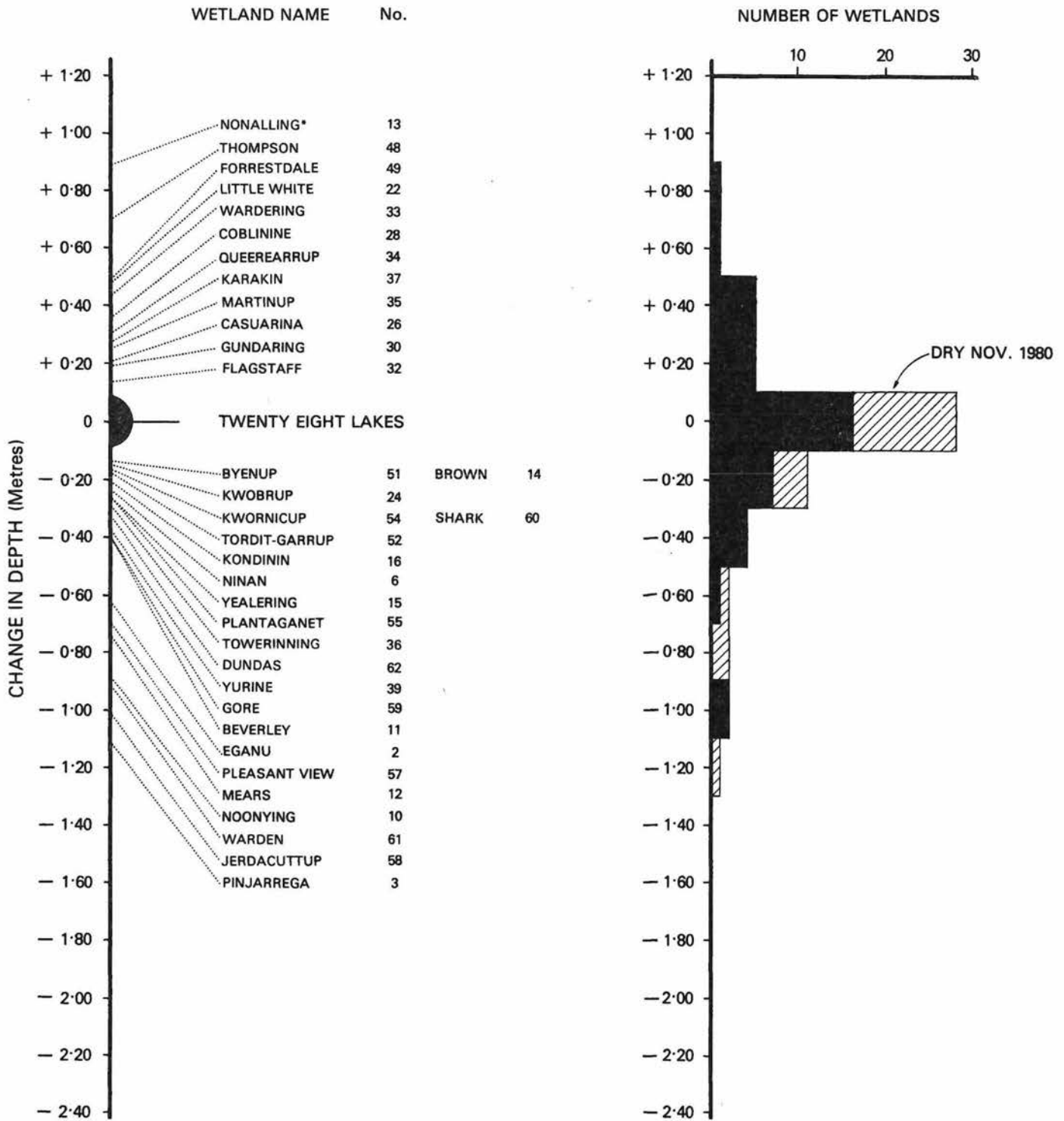


FIGURE 6a.

Change in depth of 62 gauged wetlands
Nov. 1979 to Nov. 1980

FIGURE 6b.

Summary by histogram.

*Damming of Lake Nonalling's outlet contributed to this lake's increase in depth.

1978-1980

CHANGES IN WETLAND DEPTHS

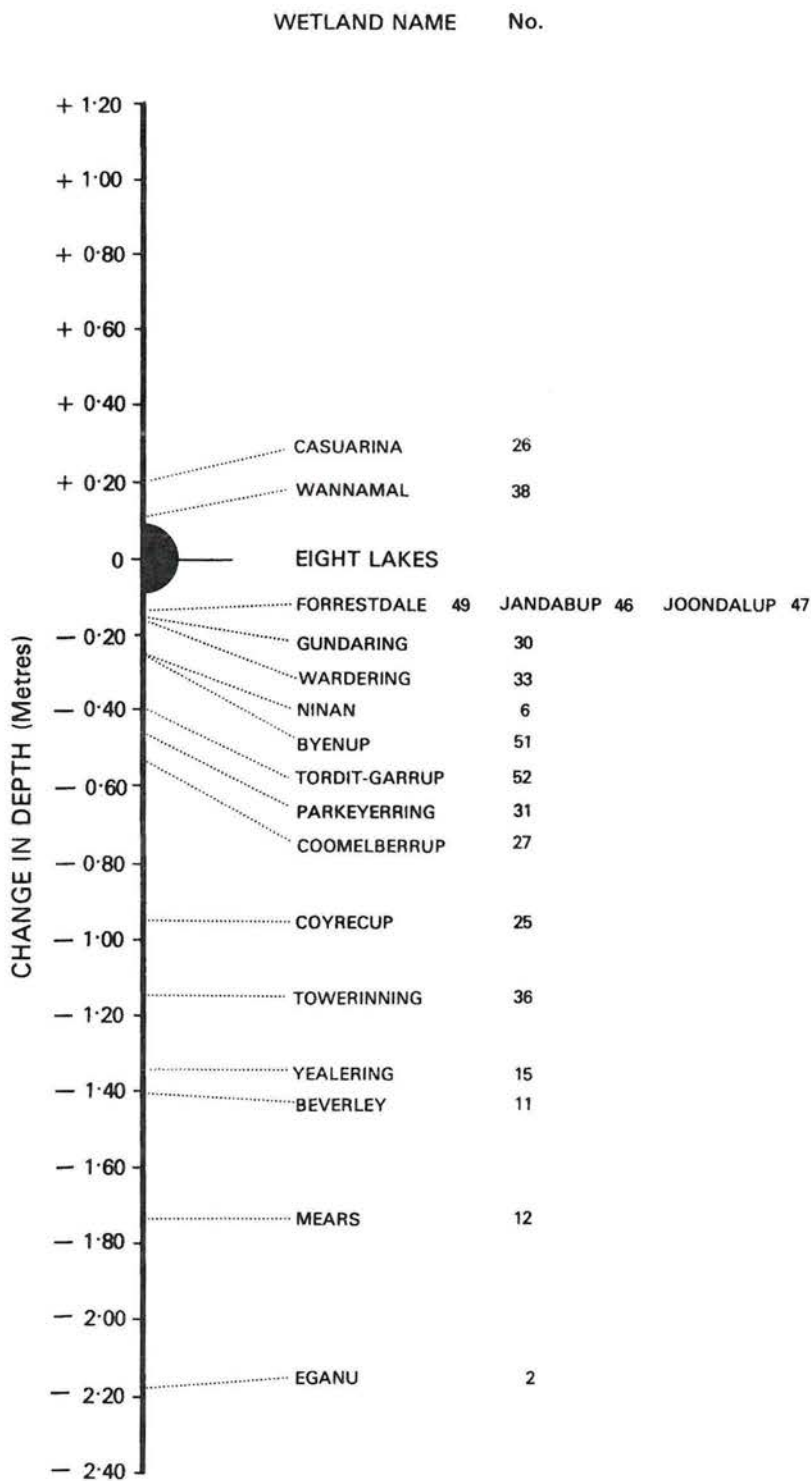


FIGURE 7a
Change in depth of 26 gauged wetlands
Nov. 1978 to Nov. 1980

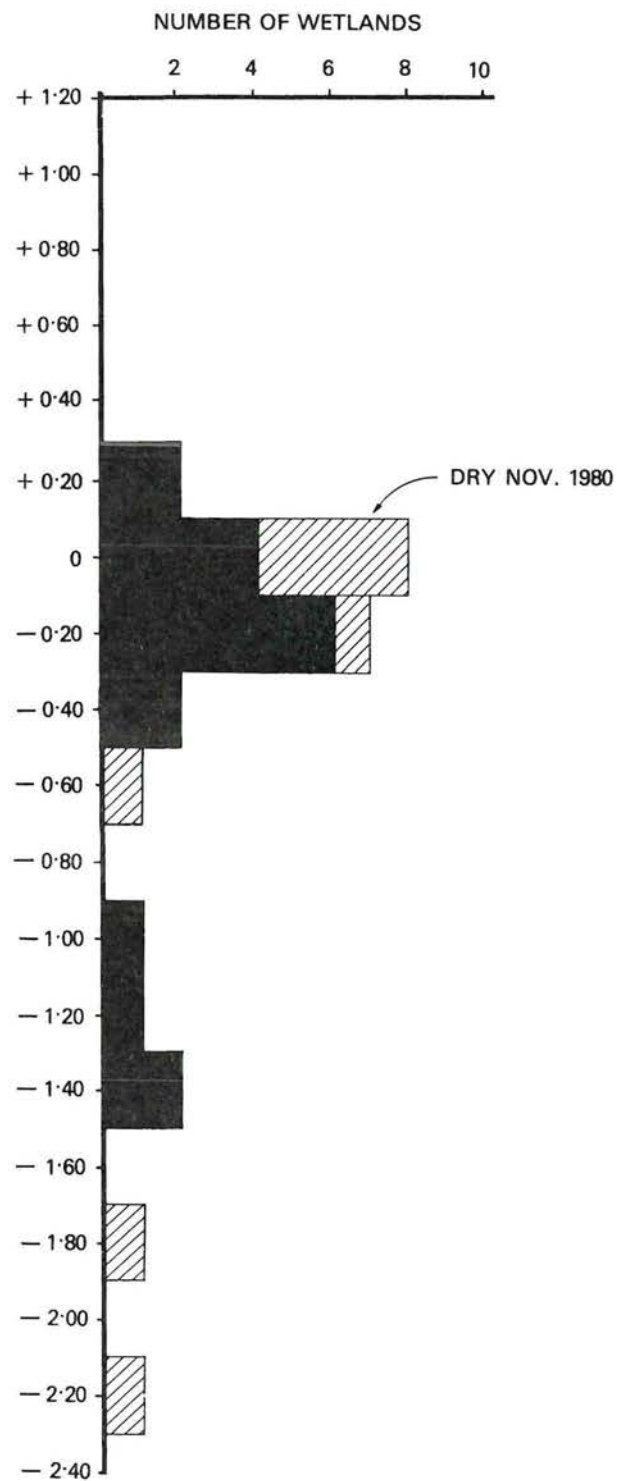


FIGURE 7b.
Summary by histogram

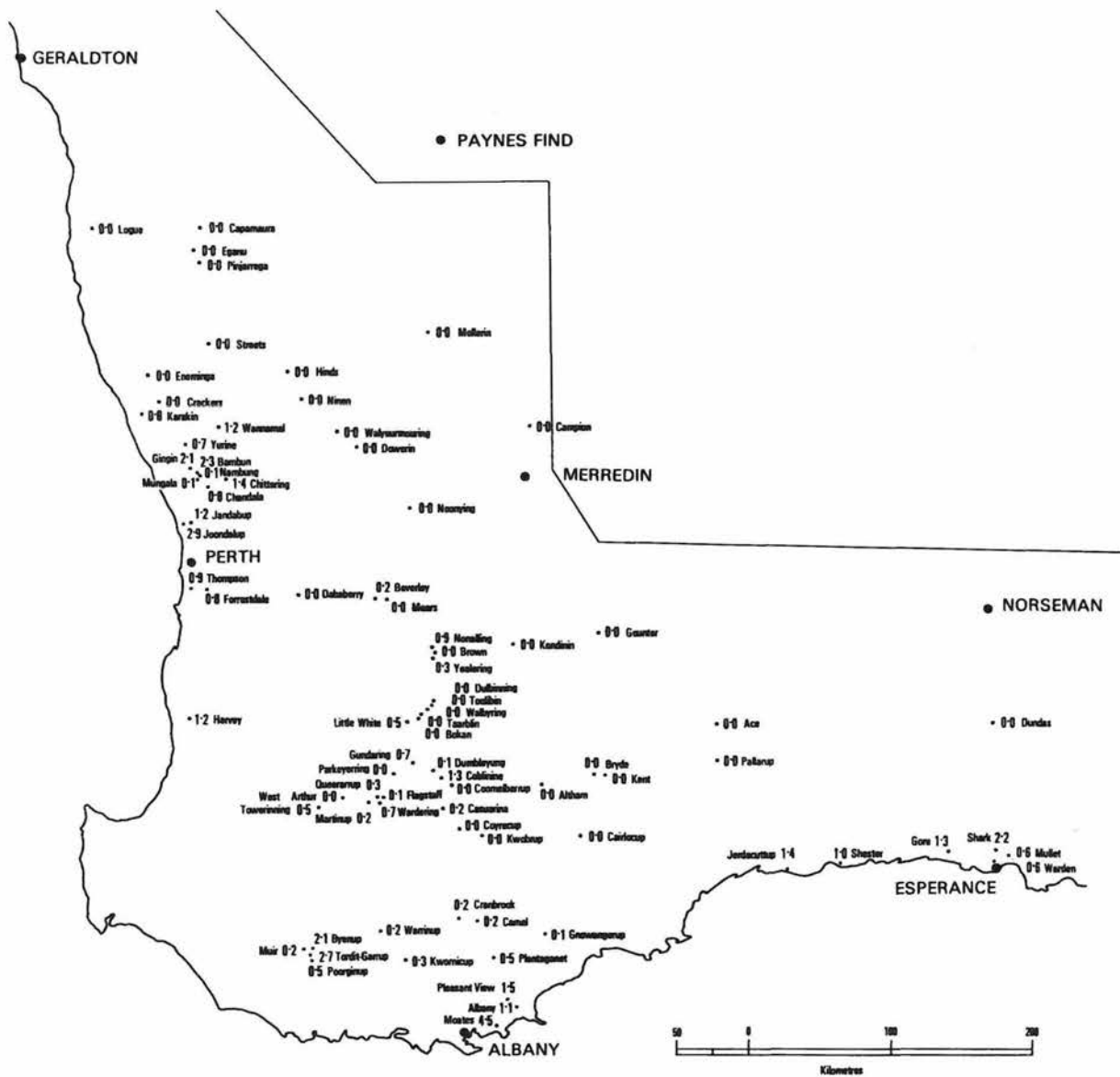


FIGURE 8. Depth of gauged wetlands, November 1980 (first week)

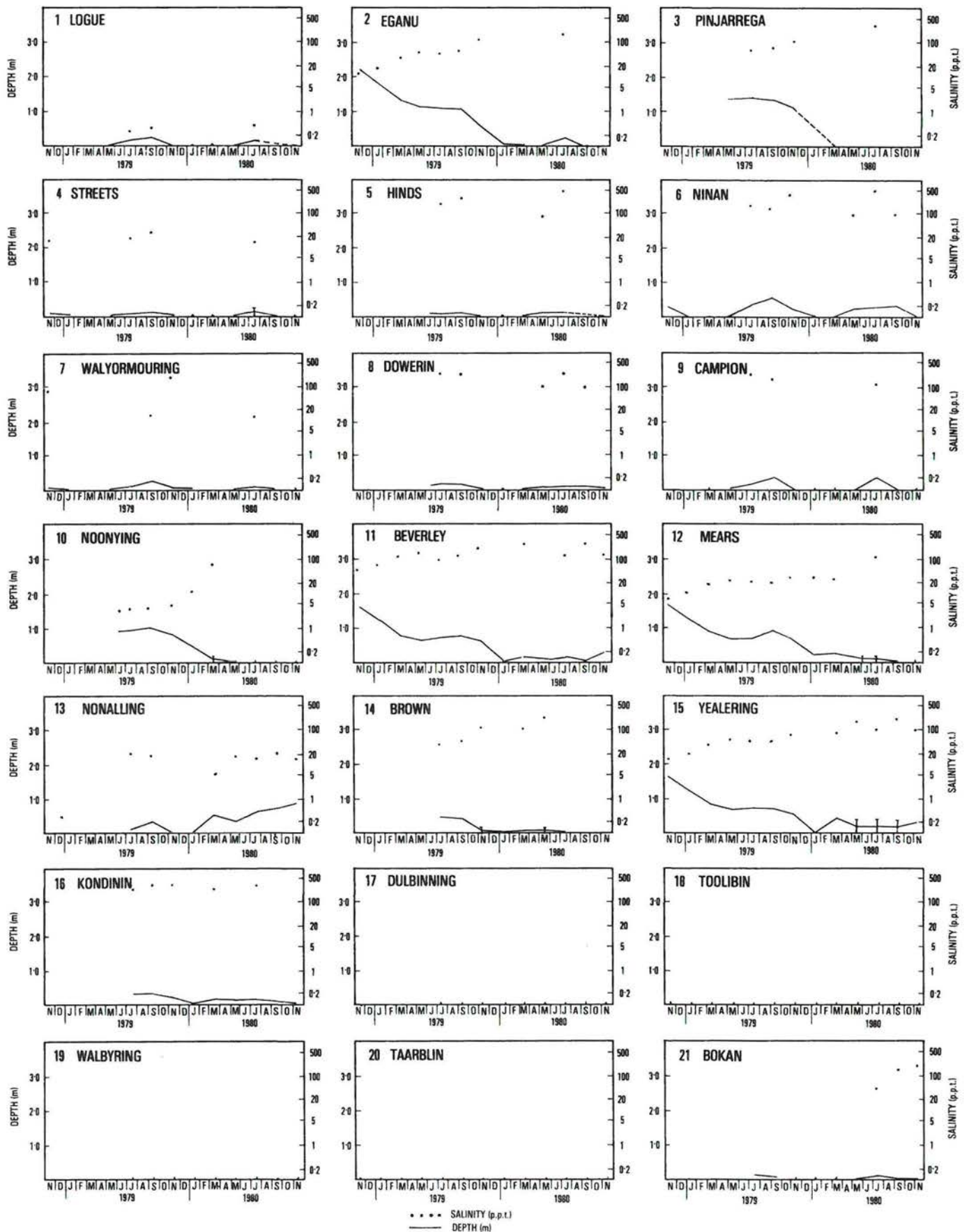


FIGURE 9. Depth and salinity variations of gauged wetlands, 1978 to 1980. Refer to figure 10 (fold-out map) for wetland locations

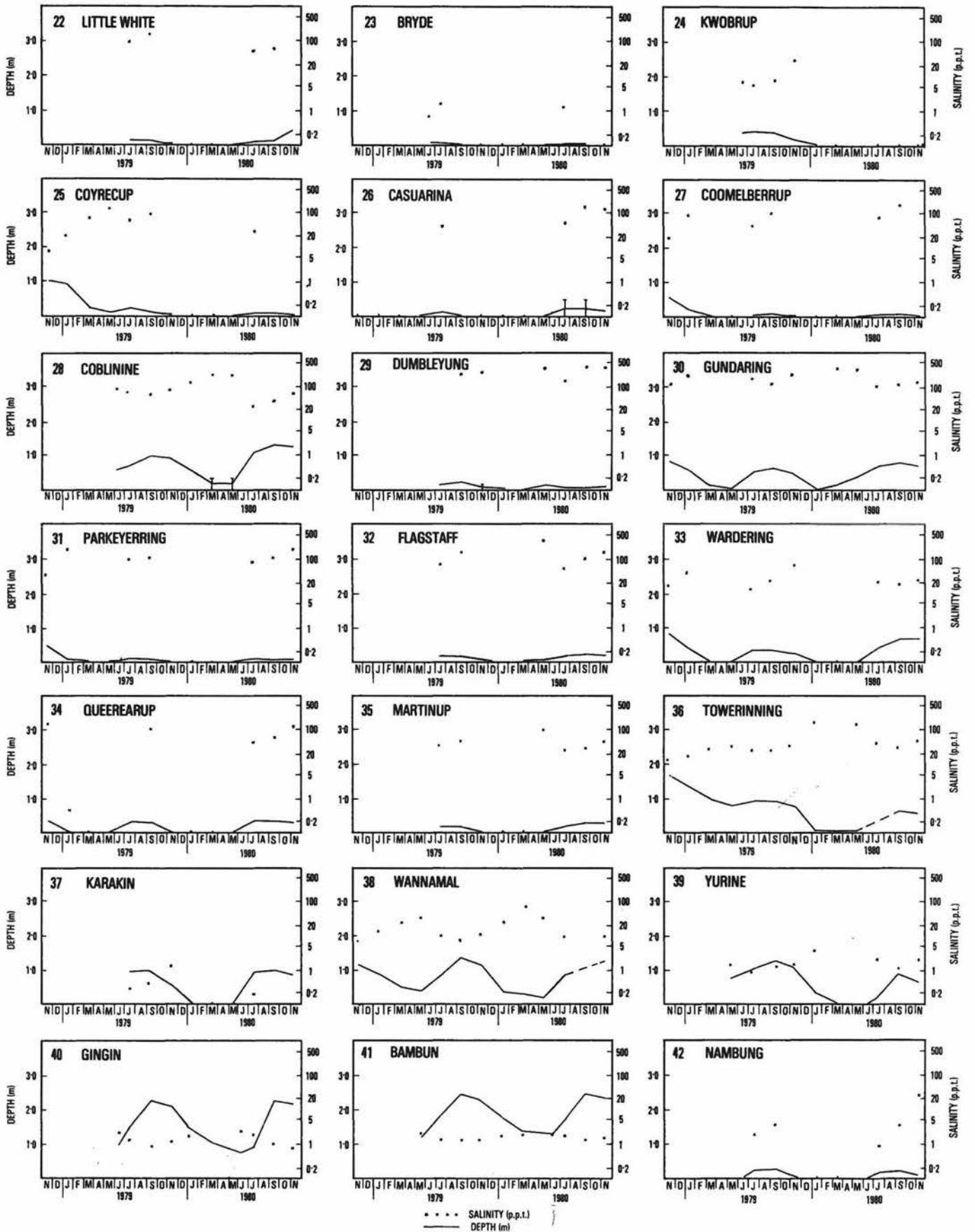


FIGURE 9. Continued

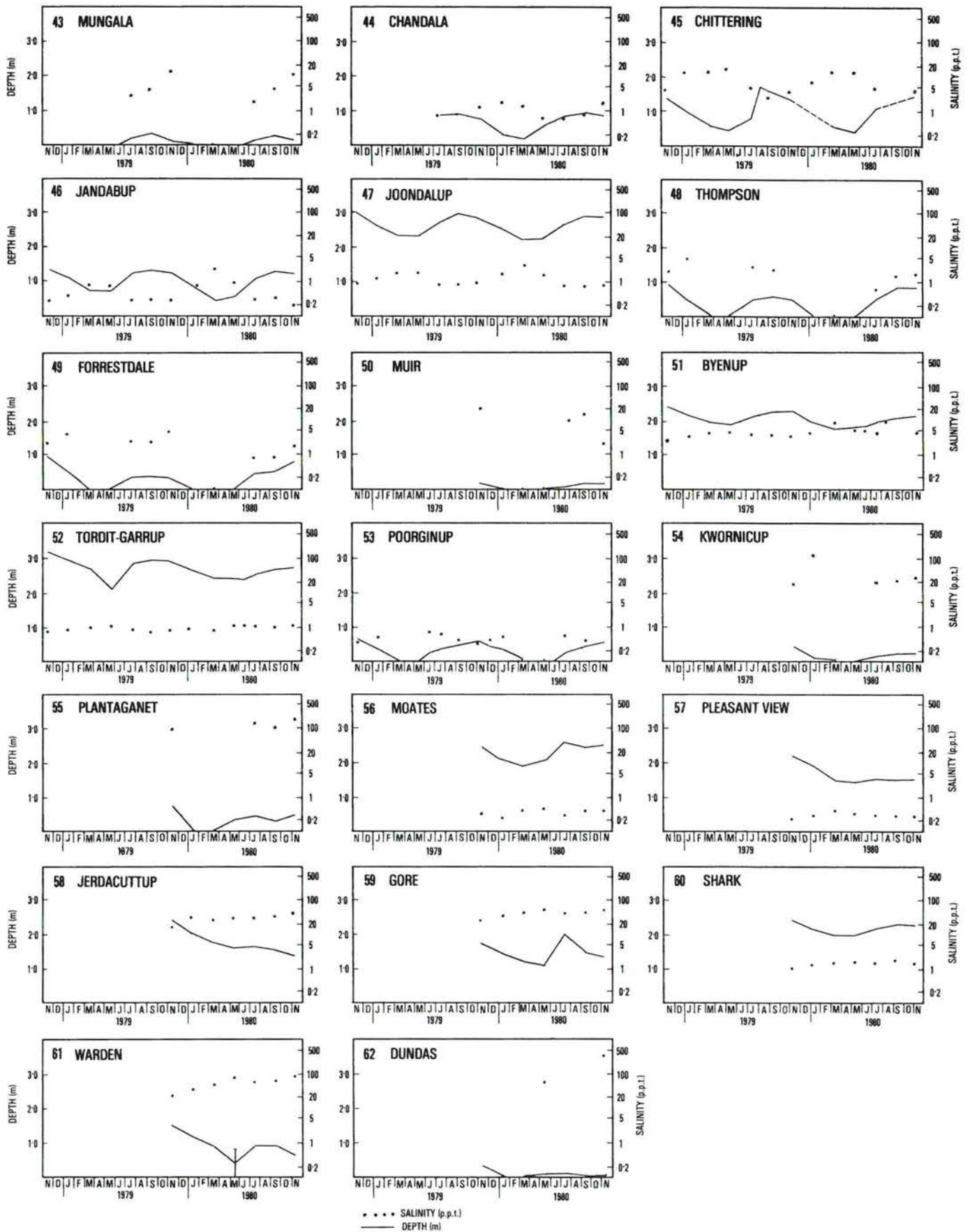


FIGURE 9. Continued

RAINFALL

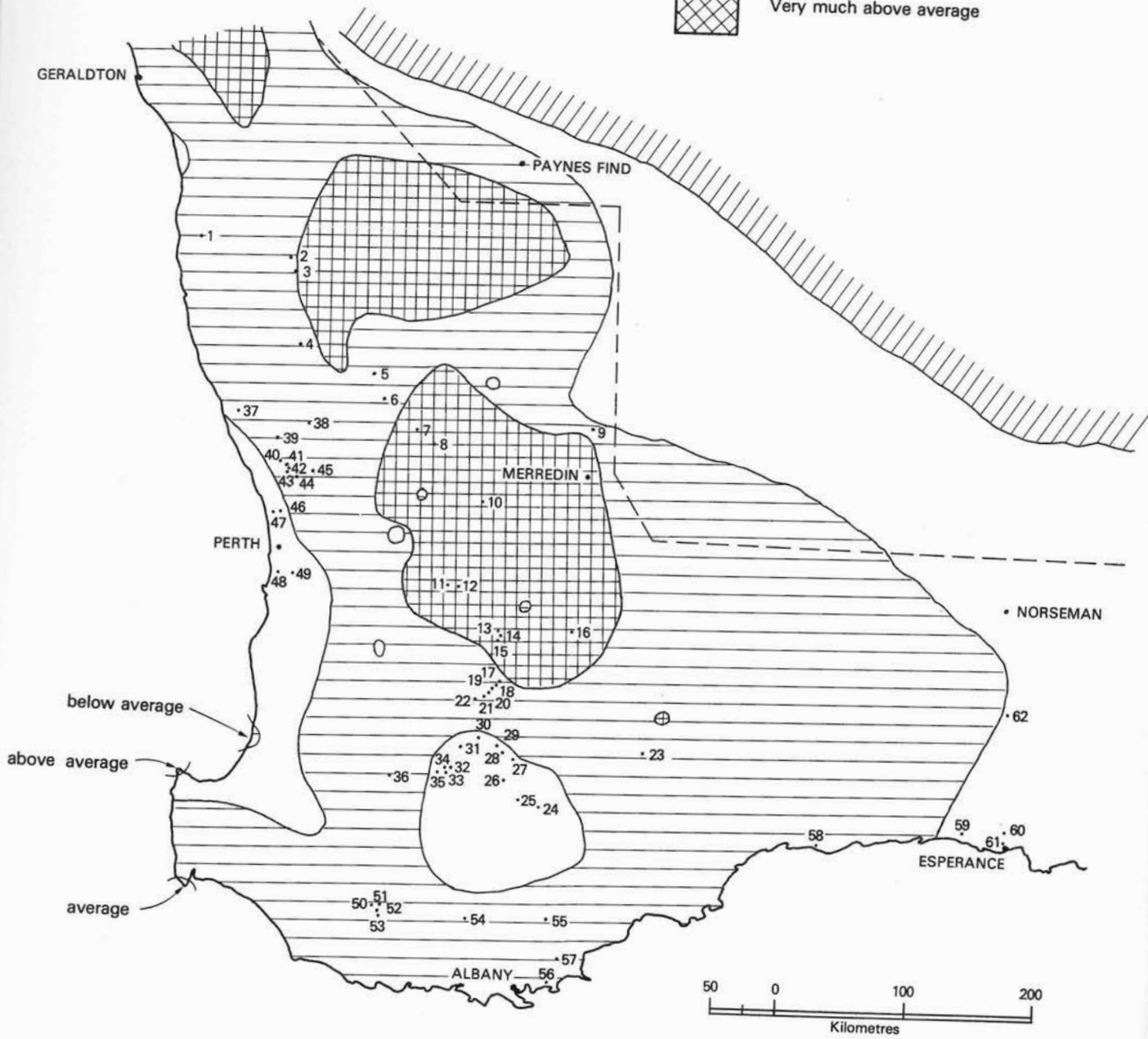
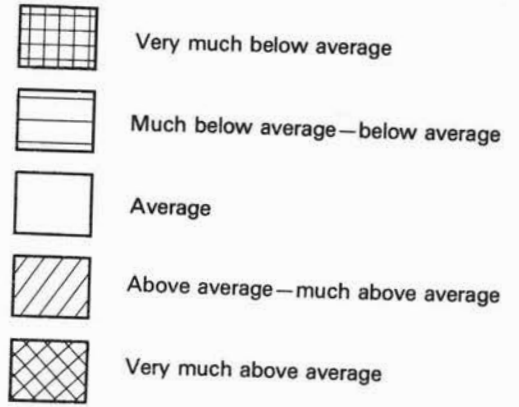


FIGURE 10 Location of gauged wetlands in relation to rainfall distribution (Jan.-Oct. 1980)