



REPORT SERIES N° 12

# THE SUPERB PARROT

A survey of the breeding distribution  
and habitat requirements

AUSTRALIAN NATIONAL PARKS AND WILDLIFE SERVICE

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# **THE SUPERB PARROT**

## **A Survey of the Breeding Distribution and Habitat Requirements**

Prepared for the Steering Committee  
on the Superb Parrot

Compiled by Rick Webster  
New South Wales National Parks and Wildlife Service

Australian National Parks and Wildlife Service  
Canberra 1988



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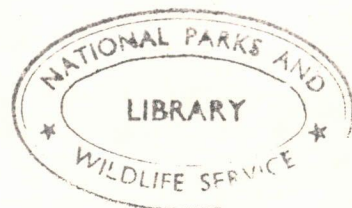
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## CONTENTS

<b>Acknowledgements</b>	v
<b>Abstract</b>	vii
<b>Introduction</b>	1
<b>Methods</b>	3
Study Area	3
Historical Breeding Records	3
Current Breeding	3
Vegetation	5
Foraging	5
Post-Breeding Dispersal	6
<b>Results</b>	7
Breeding Distribution	7
a) Present study	7
b) Records for the period 1980-1984	7
c) Historical records: Prior to 1980	11
Nest Tree Characteristics	11
Vegetation	18
Foraging	18
Post-Breeding Dispersal	21
<b>Discussion</b>	31
Breeding Distribution	31
a) Present study	31
Nest Tree Characteristics	32
Vegetation	33
a) Association between nesting and vegetation within the Murray-Riverina	33
b) Association between nesting and vegetation on the South-west Slopes	35
Foraging	35
Post-Breeding Dispersal	36
<b>Future Research</b>	37
<b>Annex</b>	
Recommendations of the Committee	39
<b>Appendices</b>	43
1	43
2	45
3	46
4	47
5	48
6	48
7	49
<b>Bibliography</b>	51



## ILLUSTRATIONS

## Tables

1	Characteristics of Murray-Riverina Nest Trees and Stands	10
2	Comparison of Murray-Riverina Nest Trees in 1985 and 1986	13
3	Comparison of Nest Stands - Murray-Riverina and Murrumbidgee	13
4	Characteristics of South-west Slopes Nest Trees and Stands	19
5	Comparison of South-west Slopes Live and Dead Nest Trees	24
6	Comparison of South-west Slopes Nest and Non-Nest Stands	24
7	Vegetation Analysis	27

## Figures

1	Superb Parrot Breeding Distribution	8
2	River Red Gum	12
3	River Red Gum Nest Tree Characteristics	15
4	Number of Colonies and Nests per Colony in 1985 and 1986	20
5a	Live Woodland Tree	22
5b	Dead Woodland Tree	23
6a	Live Woodland Nest Tree Characteristics	28
6b	Dead Woodland Nest Tree Characteristics	29
7	Box Woodland Distribution	30

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## ABSTRACT

A survey of breeding sites of the Superb Parrot (*Polytelis swainsonii*) was conducted over a specified study area in southern New South Wales and northern Victoria between 1 September and 20 December 1985. It located forty-nine nests. During a further 1986 survey, conducted between 9 September and 22 December 1986, twelve of these nests were found to have been used again. In addition the 1986 survey located a further sixty-six nests. The two-season total of 115 nests was distributed throughout the study area. Sixty-nine were found between Wagga Wagga and 'Toganmain Station' (176 km to the west of Wagga Wagga) on the Murrumbidgee River, eleven were found on the Edward River within Gulpa Island (six) and Millewa (five) State Forests and ten were found along the Murray River within Millewa (nine) and Barmah (one) State Forests. Twenty-one nests were located on the South-west Slopes (defined in the report) of New South Wales and four within the Goolgowi district north of Griffith.

The Superb Parrot was found to nest in colonies containing up to six nests. Of the forty-nine nests located in 1985, thirty-one were within 10 colonies and the remaining eighteen were single nests. Of those located during the 1986 breeding season twenty-nine were located within 11 colonies and the remaining thirty-seven were single nests. Nests within the Murray-Riverina were generally in the largest trees, in River Red Gum (*Eucalyptus camaldulensis*) forest. Ninety-three percent of nests were in trees that were large, mature, and healthy, with a larger number of spouts and located closer to watercourses on average than non-nest trees. The remainder were in large dead trees in similar locations. Nests were located no further than nine kilometres from box woodland (comprising Black Box (*E. largiflorens*) and/or Yellow Box (*E. melliodora*)) along both the Murrumbidgee and Murray Rivers. Box woodlands were exploited as foraging areas by nesting pairs during the breeding season.

Nests located on the South-west Slopes were found in both dead and living trees. Nest trees contained more spouts than did non-nest trees and were located not more than ten kilometres away from foraging sites (box-gum woodland) carrying various types of eucalypt (White Box *E. albens*; Yellow Box; Red Gum *E. blakeyi*) and crops (Wheat *Triticum aestivum*; Oats *Avena sativa*).

After each of the 1985 and 1986 breeding seasons, there was a movement away from riparian red gum into box woodland. Some Superb Parrots then left the breeding area on the Murrumbidgee. However, not all birds dispersed. Some adult birds, (probably established breeding pairs), remained in the breeding areas. Breeding sites in Victoria were not found to be frequented by Superb Parrots during winter.

On the South-west Slopes, Superb Parrots dispersed away from breeding sites over a period of about six weeks. This movement was in a westerly direction, and very few birds were subsequently observed in the breeding areas during winter. Those that have been observed on the South-west Slopes outside the breeding season are possibly established breeding pairs, as they were often observed in the vicinity of known nesting trees.



## INTRODUCTION

The Superb Parrot (*Polytelis swainsonii*) is endemic to New South Wales and Victoria. This species has not been studied intensively, although a paper by Frith and Calaby (1953) provided a description of the general biology and habitat of the species. A few short notes describing sightings of the Superb Parrot (Hobbs 1955, Kaveney 1979, Lindsay 1984) and a study reviewing its distribution in central New South Wales (Schrader 1980) have also been published. Frith and Calaby (1953) speculated that as agricultural development had peaked, the Superb Parrot population would remain stable. However, during the last ten to fifteen years, increased and changing land-use practices have had significant impact on the breeding and wintering distribution of the Superb Parrot. In addition evidence exists that illegal trapping for the aviculture industry may also be having a deleterious effect on wild populations of Superb Parrots (J. Cook pers. comm.).

In consideration of these factors, the Australian National Parks and Wildlife Service provided a States Assistance Scheme grant in 1985 to fund an investigation into the conservation requirements of the Superb Parrot in its breeding range in southern New South Wales and northern Victoria. A steering committee comprising representatives of the Australian National Parks and Wildlife Service, the New South Wales National Parks and Wildlife Service, the Forestry Commission of New South Wales and the Victorian Department of Conservation, Forests and Lands was established and this Committee set the following specific objectives for the study:

- a. To define and describe a typical Superb Parrot nesting tree.
- b. To ascertain the distribution pattern of nesting trees, that is, whether nest trees are clumped or otherwise (e.g. randomly) distributed.
- c. To describe the relationship between nest sites, different land uses and vegetation types.
- d. To quantify the aspects, including extent, of post-breeding dispersal.

Based on an interim report circulated to the government agencies forming the steering committee in mid-1986, a second phase of the study was initiated in September 1986. It was proposed to the Australian National Parks and Wildlife Service that the following objectives also be investigated with one aim being to facilitate a management plan for the long-term conservation of the Superb Parrot:

- a. The nest-site survey of the Superb Parrot should be extended through the 1986 breeding season to investigate areas where breeding was reported to occur, but could not be confirmed in the previous study. In particular, reported nesting colonies in northern Victoria and the Cowra district of New South Wales to be investigated.
- b. In the course of the 1986 study, nest site fidelity should be investigated, using the results at hand from the current study as a basis.
- c. The distribution of Superb Parrots away from breeding sites should be documented in three phases:
  - i. Pre-breeding season distribution (August-September).
  - ii. Post-breeding distribution (December-February).
  - iii. Autumn-winter movements (March-July).

- d. The survey should seek to determine if there are any discernible habitats preferred by Superb Parrots during the non-breeding season, and establish the conservation status of these habitats.
- e. The original objectives set for the 1985 survey should be further pursued in 1986.

The present report incorporates the findings from both the 1985 and 1986 surveys into single methods, results and discussion sections.

## METHODS

### Study Area

The area surveyed during the 1985 breeding season was the Murrumbidgee River valley between Hay and Narrandera in the north and the Murray River valley between Barham and Yarrowonga in the south (Figure 1). This area is referred to as the Murray-Riverina throughout this report. The steering committee decided to restrict the 1985 study area so that detailed studies could be made of all breeding sites located.

The study area was expanded in 1986 to include the southern portion of the central slopes (Cowra and Grenfell districts) of New South Wales, the central portion of the southern tablelands (Yass district) of New South Wales and the entire area known as the south-west slopes of New South Wales (Figure 1). Throughout this report this area will be referred to as the South-west Slopes.

In addition the Murray-Riverina area was extended to include the section of the Murrumbidgee River between Narrandera and Wagga Wagga.

In general the survey was limited to crown lands. Freehold land was not investigated unless records indicated regular use by Superb Parrots.

### Historical Breeding Records

A literature search was carried out. All available data on breeding of the Superb Parrot were collected from historical records and field atlas data held by the Royal Australasian Ornithologists Union (R.A.O.U.). Interviews were arranged with prominent ornithologists within and around the study area to obtain any records not lodged officially elsewhere and any anecdotal information.

### Current Breeding

The breeding range of the Superb Parrot within the Murray-Riverina district was surveyed between 1 September and 20 December 1985 and between 9 September and 22 December 1986. The study area encompassed the River Red Gum (*Eucalyptus camaldulensis*) forests of the Murray, Murrumbidgee and Edward Rivers and areas of box (Black Box *E. largiflorens*; Yellow Box *E. melliodora*; Grey Box *E. microcarpa*) and Boree (*Acacia pendula*) woodlands which in some locations surrounded the riparian red gum forests. Concentration on these habitats was dictated by the findings of prior studies and observations (Frith and Calaby 1953, Frith 1972). Surveys were conducted by vehicle and on foot along 511 km of the Murrumbidgee River west of Wagga, 423 km of the Murray River west of Yarrowonga and 58 km of the Edward River from the Murray River to Deniliquin.

Also during the 1986 breeding season a survey was conducted throughout the South-west Slopes.

A tree was assumed to be a Superb Parrot nest tree if one of the following events was recorded:

- a. a pair of Superb Parrots was seen entering a hollow,
- b. a male was seen to enter a hollow on his own,
- c. a male or female was observed entering a hollow on a number of occasions,

- d. a male was observed feeding a female at a hollow entrance or nearby,
- e. young birds were observed at a hollow entrance, or
- f. a Superb Parrot was flushed from a hollow by the observer hitting or scratching the trunk of a tree with a stick.

Use of a hollow as a nest was verified by return visits by the observer in most cases.

Superb Parrots were considered to be nesting in separate colonies if nest sites were at least 200 m apart and if there was no evidence of nesting in the intervening area.

Nest tree characteristics which were measured are presented in Tables 1 and 4 and Appendix 1. All nest trees found were measured as described by Beardsell (1985) and Burbidge (1985) except for the following characteristics which were not measured or estimated: height of the second and third highest limbs branching from the trunk; diameter of the hollow entrance; depth of the nest hollow; apparent slope of the hollow and elevation of the hollow. These measurements did not provide useful data in the previous studies and were extremely difficult and time-consuming to obtain.

To examine whether Superb Parrot nest trees varied between the three river systems an analysis of variance was carried out on all those characteristics measured. Nest trees from the Murray-Riverina were also compared to nest trees from the South-west Slopes by analysis of variance.

To determine the characteristics of forest stands in which Superb Parrots nested, measurements of nesting stands were taken and compared to measurements of randomly selected non-nest stands. Every tree with a diameter at breast height (DBH) of greater than 15 cm within a 0.25 ha circular plot around a nest tree in nest stands or around a base tree in non-nest stands was measured. Only River Red Gums over 78 cm DBH (i.e. greater than or equal to the smallest nest tree on the Murrumbidgee River) were used as the base tree in non-nest stands. Tree measurements from the nest stands were compared with tree measurements from non-nest stands by means of analysis of variance.

Non-nest stands were chosen randomly by the following method. The distance (148 km) by river between the easternmost nest located in 1985 on the Murrumbidgee River (nest 661) and the western limit of breeding ('Toganmain Station' 176 km by road west of Wagga Wagga) was determined using a curvimeter and maps of scale 1:100 000. Thirty-four random numbers were then generated in the interval zero to 148, and used as distances in kilometers down-stream from nest 661. At each of these points the width of the River Red Gum forest was determined from maps of scale 1:100 000 and a random number within that width generated. The location of the non-nest stand was then given by the random distance along the river and the random distance away from the river on the side having the easiest access. The measured stands were centred on the River Red Gum with a DBH over 78 cm nearest to each of these random points.

Thirty-four nest stands and sixteen non-nest stands were measured during the 1985 breeding season. Due to time constraints and consequent direction by the steering committee not all nest stands and non-nest stands could be measured during 1985 and for similar reasons additional stand measurements could not be collected during 1986. The sixteen non-nest stands which were measured were not chosen for any specific reason but were measured as each one was reached while moving along the Murrumbidgee River.

Trees within nest stands and non-nest stands on the South-west Slopes were also measured. Non-nest stands were selected randomly along 527 km of roads linking the townships of Yass, Boorowa, Cowra, Coolac, Junee, Cootamundra, Young and Yass. Twenty-one random numbers were generated between zero and 527 and used as distances from Yass. The nearest stand of trees to each random point was selected and the non-nest stand centered around the nearest tree of 36 cm DBH or greater. Due to time and geographic constraints, only seventeen nest stands and twelve non-nest stands were measured on the South-west Slopes.

Data from the twenty-nine measured stands were collected while travelling through the South-west Slopes along the following route: Yass, Boorowa, Cowra, Young, Cootamundra and Yass. Stands located between Cootamundra, Junee, Coolac and Yass were not measured. Details of the precise locations of all nest and non-nest stands, both within the Murray-Riverina and on the South-west Slopes are held by the New South Wales National Parks and Wildlife Service, the Forestry Commission of New South Wales and National Parks and Wildlife Division in Victoria.

### Vegetation

Trees, major shrub species and agricultural land use within the study area were recorded on a grid having cells measuring 5' latitude by 5' longitude. These data were collected while moving about within the study area and were analysed using chi-square contingency tables to ascertain whether a relationship existed between the sites chosen by Superb Parrots for nesting and certain species of trees and shrubs or agricultural land use.

The proportional cover of box woodland within the study area was also mapped on a 5' latitude by 5' longitude grid. Recent aerial photographs were not available and Landsat photo images were of little use as the areas of box woodland were too small to be visible. Thus, maps of scale 1:100 000 and personal observations of the study area were used to score the box woodland cover of each grid-cell.

Each 5' x 5' grid-cell was given a score between 0 and 5 (0 = no box woodland, 1 = less than 1/8th cover, 2 = 1/8th to 3/8ths cover, 3 = 3/8ths to 5/8ths cover, 4 = 5/8ths to 7/8ths cover, 5 = 7/8ths to full cover). These scores were recorded for all grid-cells within 30 km of the Murrumbidgee, Murray and Edward Rivers and within 30 km of the roads linking Cowra, Boorowa, Yass, Coolac, Junee, Cootamundra, Young and Cowra.

The scores were analysed using two different sets of grid-cells. The first set were those which contained one of the three major rivers of the Murray-Riverina ('river-cells') or one of the roads which linked the townships of the South-west Slopes ('road-cells'). The second set of grid-cells analysed were the eight cells which surrounded each river-cell or road-cell.

Those grid-cells containing nests will be referred to as 'nest-cells'.

### Foraging

Foraging information was collected opportunistically during the nest survey. The categories under which information was collected are listed in Appendix 1. Flight paths from the River Red Gum forests to the feeding areas were noted as was any information gained from local ornithologists and residents regarding foraging sites and food items. A list of food items is presented in Appendix 2.

### Post-Breeding Dispersal

Information on the dispersal of Superb Parrots outside the breeding season was collected by several methods. The first was to map all Superb Parrot records collected by the RAOU during the compilation of *The Atlas of Australian Birds* (Blakers et al. 1984). Secondly, information collected from prominent bird watchers during the period of the breeding survey was added to observations actually recorded during the survey. Thirdly a press release relating to the study and a questionnaire (Appendix 3) designed to obtain information on post-breeding dispersal and breeding habits of the Superb Parrot were distributed to eleven ornithologist and naturalist clubs in New South Wales, Victoria and the Australian Capital Territory as well as to local media agencies within the range of the species. People who responded to this questionnaire were contacted in early 1987 in an attempt to determine the movements of Superb Parrots after the breeding season.

## RESULTS

### Breeding Distribution

#### a) Present study

The Superb Parrot was found to nest along the Murrumbidgee, Murray and Edward Rivers and in the districts surrounding Cowra, Boorowa, Yass, Cootamundra and Young (Figure 1). Nests were located between Wagga Wagga and 'Toganmain Station' on the Murrumbidgee River. Populations on both the Murray and Edward Rivers were restricted to small areas. The breeding range of the Superb Parrot on the Murray River was found to extend from Scotts' Road in Millewa State Forest on the New South Wales side to Top Island in Barmah State Forest on the Victorian side. Along the Edward River the breeding range covered only 7 km of river downstream from Taylors Bridge. The current known breeding range on South-west Slopes is bounded by Cowra, Rye Park, Yass, Coolac, Cootamundra and Young. Superb Parrots were found breeding (a total of twenty-one nests) at locations scattered throughout this area with the highest concentrations of nests in the Young (eight), Yass (five) and Boorowa (four) districts.

For the entire study area a total of 115 nests were found, with twelve of the forty-nine 1985 nests used during both breeding seasons. Six of the nests used during both years were along the Murrumbidgee, four along the Murray and two along the Edward River. Eight of the twelve nests used during both breeding seasons were in colonies, with the remaining four nests being solitary. In addition to the twelve nests being used during both breeding seasons, three trees on the Murrumbidgee River were observed to be re-used, however a different hollow had been chosen in the second season. Four of the forty-nine nests found during the 1985 breeding season had been taken over by other bird species (Galah *Cacatua roseicapilla*; Cockatiel *Nymphicus hollandicus*; Yellow Rosella *Platycercus flaveolus* and Starling *Sturnus vulgaris*) when revisited during the 1986 breeding season.

The 115 nests located during the survey were distributed throughout the study area in the following manner: sixty-nine were along the Murrumbidgee River, eleven along the Edward, ten along the Murray, twenty-one nests were scattered throughout the South-west Slopes and four were found in the Goolgowi district north of Griffith. Although the survey was only carried out on the South-west Slopes during the 1986 breeding season, J. Kershaw had found twenty nests in the Boorowa district (pers. comm.) and N. Russil had found three nests between Cowra and Boorowa (in litt.) during the 1985 breeding season.

The survey brought to light a number of reports that Superb Parrots may nest in other locations within the study area. However, investigation of these locations provided no evidence to support the reports. The most probable unconfirmed breeding sites were at Woperana State Forest (west of Tocumwal), Sandigo, Yalgogrin, Junee (all in NSW), Bucks Crossing in Barmah State Forest (Vic) and Dufty's Bend, 15 km west of Yarrawonga (Vic). A list of areas where Superb Parrot nests are likely to be found with further investigation is contained in Appendix 4.

#### b) Records for the period 1980-1984

Data collected from local observers, from RAOU records, from literature and during this survey indicate that over the past five years the breeding range (Figure 1) of the Superb Parrot has remained fairly constant. Breeding records for the 1980-1984 period are contained in Appendix 6.



### FIGURE 1

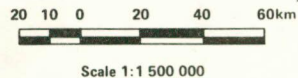
The study area and current breeding distribution of Superb Parrots. The southern boundary of the study area is the Murray River between Barham and Yarrawonga.

This list records all sites mentioned in this report and shown on the map on the opposite page as numerals.

1. Dufty's Bend
2. Woperana State Forest
3. Barmah State Forest
4. Millewa State Forest
5. Moira State Forest
6. Gulpa Island State Forest
7. Gunbower State Forest
8. Perricoota State Forest
9. Koondrook State Forest
10. 'Toganmain Station'
11. 'Wyvern'
12. 'The Homestead'
13. Yarrada State Forest
14. Benerembah State Forest
15. Carabury State Forest
16. Willbriggie State Forest
17. 'Kooba'
18. Cuba State Forest
19. 'Tubbo'
20. MIA Forest Section No. 3
21. Leeton Council Reserve
22. Whitton Punt Reserve
23. Jurambula State Forest
24. MIA Forest Section No. 2
25. MIA Forest Section No. 1
26. Berembed Weir
27. Berry Jerry State Forest
28. 'Sandy Falls'
29. 'Carns'
30. Boorowa-Cowra Road
31. Binalong-Bowning Road
32. Unnamed Site
33. Unnamed Site
34. 'Woodburn'
35. 'Roadside'
36. N. of Rankin Springs
37. N.W. of Cowra
38. E. of Narrandera
39. 'Glenlothian'
40. 'Waringa'

# Superb Parrot Breeding Distribution

Figure 1



- Boundary of 1985 Study Area
- Boundary of 1986 Study Area
- Current Breeding
- Probable Breeding Site  P
- Known Nest Sites 1-40 listed in Appendix I  .27

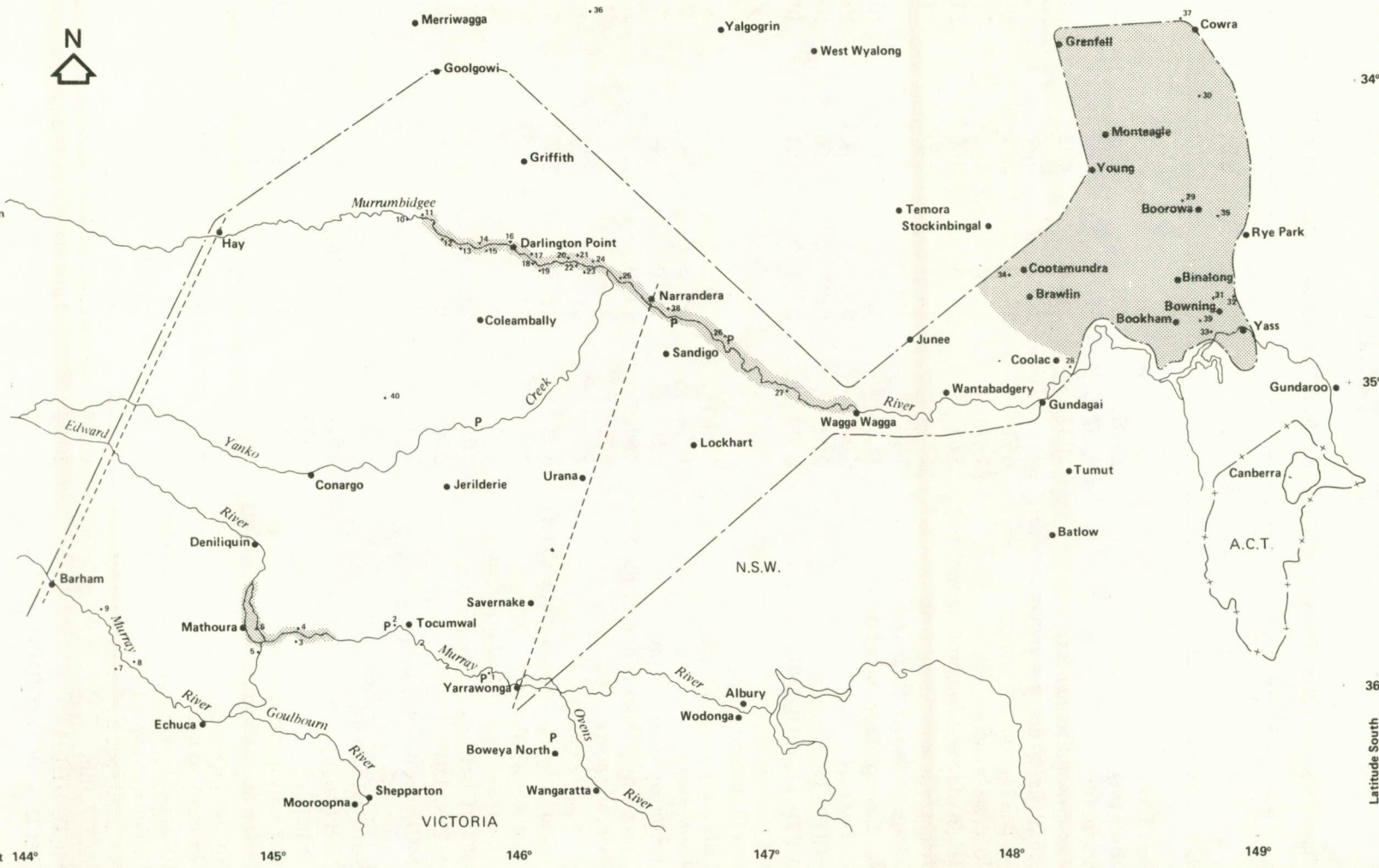


TABLE 1.

Characteristics of Nest Trees, Nest Stands and Non-Nest Stands in the Murray-Riverina.

	Mean	Range	S.D.	N
<b>Nest Trees</b>				
DBH (cm)	156.82	270 - 67	46.53	101
Height (m)	32.57	51 - 18	9.42	102
Max. crown diameter (m)	11.37	21 - 6	4.48	101
Crown dia. 90 degrees to max. dia. (m)	7.19	21 - 1	3.76	101
No. dead spouts	6.77	19 - 0	3.81	102
No. dead branches	11.44	71 - 0	11.64	102
Height of lowest 2nd order branch (m)	5.61	15 - 0	3.00	102
Height of nest	17.44	32 - 7	5.59	102
Distance to watercourse (m)	25.80	201 - 0	47.32	101
No. dead spouts + dead branches	18.22	71 - 0	12.10	102
MCD/DBH	0.007	0.017 - 0	0.003	100
MCD90/DBH	0.005	0.017 - 0	0.003	100
(MCD + MCD90)/DBH	0.039	0.078 - 0	0.017	100
<b>Nest Stands</b>				
DBH (cm)	53.26	220 - 14	46.72	324
Height (m)	19.71	44 - 3	7.92	324
Max. crown diameter (m)	6.11	26 - 0	4.44	324
Crown dia. 90 degrees to max. dia. (m)	2.64	14 - 0	2.89	324
No. dead spouts	1.06	14 - 0	2.75	324
No. dead branches	6.49	41 - 0	6.75	324
Height of lowest 2nd order branch (m)	5.52	18 - 0	3.03	324
Distance to water (m)	31.10	133 - 0	35.57	324
No. dead spouts + dead branches	7.56	45 - 0	7.78	324
MCD/DBH	0.014	0.045 - 0	0.008	324
MCD90/DBH	0.005	0.020 - 0	0.003	324
(MCD + MCD90)/DBH	0.059	0.206 - 0	0.029	324
<b>Non-Nest Stands</b>				
DBH (cm)	44.19	227 - 14	29.66	238
Height (m)	20.15	36 - 2	6.50	238
Max. crown diameter (m)	5.65	18 - 1	3.85	238
Crown dia. 90 degrees to max. dia. (m)	2.37	12 - 0	2.22	238
No. dead spouts	0.261	14 - 0	1.16	238
No. dead branches	7.09	51 - 0	6.57	238
Height of lowest 2nd order branch (m)	5.74	17 - 0	3.36	238
Distance to water (m)	70.13	282 - 0	95.29	238
No. dead spouts + dead branches	7.35	65 - 0	7.20	238
MCD/DBH	0.014	0.047 - 0.002	0.008	238
MCD90/DBH	0.005	0.019 - 0	0.003	238
(MCD + MCD90)/DBH	0.061	0.157 - 0.014	0.027	238

Non-nest stands are those trees within the 0.25 ha stand which did not contain nests. DBH = Trunk Diameter at Breast Height; MCD = Maximum Crown Diameter; MCD90 = Crown Diameter 90 degrees to the Maximum Crown Diameter.

### c) Historical records: prior to 1980

Even though the Superb Parrot breeding range has remained apparently stable over the last four or five years, it is apparent that the species no longer breeds in some areas where it once did. Prior to 1900, a Superb Parrot nest was allegedly located at King Parrot Creek, 'Doogalook', Victoria (A. Burbidge pers. comm.) however the author has not sighted the published record referred to, nor has the specific whereabouts of 'Doogalook' been ascertained. A successful nest was reported at North Mooropna, Victoria, during the 1957 breeding season (Bedggood 1958). Twenty to thirty years ago Superb Parrots also nested in the Echuca district (B. Turner pers. comm.).

Not only has the number of breeding records of Superb Parrots decreased in Victoria but the distribution of the species within that State has apparently been contracting northwards since possibly as early as 1870 when it was last reported from the Melton region (Batey 1907). Keartland (1903) reports that flocks were observed as far south as the Yarra River at Heidelberg and the creeks at Keilor during the early years of settlement in Victoria. The Wangaratta district was once part of the natural distribution, but by 1933 it was thought that only prevailing harsh conditions in the Riverina accounted for the presence of the species in the Wangaratta district (Miller 1933).

At the northern end of their distribution, Superb Parrots occur along the Macquarie, Castlereagh and Namoi Rivers (Pizzey 1980). However there are no confirmed breeding records from this area. Schrader (1980) reported that Superb Parrots had been observed inspecting hollows in Yellow Box near Bogan Gate in central New South Wales, during the breeding season. R. Renneker (pers. comm.) suspected that a few birds may have nested on the Castlereagh River near Gulargumbone during the 1970's, although he has no evidence to confirm this.

Many historical observations of nests have been recorded within the current breeding range of the Superb Parrot, along the Murrumbidgee and Murray Rivers and on the South-west Slopes (Appendix 5). Many of the nests within the Murray-Riverina were alleged to have been in box woodland, however, over the last thirty years the number of confirmed breeding records in box woodlands has been low. No confirmed breeding records for box woodlands within the Murray-Riverina were obtained during this survey, however this is not the case on the South-west Slopes where J. Manning (in litt.) and W. Warren (in litt.) report that they have observed Superb Parrots breeding in the Cootamundra and Boorowa districts during the past fifty and twenty-five years respectively and that box species are favoured nest sites.

### Nest Tree Characteristics

The data collected from ninety nest trees within the Murray- Riverina (Table 1) were used to describe a 'typical' Superb Parrot nest tree (Figure 2) for that part of the breeding range. This tree was usually a large, mature, healthy River Red Gum found in Site Quality I forest (Forestry Commission 1985). In this context Site Quality I refers to those areas of River Red Gum which produce merchantable timber but also include trees of veteran age. The 'typical' nest tree had on average a DBH of 1.57 m, a height of 33 m, and a maximum crown diameter of 11 m. The 'typical' nest hollow was located 17 m above the ground in a tree located 26 m from a watercourse (Figure 2). These mean values were obtained from data contained in Figure 3 and Table 1.

FIGURE 2

A 'typical' Superb Parrot nest tree within the Murray-Riverina.

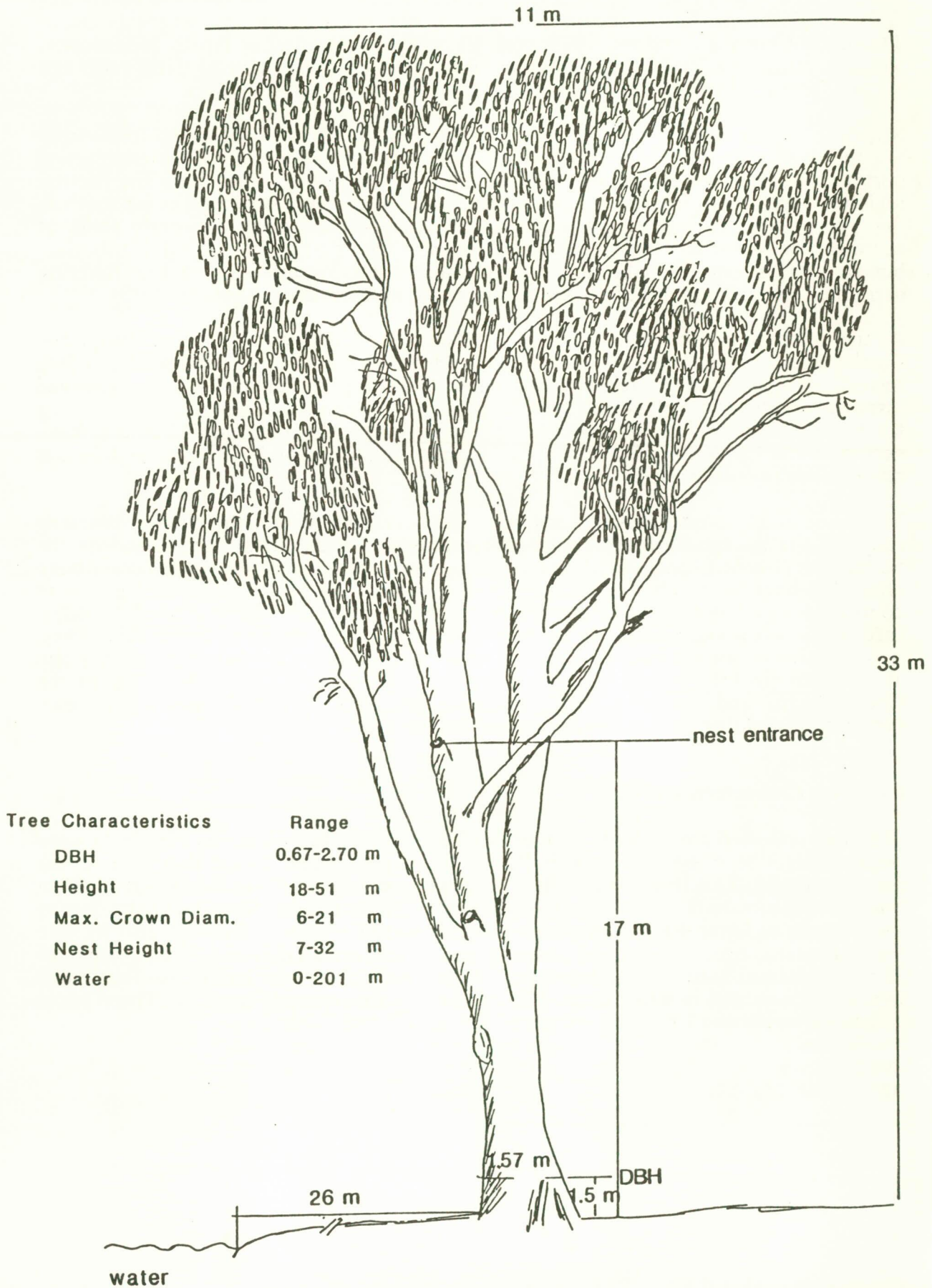


TABLE 2.

Comparison of Nest Trees from 1985 and 1986 for the Murray-Riverina: Results of the analysis of variance comparing nest trees from 1985 and 1986 for the Murray-Riverina. Abbreviations follow Table 1 (page 10).

Character	Mean		F	P	Sig.	d.f.
	1985	1986				
DBH (cm)	161.24	152.65	0.86	0.357	n.s.	1
Height (m)	34.24	31.02	3.05	0.084	n.s.	1
Height of lowest 2nd order branch (m)	6.06	5.19	2.18	0.143	n.s.	1
Max. crown diameter (m)	12.06	10.74	2.23	0.138	n.s.	1
Crown dia. 90 degrees to max. dia. (m)	7.50	6.91	0.63	0.431	n.s.	1
No. dead spouts	6.86	6.70	0.04	0.835	n.s.	1
No. dead branches	5.47	16.96	32.61	0.0001	sig.	1
No. dead spouts + dead branches	12.33	23.66	28.40	0.0001	sig.	1
Height of nest (m)	17.71	17.19	0.22	0.639	n.s.	1
Distance to water (m)	28.33	23.42	0.27	0.605	n.s.	1
MCD/DBH	0.008	0.007	2.23	0.138	n.s.	1
MCD90/DBH	0.005	0.005	0.63	0.431	n.s.	1
(MCD + MCD90)/DBH	0.041	0.037	1.33	0.251	n.s.	1

TABLE 3.

Comparison of Nest Stands and Non-Nest Stands on the Murray-Riverina: Results of the analysis of variance comparing nest stands with non-nest stands along the Murrumbidgee River. Abbreviations follow Table 1 (page 10).

Character	Mean		F	P	Sig.	d.f.
	Nest Stand	Non-Nest Stand				
DBH (cm)	53.26	44.19	6.93	0.009	sig.	1
Height (m)	19.71	20.15	0.48	0.489	n.s.	1
Height of lowest 2nd order branch (m)	5.52	5.74	0.71	0.400	n.s.	1
Max. crown diameter (m)	6.12	5.65	1.69	0.194	n.s.	1
Crown dia. 90 degrees to max. dia. (m)	2.64	2.37	1.41	0.235	n.s.	1
No. dead spouts	1.06	0.261	17.96	0.0001	sig.	1
No. dead branches	6.49	7.09	1.20	0.274	n.s.	1
No. dead spouts + dead branches	7.56	7.35	0.10	0.748	n.s.	1
Distance to water (m)	31.10	70.13	45.71	0.0001	sig.	1
MCD/DBH	0.014	0.014	0.01	0.911	n.s.	1
MCD90/DBH	0.005	0.005	1.89	0.169	n.s.	1
(MCD + MCD90)/DBH	0.059	0.061	0.40	0.527	n.s.	1

The position of the nest within the nest tree was recorded; that is, whether the nest was located in a first order branch (trunk), a second order branch, a third order branch, and so on. It was found that the majority of nests were located in branches of order two, three and four (Figure 3E). A chi-square analysis showed the position of the nest hollows to be significantly different ( $P < 0.005$ ) from a uniform distribution of nest hollows.

An analysis of variance showed that there was very little difference between most nest tree characteristics on different rivers. When the means were analysed using Tukey's test, the only significant differences ( $P < 0.0001$ ) between nest trees located on each of the rivers were the height of the lowest second order branch, the height of nest and the DBH. The height of the lowest second order branch was higher on the Edward River than on the Murrumbidgee River. Nest trees on the Murrumbidgee River, however, had a larger DBH than those on the Murray River. An analysis of variance of nest trees for the two breeding seasons showed no difference in nest trees between the two years (Table 2).

An analysis of variance between trees within nest stands and within non-nest stands revealed that three of the variables measured were significantly different (Table 3). Nest stands contained trees which had larger DBH's ( $P < 0.008$ ) and these trees contained more spouts ( $P < 0.0001$ ) than did trees within non-nest stands. Nest stands were also located closer to a watercourse ( $P < 0.0001$ ) than were the randomly located non-nest stands. These differences were confirmed by analysing the F-values using Tukey's test.

The survey also revealed that Superb Parrots nest in colonies. Of the forty-nine nests discovered during the 1985 breeding season, thirty-one (63 per cent) were within colonies whereas, for the seventy-eight (including twelve nests from 1985) nests discovered during the 1986 breeding season, twenty-nine (37 per cent) were within colonies (Figure 4). A total of ten colonies were located in 1985 and eight in 1986. All colonies were within River Red Gum forest and contained from two to six nests. Evidence suggests that the majority of the remaining nests may be part of larger colonies, although this remains to be confirmed.

Twenty-one nests were located on the South-west Slopes and four in the Goolgowi district during 1986. The tree characteristics measured in that district were analysed (Table 4) to describe two distinct 'typical' Superb Parrot nest trees (Figure 5a and 5b) for the nesting sites away from riparian forests. Two types were distinguishable because eleven of the twenty-five nests were located in dead trees. The 'typical' live nest tree had an average DBH of 0.99 m, a height of 20 m and a maximum crown diameter of 8 m. The nest hollow was located 10 m above the ground and the tree was on average 161 m from water ('water' being defined as the nearest watercourse or farm dam) (Figure 5a). Corresponding measurements for the 'typical' dead nest tree are DBH 0.84 m, height 17 m, no crown diameter, hollow height 10 m and distance from water 181 m (Figure 5b). These mean values were obtained from data contained in Figures 6a and 6b and Table 4.

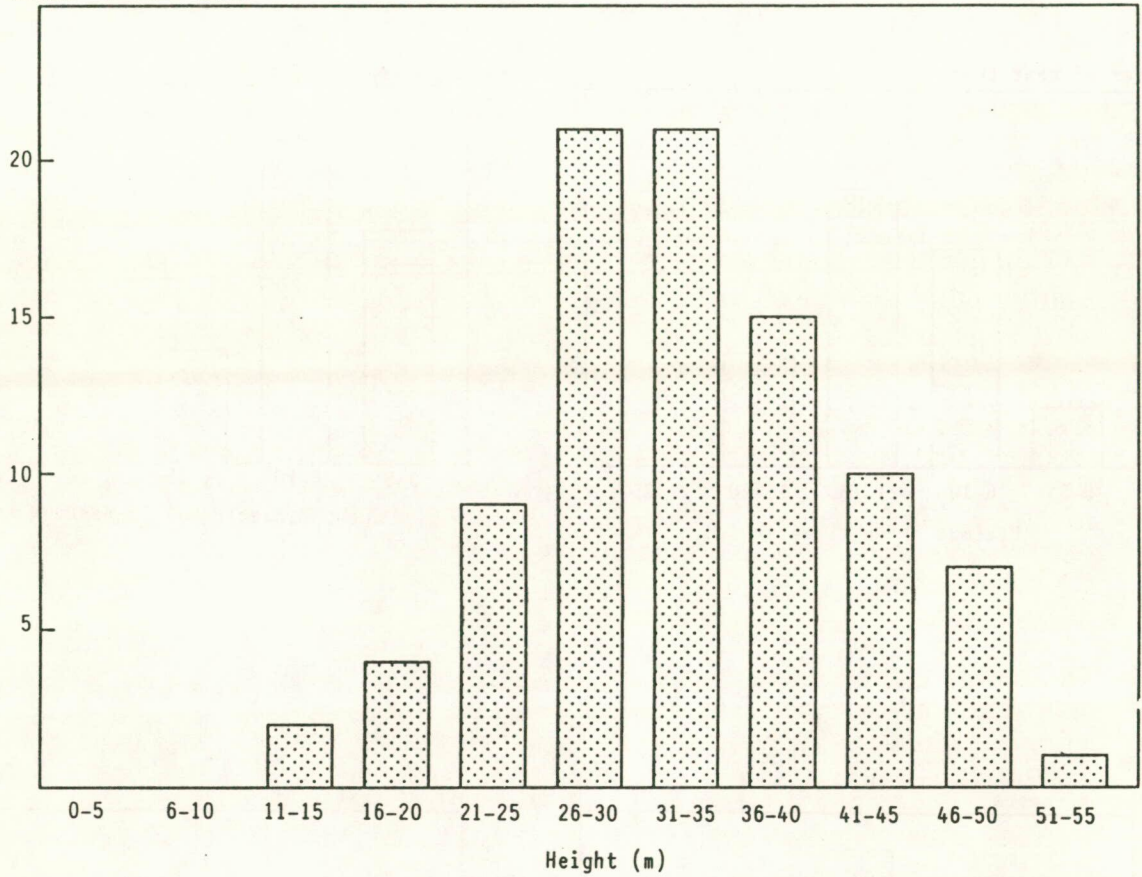
An analysis of variance comparing the live trees with dead trees showed that there was no significant difference between these two types of nest tree (Table 5). Dead trees had no measurable crown diameter which made statistical comparisons of this characteristic irrelevant.

The position of the nest hollow within nest trees on the South-west Slopes (Figure 6a (H) and 6b (H)) was not significantly different ( $P > 0.05$ ) from a random distribution of nest hollows.

**FIGURE 3**

Nest tree characteristics for the Murray-Riverina area.

**A** Number of nest trees



**B** Number of nest trees

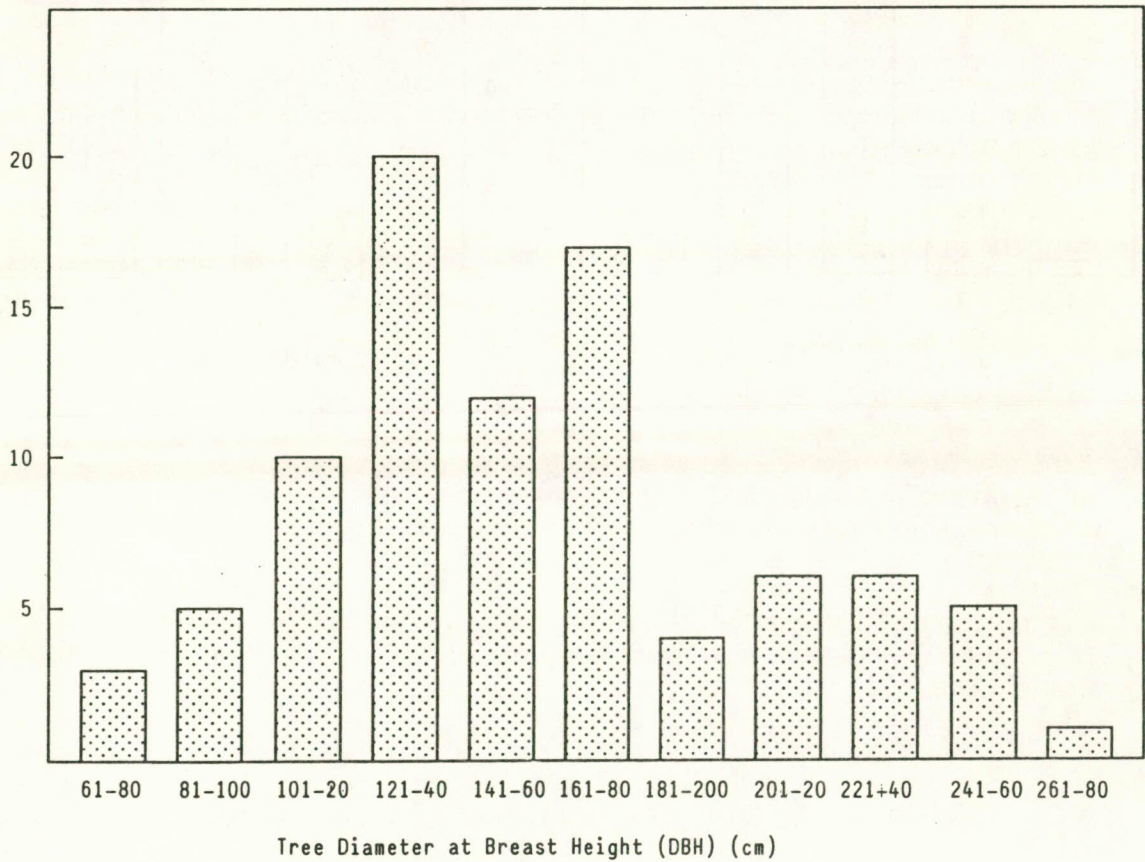
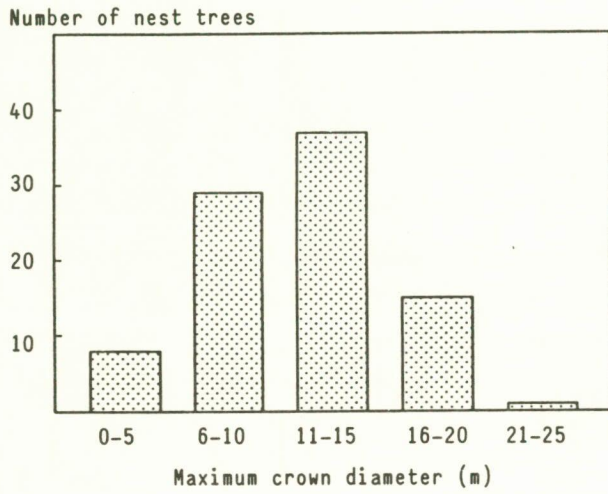


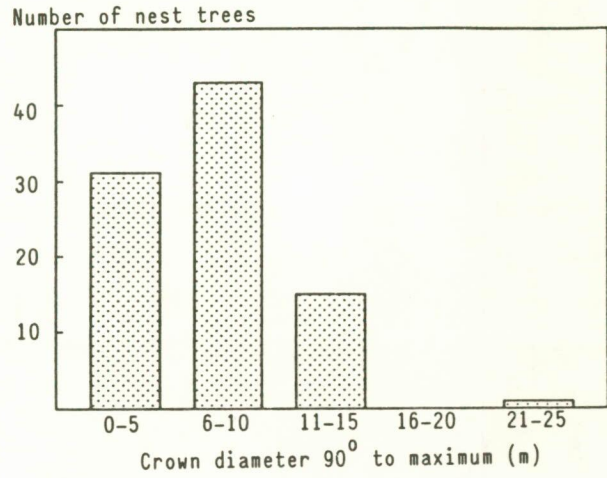


FIGURE 3 (cont.)

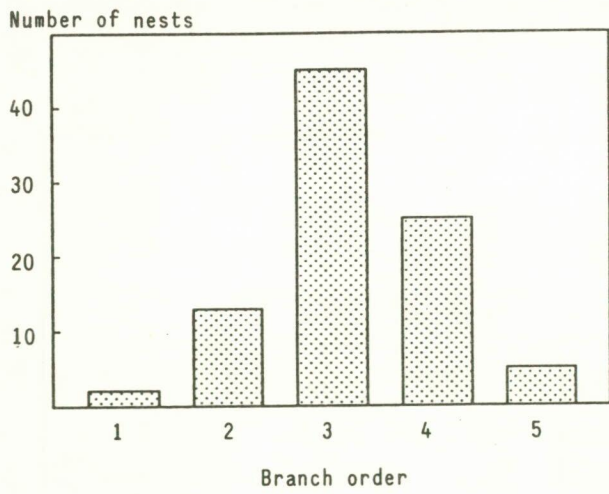
C



D



E



F

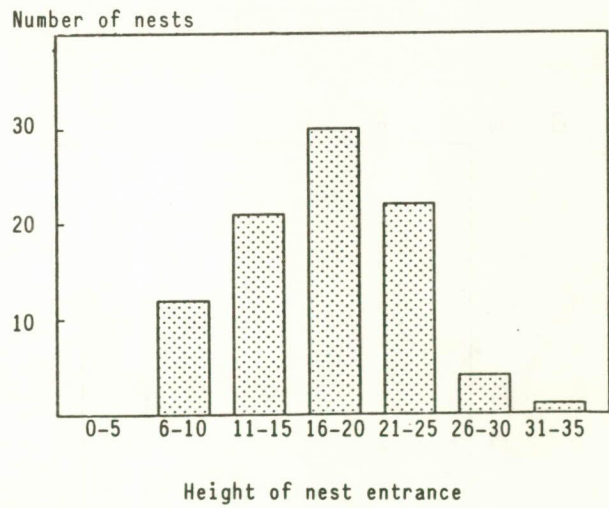
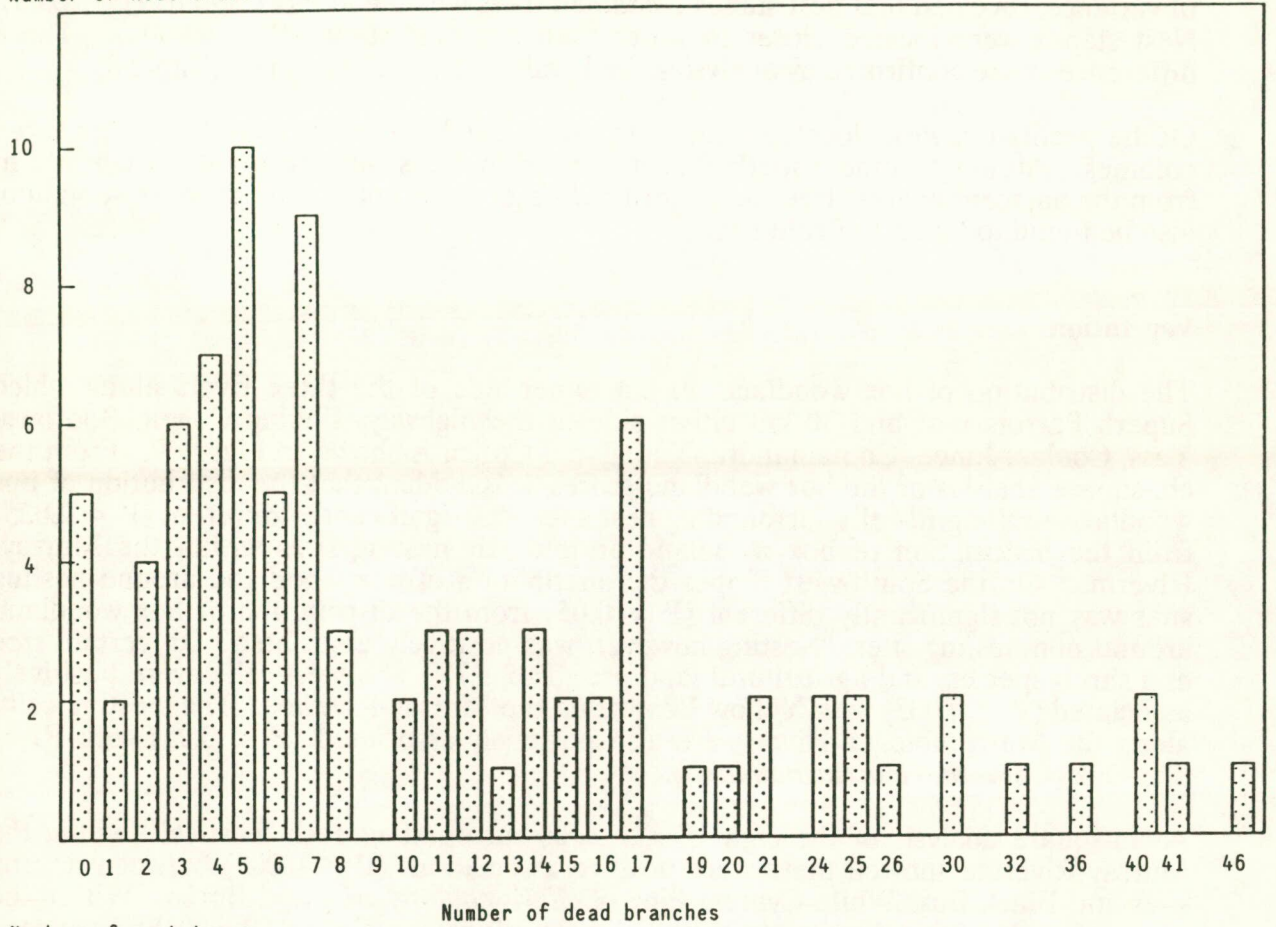
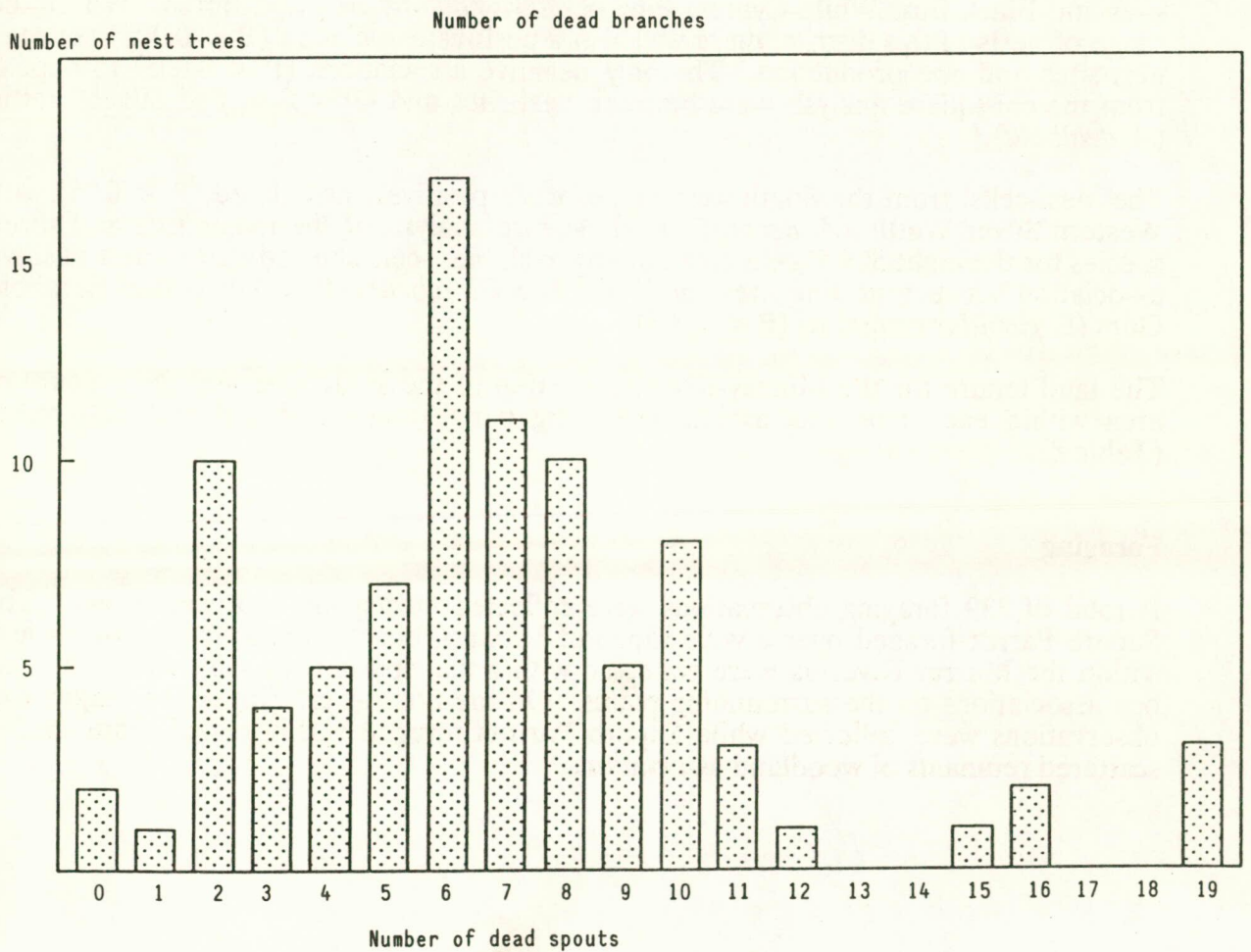


FIGURE 3 (cont.)

G Number of nest trees



H Number of nest trees



A comparison of nest stands and non-nest stands on the South-west Slopes, by analysis of variance, revealed that nest stands contained trees which had more spouts ( $P < 0.05$ ). Nest stands were located closer to water than non-nest stand ( $P < 0.0001$ ). These differences were confirmed by analysing the F-values using Tukey's test (Table 6).

Of the twenty-five nests located away from riparian habitat, seven were located in three colonies. Although some Superb Parrots nested in trees that were more than 100 m from the adjacent nearest tree the majority of single nests could, with more observation, also be found to be part of colonies.

## Vegetation

The distribution of box woodland 30 km either side of the three rivers along which Superb Parrots nest and 30 km either side of the highways linking Cowra, Boorowa, Yass, Coolac, Junee, Cootamundra, Young and Cowra is shown in Figure 7. From the chi-square analysis of the box woodland scores, it is evident that the distribution of box woodland in the grid-cells surrounding nest sites was significantly different ( $P < 0.025$ ) from the distribution of box woodland around non-nesting sites within the Murray-Riverina. On the South-west Slopes the distribution of box woodland around nesting sites was not significantly different ( $P > 0.05$ ) from the distribution of box woodland around non-nesting sites. Nesting however, was positively associated with certain tree and shrub species, and agricultural land use (Table 7). The 'nest-cells' were positively associated ( $P < 0.005$ ) with Yellow Box within the Murray-Riverina. The 'nesting cells' along the Murrumbidgee River were also positively associated ( $P < 0.05$ ) with River She-Oak (*Casuarina cunninghamiana*).

A chi-square analysis of the eight 5' x 5' cells surrounding each 'nest-cell' within the Murray-Riverina showed there were positive associations ( $P < 0.005$ ) between nesting sites and Black Box, White Cypress Pine (*Callitris columellaris*) and Boree. Within the range of nests in this district, there was also a positive association ( $P < 0.005$ ) between nest sites and rice production. The only negative associations ( $P < 0.005$ ) to appear from the chi-square analysis were between nest sites and Grey Box, and Silver Wattle (*A. dealbata*).

The 'nest-cells' from the South-west Slopes were positively associated ( $P < 0.05$ ) with Western Silver Wattle (*A. decora*). A chi-square analysis of the major tree and shrub species for the eight 5' x 5' cells surrounding each 'nest-cell' showed there was a positive association between nesting sites and White Box (*E. albens*) ( $P < 0.005$ ), and Eurabbie Gum (*E. globulus bicostata*) ( $P < 0.005$ ).

The land tenure for the Murray-Riverina portion of the study area and the amount of area within each type was ascertained using parish maps and a digital planimeter (Table 8).

## Foraging

A total of 339 foraging observations were collected during the two year survey. The Superb Parrot foraged over a wide range of habitats, but the majority of observations within the Murray-Riverina were collected within the riparian red gum and within the box associations on the surrounding plains. On the South-west Slopes the majority of observations were collected while Superb Parrots foraged within cereal crops and in scattered remnants of woodland associations.

TABLE 4.

Characteristics of Live Nest Trees, Dead Nest Trees, Nest Stands and Non-Nest Stands on the South-west Slopes: Abbreviations follow Table 1 (page 10).

	Mean	Range	S.D.	N
<b>Nest Trees (Live)</b>				
DBH (cm)	98.65	120 - 36	23.68	12
Height (m)	20.23	28 - 11	4.64	12
Max. crown diameter (m)	8.15	13 - 2	2.70	12
Crown dia. 90 degrees to max. dia. (m)	5.62	9 - 1	2.66	12
No. dead spouts	4.85	10 - 1	2.70	12
No. dead branches	15.77	30 - 3	9.20	12
Height of lowest 2nd order branch (m)	3.69	5 - 0	1.60	12
Height of nest (m)	9.69	13 - 5	3.09	12
Distance to water (m)	161.31	500 - 23	143.35	12
No. dead spouts + dead branches	20.62	36 - 5	10.63	12
MCD/DBH	0.008	0.012 - 0.004	0.002	12
MCD90/DBH	0.006	0.009 - 0.002	0.002	12
(MCD + MCD90)/DBH	0.044	0.068 - 0.017	0.013	12
<b>Nest Trees (Dead)</b>				
DBH (cm)	83.57	117 - 49	24.75	9
Height (m)	17.11	25 - 9	5.21	9
Max. crown diameter (m)	0	0 - 0	0	9
Crown dia. 90 degrees to max. dia. (m)	0	0 - 0	0	9
No. dead spouts	7.67	14 - 2	4.18	9
No. dead branches	19.56	54 - 2	17.17	9
Height of lowest 2nd order branch (m)	4.13	7 - 1	2.17	8
Height of nest	9.67	13 - 5	3.39	9
Distance to water	181.78	800 - 7	260.45	9
No. dead spouts + dead branches	27.22	58 - 13	15.93	9
MCD/DBH	0	0 - 0	0	9
MCD90/DBH	0	0 - 0	0	9
(MCD + MCD90)/DBH	0	0 - 0	0	9
<b>Nest Stands</b>				
DBH (cm)	40.15	130 - 14	31.63	41
Height (m)	13.46	28 - 8	4.53	41
Max. crown diameter (m)	3.73	12 - 0	3.13	41
Crown dia. 90 degrees to max. dia. (m)	2.61	9 - 0	2.61	41
No. dead spouts	0.585	6 - 0	1.50	41
No. dead branches	6.46	31 - 0	7.49	41
Height of lowest 2nd order branch (m)	2.37	12 - 0	2.09	41
Distance to water (m)	121.20	417 - 22	78.52	41
No. dead spouts + dead branches	7.05	31 - 0	8.29	41
MCD/DBH	0.011	0.021 - 0	0.005	41
MCD90/DBH	0.007	0.014 - 0	0.004	41
(MCD + MCD90)/DBH	0.056	0.107 - 0	0.026	41

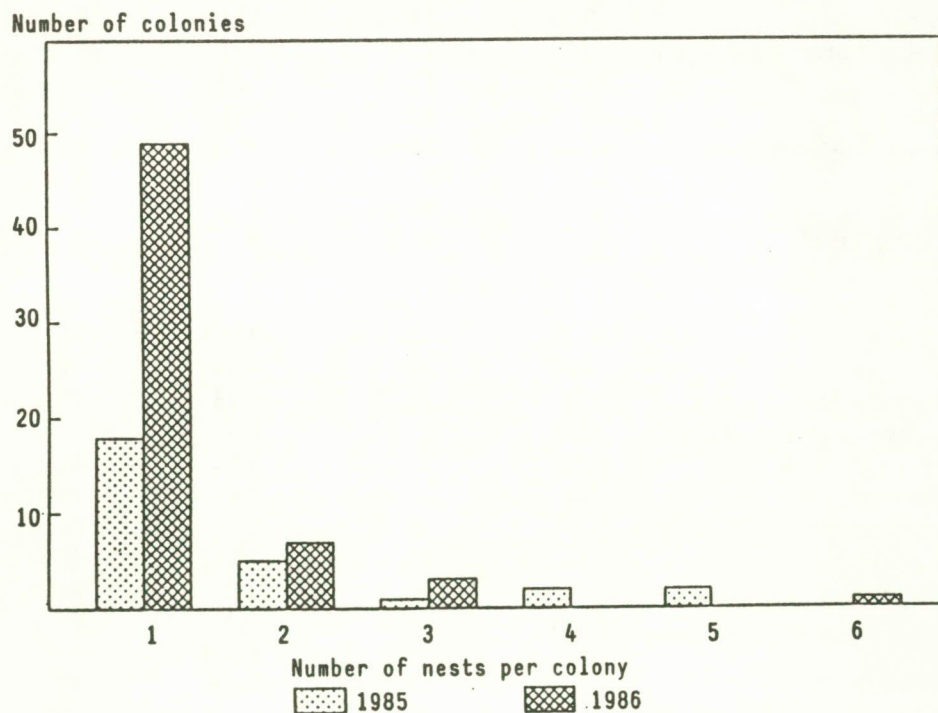
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TABLE 4 (cont.)

	Mean	Range	S.D.	N
<b>Non-Nest Stands</b>				
DBH (cm)	31.23	62 - 14	15.50	32
Height (m)	11.63	18 - 6	2.92	32
Max. crown diameter (m)	4.22	11 - 1	2.52	32
Crown dia. 90 degrees to max. dia. (m)	2.47	7 - 1	1.81	32
No. dead spouts	0.031	1 - 0	0.178	32
No. dead branches	5.59	47 - 0	9.61	32
Height of lowest 2nd order branch (m)	1.69	5 - 0	0.171	32
Distance to water (m)	334.91	520 - 30	143.30	32
No. dead spouts + dead branches	5.63	47 - 0	9.59	32
MCD/DBH	0.014	0.033 - 0.006	0.007	32
MCD90/DBH	0.008	0.020 - 0.002	0.003	32
(MCD + MCD90)/DBH	0.069	0.159 - 0.026	0.028	32

FIGURE 4

The number of known Superb Parrot nests per colony within the study area for the known nesting colonies for both 1985 and 1986. Single nests are also included.



Superb Parrots utilised a large number of seed producing plants (Appendix 2), but the majority fed on grass seeds (particularly *Danthonia sp.*), species of eucalypt, mistletoe and acacia, as well as on cereal crops (pers. obs.; P. Maher in litt.; A. Gladman in litt.). Another common food item was wheat (*Triticum aestivum*) spilt along the side of roads and within paddocks (J. Wilkinson in litt.). Superb Parrots were observed feeding on the side of the road at a number of locations along the Murrumbidgee River (pers. obs.; J. Rook pers. comm.), the Murray River (W. Labbett, P. Maher, pers. comm.) and on the South-west Slopes (R. Warren, H. Greenwood, pers. comm.). Superb Parrots have been observed feeding at roadsides in the same locations over a number of years (J. Rook, P. Maher, pers. comm.), resulting in some birds being killed by passing motor vehicles (pers. obs.; J. Brickhill, J. Rook, pers. comm.).

Food sites utilised by Superb Parrots within the Murray-Riverina were in riparian red gum and up to 9 km away in box woodlands. These box woodlands were linked to the riparian red gum nesting sites by regularly used flight paths. In most cases, these flight paths followed natural woodland (*Eucalyptus spp.*, White Cypress Pine and Boree) and only briefly crossed open ground.

On the South-west Slopes a similar foraging pattern was observed for the Superb Parrot to that in the Murray-Riverina. Some foraging sites were located near nesting sites and others up to 10 km away. The nesting and foraging sites were linked to each other by remnant stands of Eucalyptus woodland, often roadside verges, travelling stock routes and 'travelling stock and camping reserves'.

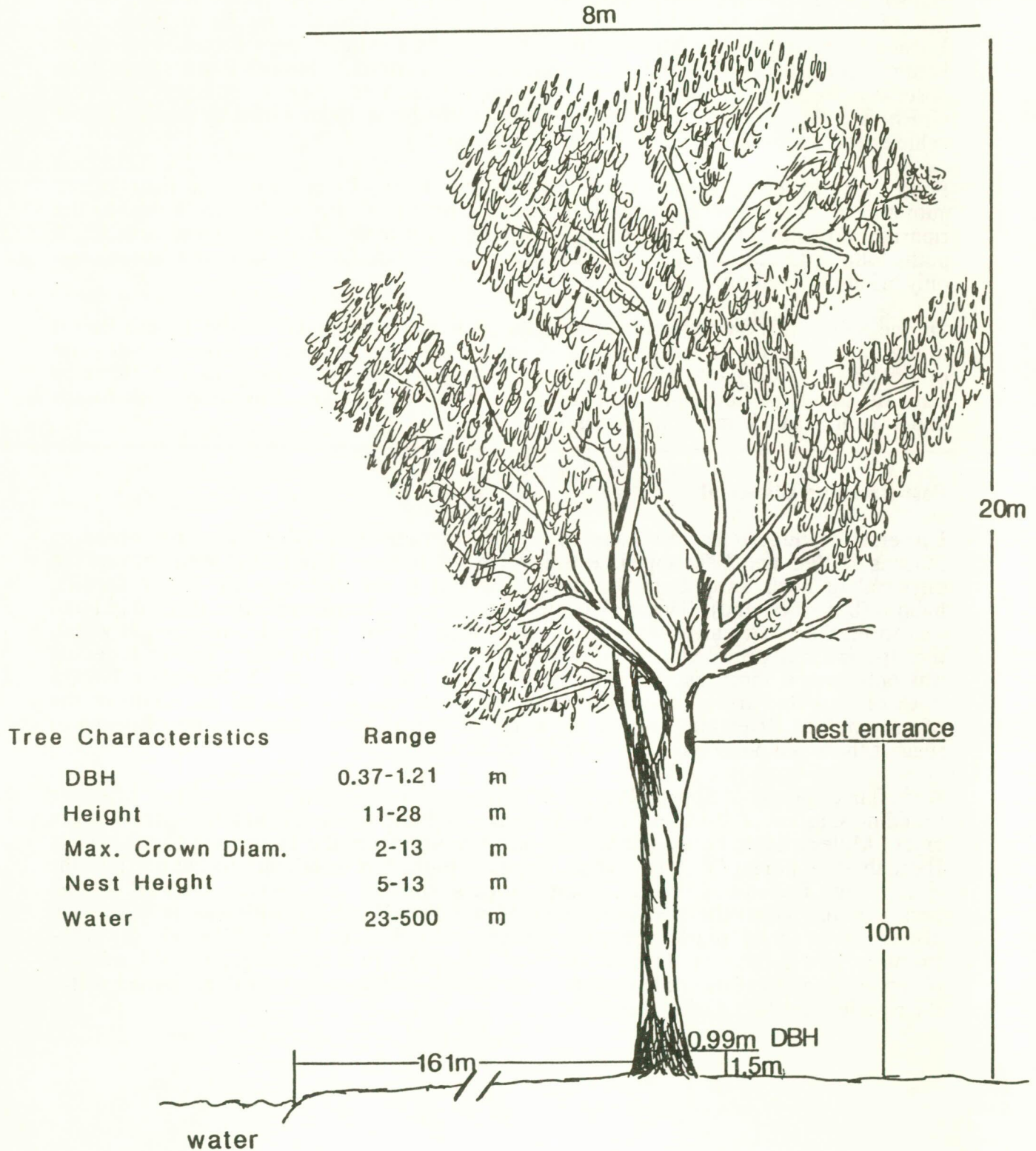
### Post-Breeding Dispersal

Dispersal of Superb Parrots away from the Murrumbidgee River after the breeding seasons of 1985 and 1986 appeared to involve two phases. The first movement was the dispersal of birds away from the nesting habitat (riparian red gum), to the feeding habitat (box woodland). This took place once the young birds were capable of flight and was so marked that only a small proportion of the breeding population was left within the riparian red gum. Movement away from riparian red gum directly after breeding was only over a short distance (approx. 15 km). Thus when on 12 December 1985, a flock of Superb Parrots containing immature birds was observed 60 km south of the Murrumbidgee River but, only 12 km north of Yanco Creek, this may be evidence to suggest there is a nesting colony along Yanco Creek.

A similar dispersal of Superb Parrots took place away from the Murray River after the breeding seasons of 1985 and 1986. Presumably those birds that nested at the eastern end of Millewa State Forest (NSW) and possibly birds from the Tongalong Creek area in Barmah State Forest (Vic) were those observed in the box woodlands to the north of the river during December 1985 (I. Campbell pers. comm.) and January 1986 (P. Maher pers. comm.). After the 1986 breeding season, one pair of birds with two fledglings was also observed 25 km south of the river, foraging in a Silky Oak (*Grevillea robusta*) in the township of Nathalia (J. Hutchinson pers. comm.). Post-breeding dispersal was not observed along the Edward River where both adult and immature birds remained within the riparian red gum during December.

FIGURE 5a

A 'typical' Superb Parrot nest tree (live) on the South-west Slopes.



**FIGURE 5b**

A 'typical' Superb Parrot nest tree (dead) on the South-west Slopes.

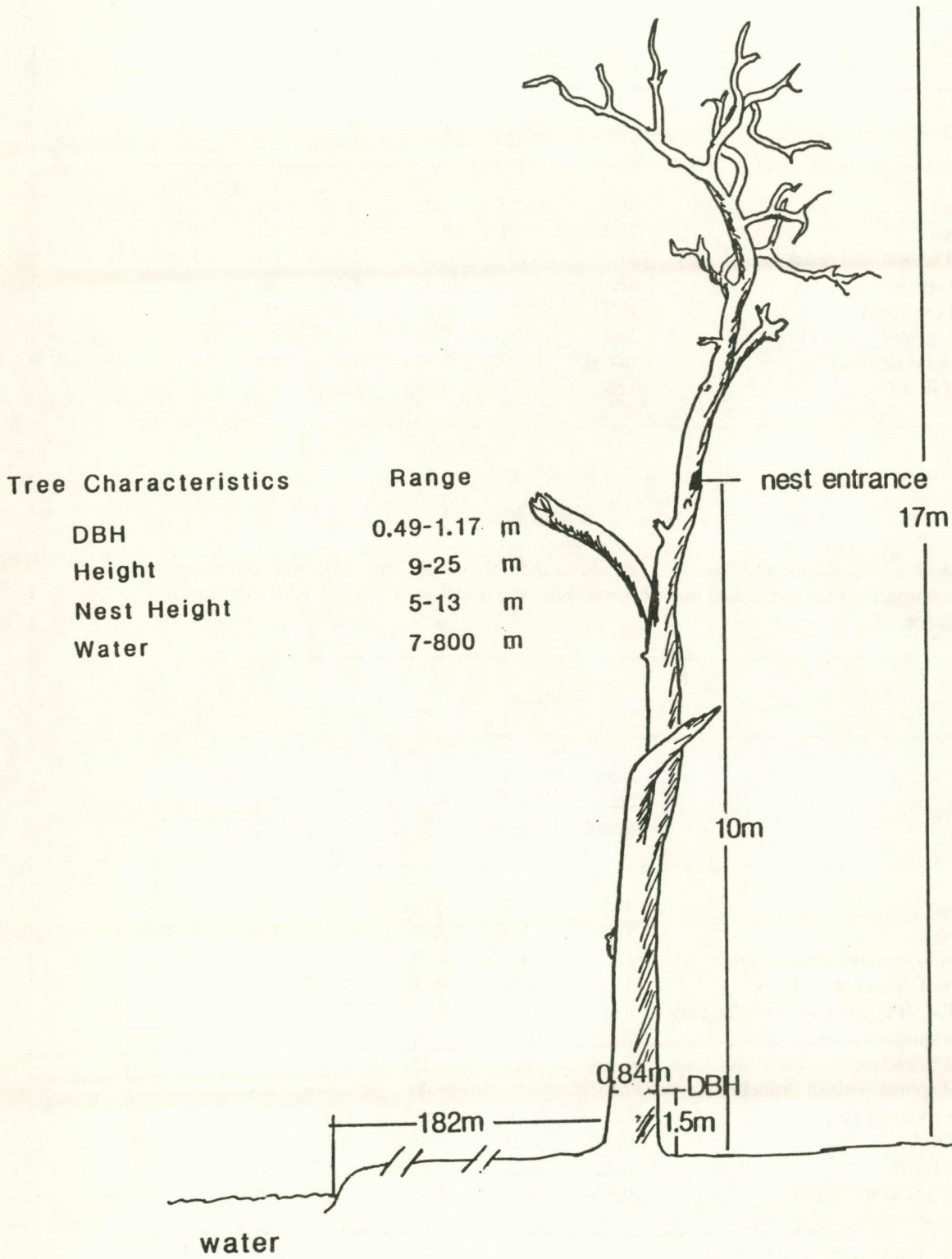




TABLE 5.

Comparison of Live Nest Trees and Dead Nest Trees on the South-west Slopes: Results of the analysis of variance comparing live nest trees and dead nest trees on the South-west Slopes. Abbreviations follow Table 1 (page 10).

Character	Mean		F	P	Sig.	d.f.
	Live	Dead				
DBH (cm)	98.65	83.57	2.08	0.165	n.s.	1
Height (m)	20.23	17.11	2.18	0.156	n.s.	1
Height of lowest 2nd order branch (m)	3.69	4.13	0.28	0.605	n.s.	1
No. dead spouts	4.85	7.67	3.72	0.068	n.s.	1
No. dead branches	15.77	19.56	0.45	0.509	n.s.	1
No. dead spouts + dead branches	20.0	27.22	1.37	0.255	n.s.	1
Distance to water (m)	161.31	131.78	0.06	0.815	n.s.	1
Height of nest (m)	9.69	9.67	0.00	0.986	n.s.	1

TABLE 6.

Comparison of Nest Stands and Non-Nest Stands on the South-west Slopes: Results of the analysis of variance comparing nest stands and non-nest stands on the South-west Slopes. Abbreviations follow Table 1 (page 10).

Character	Mean		F	P	Sig.	d.f.
	Non-Nest Stand	Nest Stand				
DBH (cm)	40.15	31.23	2.14	0.148	n.s.	1
Height (m)	13.46	11.63	3.97	0.050	sig.	1
Height of lowest 2nd order branch (m)	2.37	1.69	2.20	0.142	n.s.	1
Max. crown diameter (m)	3.73	4.22	0.51	0.476	n.s.	1
Crown dia. 90 degrees to max. dia. (m)	2.61	2.47	0.07	0.797	n.s.	1
No. dead spouts	0.59	0.03	4.31	0.042	sig.	1
No. dead branches	6.46	5.59	0.19	0.665	n.s.	1
No. dead spouts + dead branches	7.05	5.63	0.46	0.449	n.s.	1
Distance to water (m)	121.20	334.91	65.99	0.0001	sig.	1
MCD/DBH	0.011	0.014	6.48	0.13	sig.	1
MCD90/DBH	0.007	0.007	0.63	0.430	n.s.	1
(MCD + MCD90)/DBH	0.056	0.069	4.46	0.038	sig.	1

After initial localised dispersal, young Superb Parrots in the Murray-Riverina became accomplished flyers and dispersed over a far greater range. B. Davis (in litt.) reports that, during the middle of January 1986, Superb Parrots were moving in a northerly direction over his property, 10 km north of Tocumwal and the Murray River. This was his first sighting of Superb Parrots since September when he observed a flock of twenty-five flying south towards the Murray River. This coincides with observations that Superb Parrots had been absent from the Murrumbidgee River since mid-January 1986 (B. Ryan, J. Rook, pers. comm.). The dispersal of birds was further supported by the fact that very few birds were observed in riparian red gum and surrounding box woodlands of the Murray-Riverina throughout February 1986 and January-March 1987 (pers. obs.; J. Rook pers. comm.)

The location of the bulk of the population during the period, January-March each year, is unknown. The only observations of Superb Parrots from this part of the current breeding range were made by P. Maher who, during January 1986 observed six to eight birds on the property 'Waringa', 35 km NNE of Conargo (P. Maher in litt.). In the same report he records that, during January-February 1987, between ten and thirty birds were observed at the same location, approximately 65 km south of the Murrumbidgee River and 90 km north of the Murray River.

Superb Parrots were not observed thereafter within the Murray-Riverina area until 25 March 1986, when a flock of approximately fifteen birds was seen flying to the west along the edge of Cuba State Forest on the Murrumbidgee River (J. Rook pers. comm.). On 31 March 1986, between twenty and thirty birds were observed on the property 'North Tuppal' feeding in Yellow and Grey Box woodland approximately 15 km north of the Murray River (P. Maher in litt.).

The first sightings of Superb Parrots within the Murray-Riverina area after the January 1987 sightings did not take place until March-April 1987 when, on the Murrumbidgee River, J. Rook (pers. comm.) observed a flock of Superb Parrots in Black Box to the west of Darlington Point and R. Fussell (pers. comm.) observed flocks to the east and west of Narrandera. The first sighting of Superb Parrots in the Murray districts was of a flock of thirty to forty birds 15 km south-east of Deniliquin (pers. obs.; P. Maher pers. comm.). This flock was utilising an area of Black Box which had flowered a few months earlier and which had previously not been utilised for a number of years, possibly since the last time these trees flowered. This flock consisted primarily of immature birds with only a few adult birds, and remained at this location for at least a month.

From the timing of these movements it appears that for the Murray-Riverina area the 1985 breeding season commenced with nesting in early October and finished with fledging in early December, whereas for the 1986 breeding season nesting apparently commenced in late September and fledging took place in late November.

On the South-west Slopes the dispersal behaviour of Superb Parrots after nesting appears to be similar to that in the Murray-Riverina area, although observations are available for only one year (1986). Although nesting and feeding areas are interspersed on the South-west Slopes, there nevertheless appears to be an initial dispersal of Superb Parrots away from nesting sites after breeding (H. Greenwood pers. comm.). This is difficult to distinguish from everyday local movements. There was however a later net dispersal away from the South-west Slopes from late December 1986 to early January 1987, beginning from the east of Boorowa and Cowra (J. McKeon, D. Croft pers. comm.). By the end of January 1987, Superb Parrots were only found at Grenfell and Young on the western edge of the current breeding distribution. The population at Grenfell had increased from that present during the height of the breeding season when only non-breeding birds were present. By the end of January this population not only consisted of non-breeding birds but also adult pairs and successfully fledged young. In the Young district at the end of January, approximately six weeks after fledging, the

majority of the population was immature birds which appeared to be moving in a westerly direction. The population of Superb Parrots in the Cootamundra district had also moved by this time with the last large flocks observed on 22 January 1986 (J. Manning pers. comm.).

A survey of the South-west Slopes during mid-March of 1987 showed that a few Superb Parrots had moved back into some of the nesting areas. Birds were observed to the north of Boorowa (R. Warren pers. comm.), to the south-east of Yass (H. Greenwood pers. comm.) and to the north-west of Young. However flocks of Superb Parrots were also observed flying in a northerly direction through the Parkes district at this time during 1987 (N. Schrader pers. comm.).

The Superb Parrot Mail Survey run by the New South Wales National Parks and Wildlife Service resulted in ninety-three responses. This information is cited in this report and a summary of the responses is given in Appendix 7.

TABLE 7.

Results of Vegetation Analysis: Associations between nest sites and plant species or vegetation types obtained by chi-square analysis. Positive association (+ve sig.), negative association (-ve sig.), or non-significance (n.s.). River Red Gum was found in all 'river cells' (-).

Plant Species/Vegetation Unit	River Cells Only	P	Surrounding Cells	P
<b>Murray-Riverina</b>				
River Red Gum ( <i>E. camaldulensis</i> )	-		n.s.	>0.05
Black Box ( <i>E. largiflorens</i> )	n.s.	>0.05	+ve sig	<0.01
Yellow Box ( <i>E. melliodora</i> )	+ve sig	<0.005	n.s.	>0.05
Grey Box ( <i>E. microcarpa</i> )	n.s.	>0.05	-ve sig	<0.005
White Cypress Pine ( <i>C. columellaris</i> )	n.s.	>0.05	+ve sig	<0.005
Buloke ( <i>C. luehmannii</i> )	n.s.	>0.05	n.s.	>0.05
River She-Oak ( <i>C. cunninghamiana</i> )	+ve sig	<0.025	n.s.	>0.05
Silver Wattle ( <i>A. dealbata</i> )	n.s.	>0.05	-ve sig	<0.005
Boree ( <i>A. pendula</i> )	n.s.	>0.05	+ve sig	<0.005
Pasture	n.s.	>0.05	n.s.	>0.05
Rice	n.s.	>0.05	+ve sig	<0.005
Wheat ( <i>T. aestivum</i> )	n.s.	>0.05	n.s.	>0.05
Box Woodland	n.s.	>0.05	+ve sig	<0.025
<b>South-west Slopes</b>				
	Road Cells Only			
Blakely's Red Gum ( <i>E. blakelyi</i> )	n.s.	>0.05	n.s.	>0.05
Eurabbie Gum ( <i>E. globulus bicostata</i> )	n.s.	>0.05	+ve sig	<0.005
Grey Box	n.s.	>0.05	n.s.	>0.05
White Box ( <i>E. albens</i> )	n.s.	>0.05	+ve sig	<0.005
Red Box ( <i>E. polyanthemos</i> )	n.s.	>0.05	n.s.	>0.05
Yellow Box	n.s.	>0.05	n.s.	>0.05
Silver Wattle	n.s.	>0.05	n.s.	>0.05
Western Silver Wattle ( <i>A. decora</i> )	+ve sig	<0.05	n.s.	>0.05
Cereal	n.s.	>0.05	n.s.	>0.05
Box-Gum Woodland	n.s.	>0.05	n.s.	>0.05

FIGURE 6a

Nest tree characteristics for live trees on the South-west Slopes.

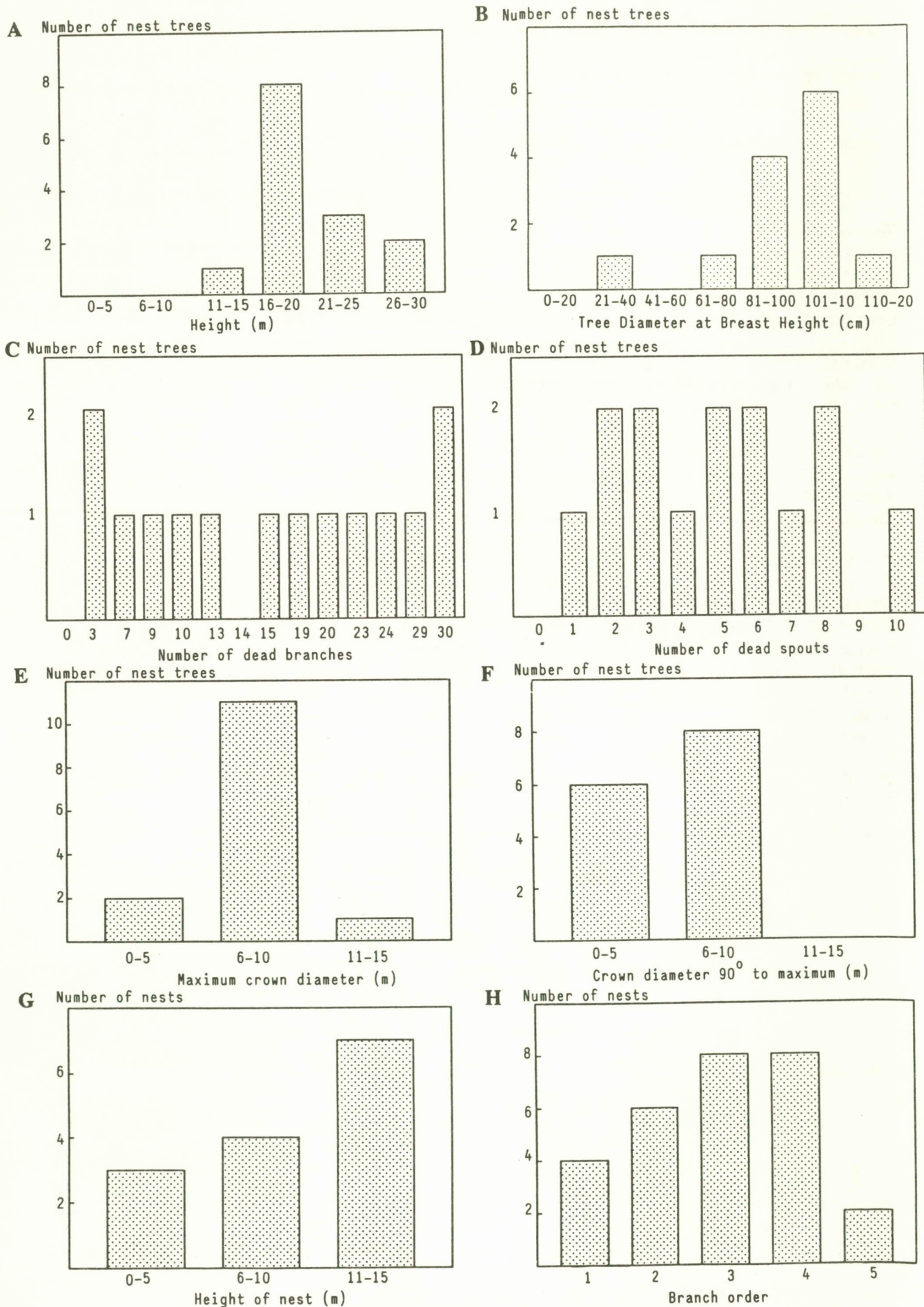
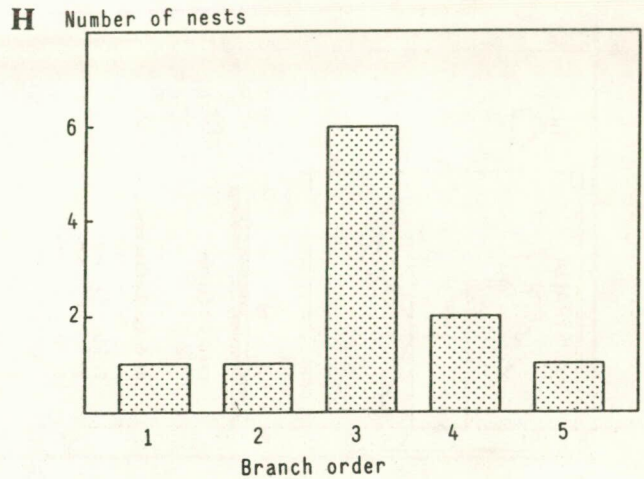
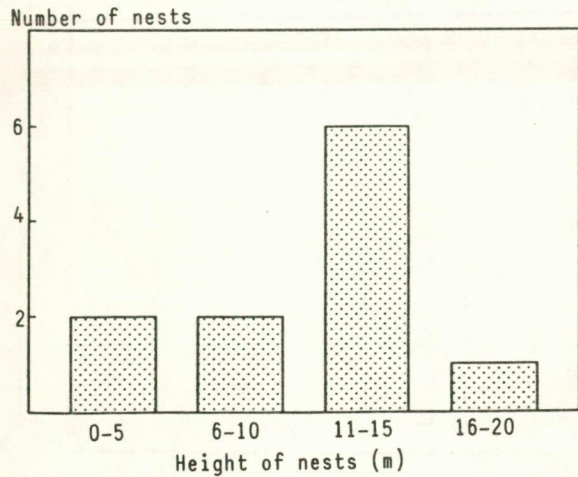
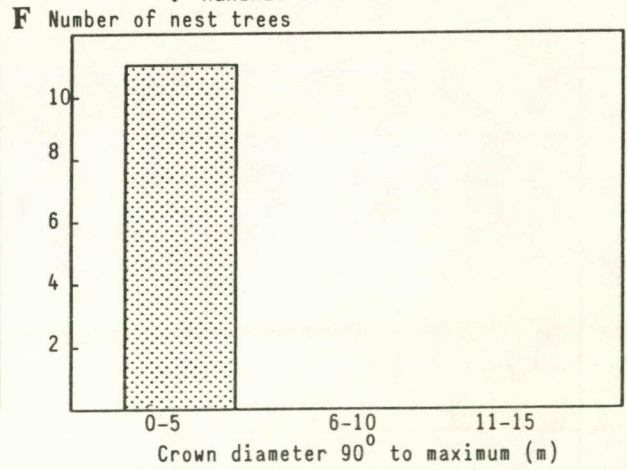
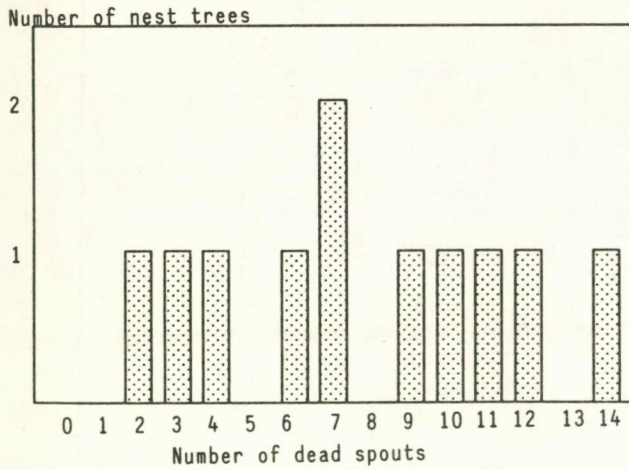
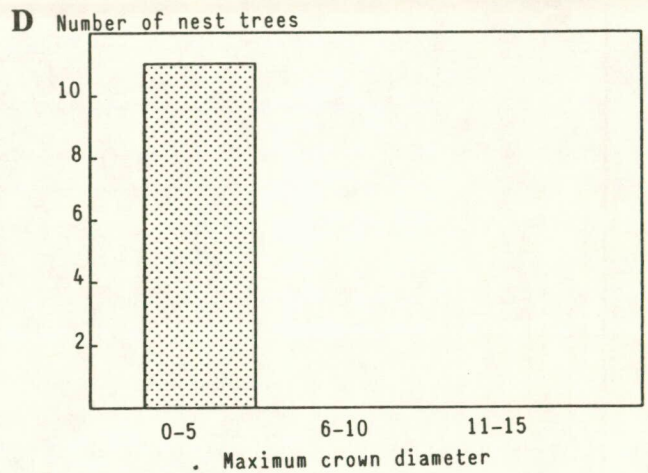
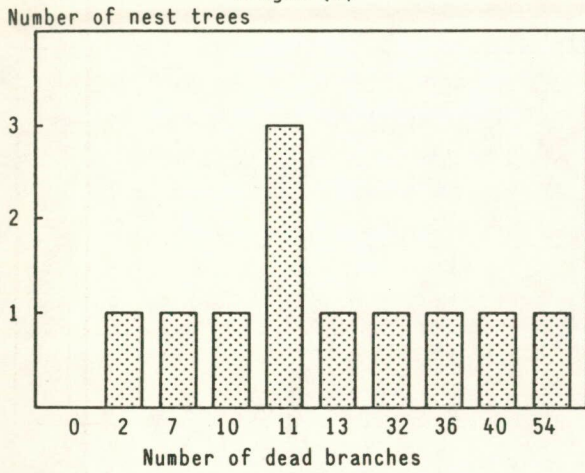
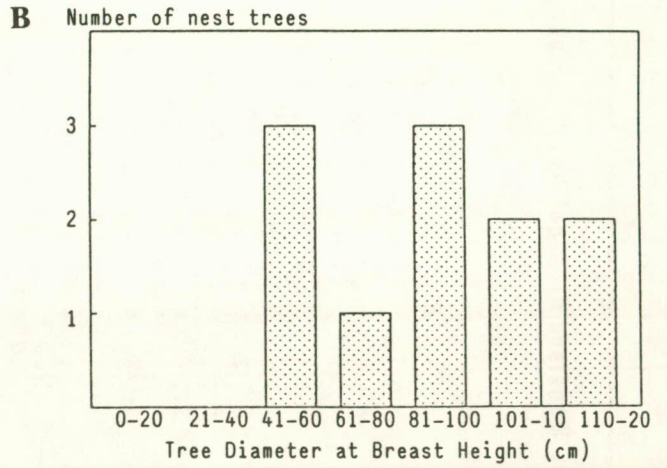
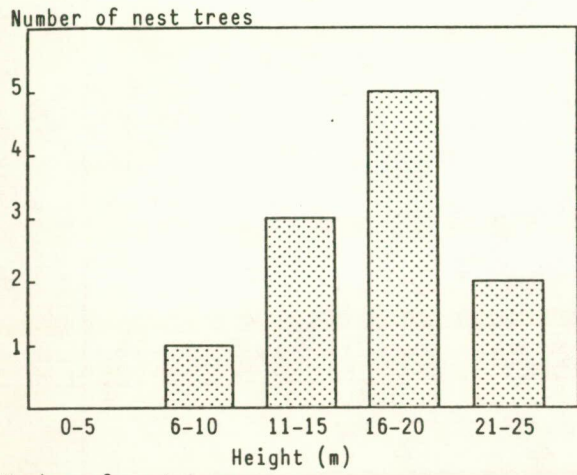
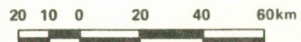
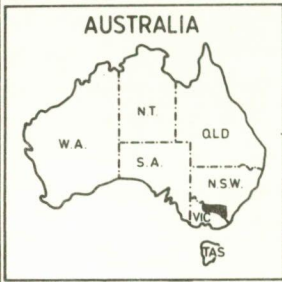


FIGURE 6b

Nest tree characteristics for dead trees on the South-west Slopes.

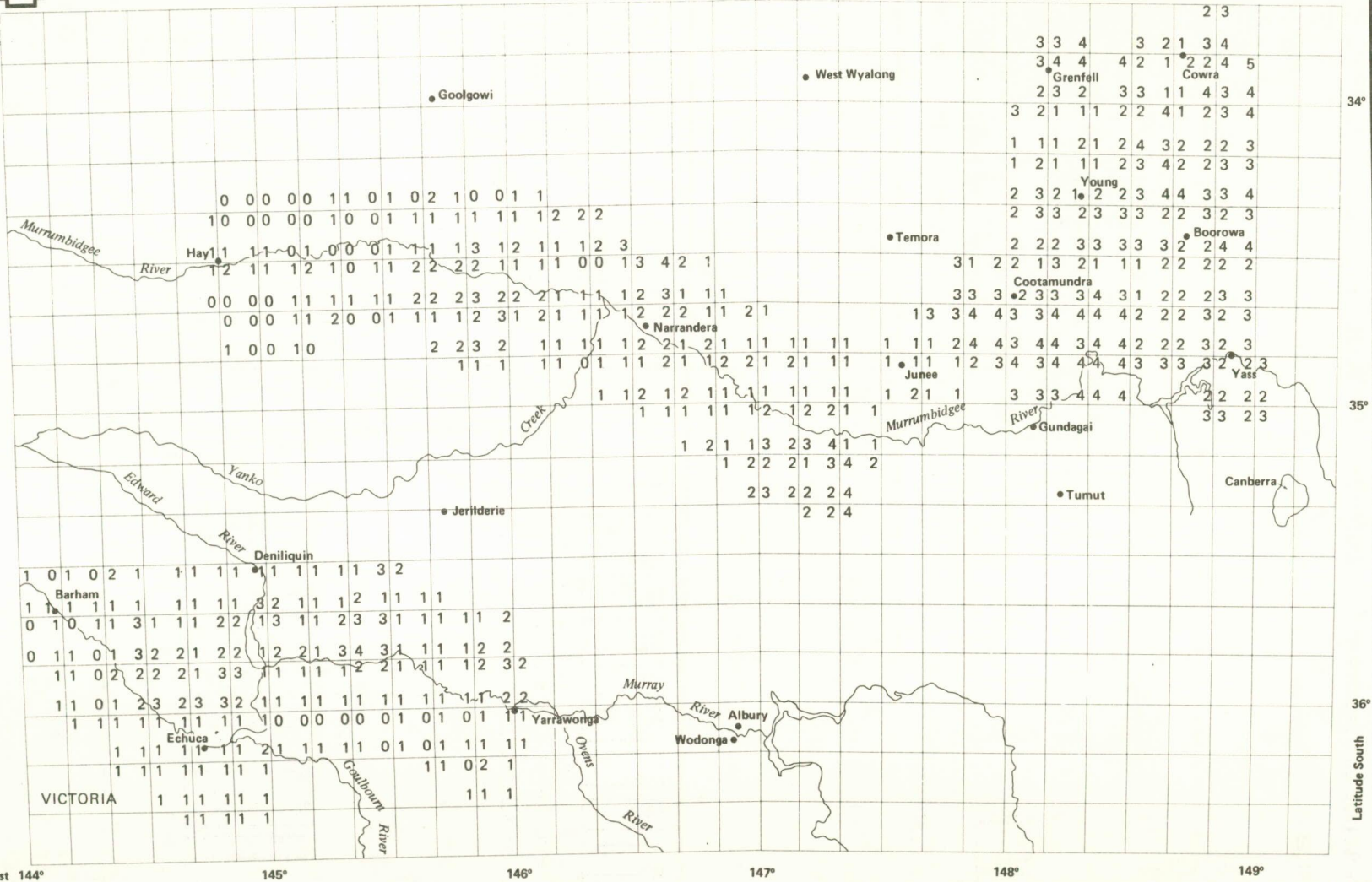


Box Woodland Distribution Figure 7



Scale 1:1 500 000

- 0 = No Box Woodland cover
- 1 = < 1/8 cover
- 2 = 1/8 - 2/8 cover
- 3 = 2/8 - 3/8 cover
- 4 = 3/8 - 7/8 cover
- 5 = > 7/8 cover



## DISCUSSION

### Breeding Distribution

#### a) Present study

The present survey was confined to what is believed to be the current breeding stronghold of the Superb Parrot (Forshaw and Cooper, 1981). It confirmed that, between Wagga Wagga and 'Toganmain Station' along the Murrumbidgee River, Superb Parrots still breed successfully. It appears that the Superb Parrot also breeds on the upper Murrumbidgee River (upstream of Gundagai), as H. McIntyre (in litt.) believes the Superb Parrot to have bred on her property for the past forty years (Appendix 7), although no evidence was obtained during the 1986 breeding season to support this. The survey did confirm that Superb Parrots still nest successfully in the riverine forests of the Deniliquin district along the Edward and Murray Rivers, although the number of birds observed each breeding season varies (P. Maher pers. comm.).

It was confirmed that Superb Parrots breed in significant numbers in Victoria. This is contrary to oft-quoted reports. The species is known to have bred in various parts of Barmah State Forest for at least the past three years. Although only one nest was found in Barmah State Forest during the 1985 breeding season, evidence suggests that there could be at least four nesting sites within this forest. At three sites where nests were not found, adult Superb Parrots were observed feeding young birds just out of the nest during the 1986 breeding season (pers. obs.). This situation has been observed at these locations over a number of years (J. Hutchinson pers. comm.). With further investigation a fifth nesting site may also be found.

During the 1984 breeding season, Superb Parrots were also observed breeding west of Yarrawonga (Vic). Although confirmation of this breeding site was not obtained for either 1985 or 1986, M.J. Casey (in litt.) reports the birds frequented the same area during the 1985 breeding season and were common on both sides of the river.

Although the Superb Parrot was breeding successfully within the riparian red gum during the course of this study, there was no evidence of breeding in box woodland of the Murray-Riverina. Frith (1972), in a CSIRO report, states that the Superb Parrot on 'Toganmain Station' 'breeds in the Black Box country'. Thirty-four hours were spent searching box woodland on 'Toganmain Station' and throughout the Murray-Riverina area and many more hours were spent travelling through this habitat. A number of earlier nest records support the claim that the Superb Parrot utilised box woodland of the Murray-Riverina in the past (D. Davies, J. Rook, I. Campbell and A. Cecil pers. comm.).

No nests were located in box woodland surrounding the Murrumbidgee and Murray Rivers, however four nests were located in box woodland at Goolgowi, north of Griffith, during the 1986 breeding season, and Superb Parrots have been known to nest there for a number of years (J. Cahill pers. comm.). The area is dominated by box, pine and mallee species, with Inland Red Box (*E. intertexta*) and dead trees being used as nesting sites. D. Arnold (pers. comm.) also reports that two Superb Parrot nests were found in the Merriwagga district (Figure 1) (approx. 22 km N of Goolgowi) during the 1984 breeding season.

Despite the numerous historical references to box woodland as nesting habitat all observers now state that it has been many years since anyone observed Superb Parrots nesting in box woodland. The lack of confirmed nesting records in the box woodland of the Murray-Riverina could be due to a reduction in the number of favourable nesting



sites as a result of the clearing of large areas of land. If only a small proportion of the Superb Parrot population now nested in the box woodland, this could explain the difficulty in confirming nest sites, as these would be difficult to locate within the widely scattered remnants of habitat.

The extension of the study area to include the South-west Slopes for the 1986 breeding season led to the confirmation that Superb Parrots do nest in this region of New South Wales. The scattered distribution of nesting sites on the South-west Slopes is probably a result of the wide-spread clearing for agriculture, which has decreased the number of available nest sites and has probably reduced foraging resources. However the reduction of foraging resources has no doubt been offset to a degree by the planting of cereal crops and by the development of horse studs (Cootamundra district) where large amounts of grain are continually provided to stock (J. Manning pers. comm.).

In this portion of the current breeding range, Superb Parrots utilise many eucalypt species, including River Red Gum and various box species, for nesting. However live trees were not the only type of tree used as a nest site; dead trees were used much more extensively on the South-west Slopes than within the Murray-Riverina.

### Nest Tree Characteristics

Although a 'typical' nest tree can be described (page 14), there is nevertheless some variability between actual nest trees (Figure 3 and Figure 6). This is particularly obvious if the nest trees of the Murray-Riverina area are compared with those of the South-west Slopes. The 'typical' tree utilised by Superb Parrots in the riparian red gum forest is mature and healthy, usually the largest tree in that part of the forest, and on average 26 m from a watercourse (Table 1). Within the Murray-Riverina area, only seven dead trees (7.7 per cent of all nest trees) were used for nesting. Eleven (40.9 per cent) of trees utilised by Superb Parrots on the South-west Slopes and within the Goolgowi district were dead (pers. obs.; N. Russil in litt.; J. Kershaw pers. comm.) and were on average 181 m from water (Table 4). These trees were often the largest available and sometimes the only trees available (pers. obs.; J. Kershaw pers. comm.) and hence this could explain why dead trees are used for nesting. High nest site fidelity could also explain the use of dead trees, since the majority of dead nest trees currently used by Superb Parrots have been killed, only over the last ten to twenty years, usually by poisoning (W. Warren pers. comm.), ringbarking (R. Murphy pers. comm.; For. Comm. NSW 1985) or permanent flooding (as in Tombullen Storage Area) and may therefore have been selected as nest sites when alive.

The theory that nests initially located in live trees are still utilised after the death of the tree is further supported in that twelve nests (in live trees, in the Murray-Riverina) found during the 1985 survey were used again in 1986. In addition, three trees utilised in 1985 were used again in 1986, but different hollows were selected. Also one of the nest trees on the Edward River is known to have been used for the last three breeding seasons. On the south-west slopes, where the highest proportion of nest trees were dead, a single dead tree used for nesting during the 1985 breeding season (N. Russil in litt.) was revisited (this time by the author) in the 1986 season. The dead trees utilised for nesting, as well as being often the largest trees available, would have hollows of a suitable size and depth (Campbell 1901, North 1911, Frith and Calaby 1953).

Throughout the study area stands containing nest trees were found to be located significantly closer to water, on average than randomly located stands which did not contain nest trees (Tables 1 and 3). Although most nest stands were located close to watercourses, these were, in some situations, ephemeral creeks which flowed only rarely. The colony of six nests located in Millewa State Forest was two kilometres from the Murray River, and the single nest in Barmah State Forest was five kilometres from the river. On the South-west Slopes and in the Goolgowi district, only two of the twenty-five nest trees found were in the vicinity of permanent streams, although six of the nests were located near man-made dams. Thus it would appear that the observation of Frith and Calaby (1953) that a typical Superb Parrot nest site is situated over water is not always so, rather it appears that it is situated close to water. One possible reason for this association of Superb Parrot nests with watercourses (whether they be ephemeral or permanent) is that the most favourable nest trees grow on these sites. This is supported by the data gathered from nest stands and non-nest stands (Table 3) along the Murrumbidgee River and on the South-west Slopes (Table 5).

Nest stands possessed other characteristics which made them more favourable for nesting than non-nest stands. There was a higher number of spouts (dead broken limbs) in the nest stands compared to non-nest stands ( $P < 0.001$  Murray-Riverina;  $P < 0.05$  South-west Slopes). Dead spouts were 'typical' nesting sites (pers. obs.) and nest stands provided more of this type of favourable hollow. Also, more spouts were found in larger trees, and trees in the nest stands within the Murray-Riverina area were significantly larger than those in non-nest stands.

Most Superb Parrots observed nesting during the survey (92 per cent in the Murray-Riverina and 77 per cent on the South-west Slopes ) nested in branches of order two, three or four (Figure 3E and Figures 6a (H) and 6b (H) ). This is probably because these older branches usually contain the most well-developed hollows. North (1911) noted the preference of this species for nesting in deep hollows, sometimes with the nest chamber at or near ground level. During this survey one nesting chamber was found at ground level, some eleven metres below the hollow entrance.

Although sixty-seven of the 115 nests located were apparently single nests, there was often indirect evidence to suggest that of these nests most belonged to colonies. Frequently, in known nesting areas, single males or flocks of males would fly in, or birds would congregate at the beginning of a flight line, or pairs of birds would show an interest in a particular area, suggesting that more nests may be present.

## Vegetation

### a) Associations between nesting and vegetation within the Murray-Riverina

Within the Murray-Riverina, the nest-cells were positively associated with Yellow Box and River She-Oak. Therefore it is possible that these two species may be used as indicators of potential Superb Parrot nest sites, in this part of the nesting range.

A correlation between nests of the Superb Parrot and the close proximity of box woodland was demonstrated. All nests located in this survey were restricted to stretches of river with box woodland within 9 km. This may be why the Superb Parrot does not nest west of Toganmain Station on the Murrumbidgee River, as the Black Box woodland decreases to small patches and is virtually only a few trees wide either side of the river at Hay (the western edge of the study area). The majority of nesting sites found in this survey were on crown land belonging to either the Forestry Commission of NSW or the Pasture Protection Board. Forest on freehold land within 'Toganmain Station', 'Wyvern', 'Kooba' and 'Tubbo' is thought to be utilised for nesting (pers. obs.; J. Rook pers. comm.), although this was not confirmed.

The majority of feeding sites utilised during the breeding season were found on: 'Toganmain Station', 'The Homestead' and 'Tubbo' properties, where box and cypress pine woodland species were exploited. Conservation of freehold land exploited by Superb Parrots is of major importance and clearing of these areas could be expected to have an adverse effect on the survival of the parrots within this district.

The scattered distribution of nesting along the Murray River is more difficult to explain. The small colony which is reported to exist at Yarrowonga could be utilising the box woodland seven kilometres to the north. There is then an apparent gap in the nesting distribution from 15 km west of Yarrowonga to Millewa State Forest, a distance of 126 km by river. However the gap may be bridged by a small nesting colony which is thought to exist in the vicinity of Dead River, near Tocumwal (W. Labbett pers. comm.). The reason for any such gap(s) in the nesting range is likely to be the lack of box woodland. Large areas have been cleared for stonefruit and citrus orchards and for rice production.

West of Tocumwal in Millewa and Barmah State Forests, the area of remaining box woodland is greater than the remaining areas to the east between Tocumwal and Yarrowonga and thus provides nesting pairs of Superb Parrots with a ready food source. West of Barmah State Forest to the edge of the study area at Barham, no nesting colonies were located. The absence of nesting in Gunbower, Perricoota and Koondrook State Forests is difficult to understand as box species occur within and adjacent to the riparian red gum forests.

A similar situation exists along the Edward River with only a seven kilometre stretch of river being utilised for nesting by Superb Parrots. The reason this portion of the Edward River contains nests is likely to be the close proximity of food. Dwarf Cherry (*Exocarpus stictus*) occurs throughout this section of the red gum forest and the fruit is eaten by Superb Parrots. Box woodlands also occur only six kilometres away, and Superb Parrots have been observed there feeding on native grasses and spilt wheat (P. Maher pers. comm.).

Grey Box woodland and Silver Wattle occur most commonly at the south-western extremity of the breeding range. The negative association between nesting sites and Grey Box and Silver Wattle may indicate a lack of breeding in the south-west of the Murray-Riverina rather than the unsuitability of Grey Box woodland or Silver Wattle as a food source. Where nesting sites are located within nine kilometres of Grey Box woodland, Superb Parrots were observed flying to and from the woodland (pers. obs.; P. Maher pers. comm.). Superb Parrots foraged on various weed and grass seeds, fallen grain and Emu Bush (*Eremophila longifolia*) while in the Grey Box woodland (P. Maher in litt.), and were observed foraging on Silver Wattle in both Millewa and Barmah State Forests.

Nesting sites were positively associated with White Cypress Pine and Boree. This association may exist because of the availability of food found within the scattered remnants of these vegetation types. Within White Cypress Pine woodlands, Superb Parrots feed on grass and other seeds (C. Beardsell pers. comm.), Deane's Wattle (*A. deanii*) and on lerps (Fam. Psyllidae) from Yellow Box, while the Grey Mistletoe (*Amyema quandang*) is exploited in the Boree (pers. obs.; P. Maher in litt).

The positive association between nesting sites and rice production areas is possibly due to the fact that there are remnant patches of box woodland left in most paddocks used for rice production. In many situations these patches are exploited for food and as flight paths (pers. obs.; J. Rook pers. comm.).

### b) Associations between nesting and vegetation on the South-west Slopes

On the South-west Slopes, the 'nest-cells' were positively associated with Western Silver Wattle. This species grows in association with pine and box woodlands, and on red loams (Costermans 1981) which are characteristic of the South-west Slopes. As the majority of nests found in this area were in remnant patches of box woodland on red loams Western Silver Wattle may be useful as an indicator species so as to locate nesting sites.

The positive association between nest sites and White Box is probably due to the quantity of food gained from the latter. Early in the 1986 breeding season, Superb Parrots foraged on the flowers. White Box also develops nest hollows suitable for Superb Parrots (pers. obs.; J. Smith pers. comm.).

There is also, not surprisingly, a positive association between nest sites and Eurabbie Gum. This is a popular species of eucalypt to be planted on the South-west Slopes either as a wind-break or as a road-side reserve species.

### Foraging

Frith and Calaby (1953) found the Superb Parrot to be mainly a ground-feeder. During the current survey 55 per cent of foraging observations were collected whilst Superb Parrots were feeding on the ground. During the breeding season, the survey indicated favoured foods of the Superb Parrot to include, Dwarf Cherry, White Top (*D. caespitosa*), Barley Grass (*Hordeum leporinum*), wheat and oats (*Avena sativa*) before they were fully ripe, and two species of mistletoe (Grey Mistletoe and Box Mistletoe, *Amyema miquelli*). Besides utilising these food items, native grasses within the box woodlands were also exploited.

In the Murray-Riverina, Superb Parrots were also observed to forage in the canopy of eucalypts where they fed on all stages of the flowers and fruits (from young buds through to seed capsules) of River Red Gum, Black Box and Yellow Box. On the South-west Slopes, White Box was utilised in the same manner. In June 1985, Superb Parrots foraged on lerps and young flower buds of Bimble Box (*E. populnea*) at Warren, NSW. The results of this study indicate that considerable resources are obtained from aboreal habitats. Foraging sites are associated with either box woodland, riparian red gum forest or cereal crops.

The drinking habits of the Superb Parrot cannot be elaborated upon other than has been done by Frith and Calaby (1953), as the species was observed drinking only once during the present survey. This was from a puddle in the middle of a secondary road during the late afternoon.

### Post-Breeding Dispersal

It is believed that there is a northerly movement of Superb Parrots after the breeding season (Morris and McGill 1980, Schrader 1980, Forshaw and Cooper 1981). After the 1985 and 1986 breeding seasons, Superb Parrots were not observed again along the Murrumbidgee River (within the study area), during the current survey, until March-April of the following years. Some parrots return to the breeding area during winter, and it appears likely that these are established breeding pairs, while the majority of birds which move elsewhere during winter are in all likelihood to be non-breeding birds (J. Forshaw pers. comm.).

Dispersal appears to begin as soon as the young fledge. The first movement of birds is away from the river into box woodland, which is used as a feeding area during the breeding season. This movement is so marked on both the Murrumbidgee and Murray Rivers that areas of riparian red gum where Superb Parrots are common during the breeding season become devoid of them for a subsequent period. It seems likely that this initial post-breeding dispersal is related to the availability of food. Within the box woodlands, food is readily available, especially in those areas where wheat is also grown. The Superb Parrot not only utilises native grasses (pers. obs.; Frith and Calaby 1953) but also fallen ears of wheat (Frith and Calaby 1953) and road-side wheat spilt from trucks.

In the Murray River region, very few birds are observed on the New South Wales side of the river during winter (June-Aug.) and none are seen in Victoria for the corresponding period (P. Maher, W. Labbett, pers. comm.). The situation on the Edward River appears to be slightly different. A large portion of the Superb Parrot population leaves the riparian red gum forest during winter, however movement away from the nesting colonies immediately the young are flying has not been observed. Although Superb Parrots forage in the box woodland surrounding the Edward River, they also exploit a readily available food source within the riparian red gum. Thus there exists no need for Superb Parrots to fly several kilometres to obtain food when in this area.

A similar situation to that in the Murray-Riverina district exists on the South-west Slopes, except that the dispersal of Superb Parrots is in a westerly direction, based on an observed increase in the number of Superb Parrots around Grenfell during the survey and a westerly movement of Superb Parrots around Young during January-February 1987. Those Superb Parrots which move away from the South-west Slopes could be the portion of the population which moves to the central-north of New South Wales, since very few birds other than a few established breeding pairs are observed on the South-west Slopes during the winter months (R. Warren, H. Greenwood, pers. comm.). If this movement of Superb Parrots indeed occurs then these two areas of New South Wales could be exploited when conditions are most favourable.

Although most of the Superb Parrots would appear to move away from their nesting sites after the young fledge, this study has not established the proportion of the population which disperses to the north. However, this movement of Superb Parrots into the central-north of New South Wales appears to be supported by records collected by the Royal Australasian Ornithologists Union (Blakers et. al. 1984) and from records collected in the Superb Parrot Mail Survey. Of the 51 observations made north of latitude 33° 20' S, 53 per cent were made during winter and only 16 per cent in each of the other seasons. Further investigations, particularly of movements, could elucidate the relationships between the birds of the Murray-Riverina and other populations on the South-west Slopes.

## FUTURE RESEARCH

Although this survey has provided information on the breeding requirements of the Superb Parrot, the successful management of the species would benefit from further research into the following areas:

Survey of the winter habitat to determine:

- . non-breeding habitat of the Superb Parrot
- . the conservation status of these habitats, and
- . the demography of the Superb Parrot population in winter.

Investigation of dispersal of the Superb Parrot:

- . after breeding (Jan.-March), and
- . during the non-breeding period (April-Aug.)

This may be possible by implementing a banding and/or a radio-tracking program.

Investigation of nest site fidelity and competition for nest sites during future breeding seasons.

Investigation of the possibility that there is two distinct populations of Superb Parrots, one on the South-west Slopes and one in the Murray-Riverina.

Investigation of survival and recruitment rates of Superb Parrots.

Mapping of the distribution of the Superb Parrot and various box woodland species Black Box, Yellow Box, Grey Box, White Box, Bimble Box and Red Box (*E. polyanthemos*).

Investigation of the utilisation of habitats by Superb Parrots.

## ANNEX: RECOMMENDATIONS OF THE COMMITTEE

Under the States Co-operative Assistance Program, the Australian National Parks and Wildlife Service funded an investigation into the conservation requirements of the Superb Parrot *Polytelis swainsonii* in its breeding range in south-eastern Australia. This investigation was undertaken as a follow-up to a study of the closely-allied Regent Parrot *Polytelis anthopeplus*, and was in response to a recommendation from the *ad hoc* steering committee set up to oversee that earlier study.

Under a consultancy agreement with the New South Wales National Parks and Wildlife Service, Mr R. Webster carried out this investigation in two stages, in 1985-86 and 1986-87. The findings are presented in this publication.

With Ministerial approval, Commonwealth and State Government agencies set up an *ad hoc* steering committee of their representatives to oversee the investigation and to formulate recommendations for the conservation of the Superb Parrot. Membership of the steering committee was as follows:

New South Wales	Forestry Commission	Mr J. Shields (Chairperson)
	National Parks and Wildlife Service	Mr J. Hardy (Secretary) Dr D. Priddel
Victoria	Department of Conservation, Forests and Lands.	Mr L. Ahern
Commonwealth	Australian National Parks and Wildlife Service.	Mr J. Forshaw

The committee resolved that the following recommendations be brought forward on the basis of the report submitted by Mr Webster.

### Recommendation I - Conservation of native woodland

#### Preamble

The results of the two year survey substantiate the suggestion that native woodland vegetation is an important foraging resource for breeding Superb Parrots. During this survey Mr Webster identified a number of areas as encompassing breeding sites. It is now clear that the proximity of native woodland to these breeding areas is a key factor in sustaining breeding colonies of Superb Parrots at these sites. All colonies occur within 10km of native woodland. Breeding appears not to occur where these woodlands have been extensively cleared. At present, in both New South Wales and Victoria, private landowners clear native woodland on their property without the relevant authorities having considered the Superb Parrot's requirements.

#### Recommendation

The Committee recommends that:

- all areas of native woodland within 20 km of known Superb Parrot breeding colonies be retained;
- the relevant governments place legislative restrictions upon clearing of these woodland areas;
- in assessing applications for clearing, the relevant agencies consider the potential of the woodlands as foraging resources.

Areas near Darlington Point, New South Wales, including Toganmain and Tubbo Stations, are areas of notable importance. Land management agencies in both Victoria and New South Wales need to further identify relevant areas of woodland and appropriately address the problem of protecting them from clearing.

**Lead agencies:** NSW National Parks and Wildlife Service  
NSW Forestry Commission  
Vic Dept. of Conservation, Forests and Lands

**Note:** The Committee notes with concern the apparent lack of governmental processes with which to regulate the clearing of native vegetation on freehold land within 20 km of the Murray, Edward and Murrumbidgee Rivers.

## **Recommendation II - Nest habitat management on public lands**

### **Preamble**

This survey documented the occurrence of Superb Parrot nest sites predominantly within Type One river red gum forest, which is defined in the NSW Forestry Commission's Murrumbidgee Management Plan. The Murrumbidgee Management Plan and the Murray Management Plan identify the riparian strip adjacent to watercourses as high priority for the management of Superb Parrots. Under these plans, foresters will not remove any trees of greater than 150 cm diameter at breast height from the river red gum forests along the Murray and Edward Rivers. The Committee noted this action taken by the Forestry Commission to protect Superb Parrot nesting habitat. The Committee further noted that protecting current nest sites and providing an adequate supply of nest sites in the future is of the utmost importance.

### **Recommendation**

The Committee recommends that the relevant forestry agencies:

- immediately prevent clearing of the nest-sites of the Superb Parrot which occur on public lands currently used for wood production; this should be the first step in a long-term program of habitat management;
- designate specific management techniques in order to protect known nesting sites in the long term;
- extend this protection to any new sites identified in the future.

The Committee recommends that the New South Wales Catchment Areas Protection Board:

- be advised of the importance of establishing a protected strip adjacent to the Murray, Edward and Murrumbidgee Rivers to provide nesting habitat for Superb Parrots;
- consider the Superb Parrot's requirements in assessing future applications for destruction of trees within the breeding range of this species.

**Lead agencies:** NSW Forestry Commission  
Vic Dept. of Conservation, Forests and Lands

**Note:** The main points of the above recommendation are taken into account in management plans for the relevant Forestry Districts in NSW, and the goals of these plans should be actively pursued. The Committee has reviewed current and planned future forest management plans in NSW in the light of the information provided on the conservation status of the Superb Parrot, and it would be useful if this process could be repeated in Victoria.



### **Recommendation III - Nest site protection on private lands**

#### **Preamble**

Nest-sites occurring on private or leasehold land are far less secure than those occurring within state forests and other reserves. The protection of nesting habitat on private land along the Murrumbidgee River in New South Wales is of special concern, particularly where such habitat occurs in close proximity to box woodland on Toganmain and Tubbo Stations near Darlington Point.

#### **Recommendation**

The Committee recommends that:

- in assessing the value of river red gum woodland for reservation under the New South Wales National Parks and Wildlife Act, the relevant agencies give the highest priority to acquiring leasehold or private lands which carry nesting habitat for the Superb Parrot.

**Lead Agencies:** NSW National Parks and Wildlife Service  
NSW Forestry Commission  
Vic Dept. of Conservation, Forests and Lands

### **Recommendation IV - Barmah Forest**

#### **Preamble**

The only population of Superb Parrots detected in Victoria in the course of the study was centered upon Barmah Forest. People have seen the birds regularly and evidently the population is quite significant. In the absence of comparable field observations in other parts of Victoria, every effort must be made to afford strong protective measures for this population and its habitat.

#### **Recommendation**

In view of this demonstrated importance of Barmah Forest as nesting and feeding habitat for Superb Parrots in Victoria, the Committee endorses the Land Conservation Council Final Recommendations for the Murray Valley Study Area proposals, which further protect Barmah Forest.

**Lead agency:** Vic Dept. of Conservation, Forests and Lands

### **Recommendation V - Removal of standing dead trees**

#### **Preamble**

This study has confirmed that significant numbers of Superb Parrots nest in rural lands of the south-western slopes of NSW. Here the continuing availability of nesting habitat appears to be at risk. The Committee views with concern inadequacies in co-ordinated control which result in minimal supervision over the removal of standing dead trees from T.S. & C.R.s and other Crown reserves. Such trees are used by Superb Parrots for nesting.

### **Recommendation**

The Committee urges New South Wales authorities to take appropriate action to address these inadequacies.

**Lead agency:** NSW National Parks and Wildlife Service

### **Recommendation VI - Follow-up monitoring**

#### **Preamble**

Despite the vast increase in knowledge provided by the current study, the Committee notes that a long term program of both research and management is necessary to ensure the conservation of the Superb Parrot. Local staff of the relevant government agencies are the most important personnel in such programs. The local staff are particularly well situated to participate in studying nest site fidelity, investigating long-term population fluctuations and monitoring the effect of land management practices.

#### **Recommendation**

The Committee urges the lead agencies listed below to:

- support their local staff in encouraging the protection of nest and foraging sites used by Superb Parrots;
- further encourage staff to support and participate in local monitoring and documentation of nesting and foraging sites.

**Lead Agencies:** NSW National Parks and Wildlife Service  
NSW Forestry Commission  
Vic Dept. of Conservation, Forests and Lands

### **Recommendation VII - Further Research**

#### **Preamble**

The Committee holds further research to be crucial to the conservation of the Superb Parrot.

#### **Recommendation**

The Committee encourages follow up research on the Superb Parrot. Areas identified for further research include: dispersal movement; affinities between 'separate' populations; habitat utilisation; recruitment and survival; nest site fidelity and competition for nest sites; mapping of woodland habitats.

## APPENDICES

## APPENDIX 1

Nest tree characteristics measured during the breeding season.

1. Nest Number
2. Date
3. Observer
4. Bird Species
5. State
6. Locality
7. Latitude
8. Longitude
9. Grid Reference
10. Nest Tree Species
11. Circumference of Trunk at Breast Height over Bark (CBHOB)(cm)
12. Height (m)
13. Max. Crown Diameter (m)
14. Crown Diameter 90 degrees to Max. Dia. (m)
15. No. Dead Branches
16. No. Dead Spouts
17. Height of 1st, 2nd Order Branch (m)
18. Nearest Water : Bearing  
: Distance (m)
19. Other Superb Parrot Nests -
 

Nearest	: Distance (m)
	: Bearing
2nd	: Distance (m)
	: Bearing
3rd	: Distance (m)
	: Bearing
4th	: Distance (m)
	: Bearing
20. Branch Order Nest is in
21. Height of Nest Above Ground
22. Aspect of Nest Entrance
23. Nest Opening Towards or Away from Water

Stand characteristics measured during the breeding survey.

1. Stand No.
2. Nest/Base Tree No.
3. Date
4. Bird Species
5. State
6. Locality
7. Latitude
8. Longitude
9. Grid Reference
10. Nest/Base Tree Code
11. Tree Species
12. Hollow Utility
13. CBHOB (cm)
14. Height (m)
15. Max. Crown Diameter (m)
16. Crown Diameter 90 degrees to Max. Dia. (m)
17. No. Dead Branches

## APPENDIX 1 (cont.)

18. No. Dead Spouts
19. Height of 1st, 2nd Order Branch
20. Nearest Water : Distance (m)  
: Bearing
21. Dist. to Nearest Tree (> 30cm DBH)
22. Dist. to 2nd Tree (> 30cm DBH)
23. Dist. to 3rd Tree (> 30cm DBH)
24. Crown Cover for .25 ha Stand
25. No. of Superb Parrot Nests in .25 ha Stand
26. No. of Trees 15 cm < DBH < 30 cm in .25 ha Stand
27. No. of Trees 30 cm < DBH < 80 cm in .25 ha Stand
28. No. of Trees 80 cm < DBH < 150 cm in .25 ha Stand
29. No. of Trees DBH > 150 cm

Then for each tree within the .25 ha stand over 15 cm DBH the following characteristics were measured.

- a. Dist. from Nest or Base Tree
- b. Dist. to Water
- c. CBHOB (cm)
- d. Height (m)
- e. Max. Crown Diameter (m)
- f. Crown Diameter 90 degrees to Max. Dia. (m)
- g. No. Dead Branches
- h. No. Dead Spouts
- i. Height of 1st, 2nd Order Branch
- j. Hollow Utility
- k. Nest Present

Foraging data collected during this survey.

1. Date
2. Location
3. Flock Size
4. Wind
5. Temperature
6. Weather
7. Bird Species
8. Sex
9. Age
10. Position of Foraging Action (i.e. on the ground, leaves, flowers, branch, etc.)
11. Tree Species
12. Live/Dead
13. Foraging Action
14. Height of Foraging Action
15. Grid Reference
16. Type of Prey Item
17. Size of Prey Item
18. Vegetation Layer (where foraging action took place)
19. Post Foraging Behaviour
20. Success/Failure (of foraging attempts)
21. Observer
22. Observation No.
23. Latitude
24. Time of Day
25. Longitude

45  
APPENDIX 2

Plants used as food by Superb Parrots within their distribution. This information was collected during the breeding survey and from replies to the NSW National Parks and Wildlife Service Superb Parrot Mail Survey. Nomenclature is based on Cunningham et al. (1981).

Family	Scientific Name	Common Name	Food	Reference
Cupressaceae	<i>Callitris columellaris</i>	White Cypress Pine	?	1
Poaceae	<i>Avena sp.</i> *	Wild Oat	s	2,26
	<i>A. sativa</i> *	Oat	s	1,2,3,4,5,6
	<i>Danthonia caespitosa</i>	White Top	s	1
	<i>Triticum aestivum</i> *	Wheat	s,s.g.	1,3,4,8,16,18, 19,20,21,22
	<i>Hordeum sp.</i> *	Barley	s	19
	<i>H. leporinum</i> *	Barley Grass	s	1
	<i>Sorghum bicolor complex</i> *	Sorghum	s	7
	<i>Stipa sp.</i>		s	1,8
Proteaceae	<i>Grevillea robusta</i>	Silky Oak	f	23
Loranthaceae	<i>Amyema miquelli</i>	Box Mistletoe	b,f	8
	<i>A. quandang</i>	Grey Mistletoe	b	1,8
Santalaceae	<i>Exocarpus strictus</i>	Dwarf Cherry	b	1,8
Polygonaceae	<i>Polygonum aviculare</i>	Wireweed	b	8
	<i>Rumex sp.</i>	Dock	s	5
Chenopodiaceae	<i>Atriplex semibaccata</i>	Creeping Saltbush	?	8
	<i>Salsola kali</i>	Buckbush	?	8
Caryophyllaceae	<i>Stellaria media</i> *	Chickweed	?	24
Nyctaginaceae	<i>Boerhavia diffusa</i>	Tar Vine	?	8
Mimosaceae	<i>Acacia acinacea</i>	Gold-Dust Wattle	s	1
	<i>A. baileyana</i>	Cootamundra Wattle	s	1,5,8,9,10,12
	<i>A. cardiophylla</i>	Wyalong Wattle	s	10
	<i>A. dealbata</i>	Silver Wattle	s	1
	<i>A. deanei</i>	Deane's Wattle	s	1
	<i>A. saligna</i>	Western Wreath Wattle	s	6
Fabaceae	<i>Lotus sp.</i>	Trefoil	s	26
Geraniaceae	<i>Erodium sp.</i>	Crowfoot	?	8
Myrtaceae	<i>Eucalyptus camaldulensis</i>	River Red Gum	f.b.,f.s.,l	1,8
	<i>E. melliodora</i>	Yellow Box	f.b.,f.s.,l	1,8,13,14,24
	<i>E. largiflorens</i>	Black Box	f.b.,f.s	1
	<i>E. populnea</i>	Bimble Box	l	1
	<i>E. microcarpa</i>	Grey Box	?	15
	<i>E. albens</i>	White Box	f	1
	<i>E. sideroxylon</i>	Mugga Ironbark	f	16
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn	b	8
Myoporaceae	<i>Eremophila longifolia</i>	Emubush	?	8
Asteraceae	<i>Arctotheca calendula</i> *	Capeweed	?	25
Ulmaceae	<i>Ulmus campestris</i> *	Elm	f	18
Euphorbiaceae	<i>Glochidion ferdinandi</i> *	Cheese Tree	?	17

? = unknown food,  
f.b. = flower buds,

s = seeds,  
l = lerps,

b = berries,  
s.g. = spilt grain,

f = flowers,  
\* = not native to Australia.

1. pers. obs.,
2. H. Greenwood pers. comm.,
3. M. Flannery (in litt.),
4. W.D. Warren (in litt.),
5. V.H. Reardon (in litt.),
6. J.I. Wilkinson (in litt.),
7. D.M. Johnson (in litt.),
8. P. Maher (in litt.),
9. J. Manning pers. comm.,

10. J. McKeon (in litt.),
11. J. Bell (in litt.),
12. J.D. Croft (in litt.),
13. A. Gladman (in litt.),
14. A. & G. Black (in litt.),
15. M. Cochrane (in litt.),
16. G. Schneider (in litt.),
17. J.M. Chambers (in litt.),
18. W.J. Mullet (in litt.),

19. L.G. Rees (in litt.),
20. J. Rook pers. comm.,
21. C. Turner (in litt.),
22. H. Bouchier (in litt.),
23. J. Hutchinson pers. comm.,
24. G.A. Keartland (1903),
25. Dr. L. Llewellyn pers. comm.,
26. S. Pugh (in litt.).



**APPENDIX 3**  
**NSW NATIONAL PARKS AND WILDLIFE SERVICE**  
**SUPERB PARROT SURVEY**

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Please provide as much detail as possible. One information sheet should be completed for each separate observation.

1. DATE OF OBSERVATION: ..... TIME.....am/pm
2. LOCATION: (Please be as precise as possible - property name reserve etc. and map co-ordinates would be useful): .....  
 .....  
 .....  
 .....
3. HOW MANY SUPERB PARROTS DID YOU SEE?  
 (a) ONE  ; TWO  ; FLOCK   
 (b) NO. OF BIRDS IN FLOCK .....
- (c) COMPOSITION OF FLOCK:-  
 NO. OF MALES ..... NO. OF FEMALES .....  
 NO. OF IMMATURES ..... NOT KNOWN .....
4. HABITAT  
 (a) General description:-  
 RIVER RED GUM  ; BOX WOODLAND  ;  
 BOX/CYPRESS PINE WOODLAND  ; OTHER   
 (b) Detailed description of habitat including vegetation associations:-.....  
 .....  
 .....
5. OTHER INFORMATION  
 (a) If you have observed Superb Parrot in this area in the past, can you please provide approximate dates, months or seasons:- .....  
 .....  
 (b) Do Superb Parrots breed in this area? YES  ; NO   
 (c) Evidence of breeding observed:- .....  
 .....  
 (d) What food sources do Superb Parrots utilise in this area?  
 .....  
 (e) Any further information .....  
 .....  
 .....
6. Observers Name & Address: .....  
 .....  
 Phone No. .... Thank you.
7. Please forward completed information sheets to:-

The Director (Attention Mr. J. Hardy)  
 National Parks and Wildlife Service  
 P.O. Box N189  
 Grosvenor Street, Sydney 2000

## APPENDIX 4

Possible Superb Parrot Breeding Sites: Due to lack of time or failure to locate nests when visited, the following locations or areas could not be confirmed as breeding colonies during this survey.

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Major Stream	Location/Area
Murrumbidgee River	'Tubbo', NSW 'Kooba', NSW Willbriggie State Forest (East), NSW Carabury State Forest, NSW 'The Homestead', NSW 'Wyvern', NSW 'Toganmain Station', NSW
Murray River	Woperana State Forest, NSW Barmah State Forest:- Bucks Crossing, Vic Murray River Forest:- Dufty's Bend, Vic Gunbower State Forest, Vic
Other	Yanco Creek, NSW

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## APPENDIX 5

## Historical Breeding Records Prior to 1980

Observer	Date	Lat.	Long.	Notes
J. Cotton	1849	3730	14530	King Parrot Creek, Doogalook, Vic
E. Williams in A.J. North	2.10.1899	3530	14730	Murrumbidgee R. near Wagga Wagga, NSW
J. Watson	4.10.1910	3530	14600	Urana Lake. Eggs collected. NSW
B. Turner	1950's	3605	14445	6-8 kms to the East of Echuca, Vic
J. Hobbs	1953	3530	14430	Gulpa Island S.F., NSW
G.W. Bedggood	1957	3620	14520	Mooroopna: reared 4 young. Vic
A. Cecil	1968	3540	14450	Nest located on Line Road Mathoura, NSW
R.M. Cooper	1.10.1968	3435	14555	Darlington Point, NSW
R.M. Cooper	1.10.1968	3440	14605	10 km E. of Darlington Point, Morundah Road, NSW
B.L. Schmidt	1.9.1971	3435	14755	Stockinbingal, NSW
P. Maher	26.12.1977	3555	14455	Mojira S.F.: Feeding young, NSW
B. Ryan	1.1. - 31.12.1978	3435	14545	Nest located 26 km W. of Darlington Point, NSW
D.D. Hayne	5.9. - 30.11.1978	3435	14805	Cootamundra, NSW
A.& R. Faulks	1.9. - 14.12.1978	3435	14805	Cootamundra, NSW
W.T. Pigg	2.8. - 5.11.1978	3455	14635	Sandigo, NSW

## APPENDIX 6

Breeding Records for the Period 1980-84: The data contained within this appendix is not for publication but can be obtained from the NSW National Parks and Wildlife Service, the Forestry Commission of NSW and the National Parks and Wildlife Division in Victoria.



## APPENDIX 7

Summary of responses to the mail survey carried out by the NSW National Parks and Wildlife Service. The Service asked the public to record any sightings of this species.

Reports considered to contain sensitive data are marked thus \*. This data is held by NSW National Parks and Wildlife Service.

Observer	Date	Location	Comments
C. Bragg		'Landgrove', Cootamundra	Winter months, in pairs in grey box near dams, for several years.
C. Burges		Tocumwal	No definite identification
D. Croft	Nov. 85	Woodstock	Small flock, <i>Acacia</i> , <i>Grevillea</i> and <i>Callistemon</i> spp.
A. Gladman		Gogelderie- Darlington Pt	Decreased since 50's & 60's.
		Coleambally Rd	Increased during 85. Feed on wattle seed around Coleambally from Christmas. Not seen around Coleambally during winter, but are observed along Murrumbidgee.
T.W. Glover *			
H. Greenwood *			
C. Hardie	25.4.86	Tallimba	In flowering Yellow Gum. Decreased in numbers.
J. Knight	Jan-Feb 86	12-14 km N.W. of West Wyalong	20-30 birds mostly males in box/pine roadside reserve.
R. Langford		Canowindra	Observed occasionally in flocks of 20+ at certain times of the year.
W.A. Leonard	Apr.85	Coonamble	2 birds along Castlereagh River.
R. Logg		'Belmont', West Wyalong	10 miles south, 8-10 birds often fly over.
		'Duluguilli'	Larger flock observed once a week. Feed in dog bush when seeding, Ironbark and Yellow Box when flowering.
J. Lowry		Wagga Wagga	3+ birds live in street.
J. Main		'Treetops', Cootamundra	Reasonably common west of Cootamundra.
J. Manning *			

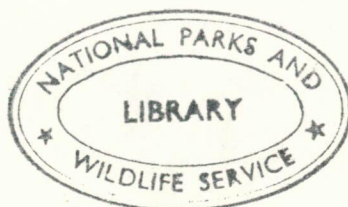
(continued over)

## APPENDIX 7 (cont.)

Observer	Date	Location	Comments
G. McConnell		Ungerie	Migrate yearly through this district.
J. McKeon	Oct-Dec 86	Boorowa	20-25 birds, 7 km East of Boorowa, not observed other times of year. Feed on <i>Acacia</i> spp.
H. McIntyre *			
W.J. Mullet		Galong	Feed in Gum and Elm Trees when in flower.
P. O'Brien		Wagga Wagga	Becoming rarer in Riverina. Saw more birds, spring 1985, than observed for many years. Sightings in Wagga district.
S. Pugh	4.4.86	'Banandra'	20 birds, 1/3 males. Eating Wild Oat & Trefoil seeds.
P. Raine		Gundaroo	Observed 2 or 3 prs. daily. Travel east-west route to S.W. of town.
L.G. Rees	25.4.86	'Dundoo', Beckom	50 in Sugar Gums, east->west. 6 in Sugar Gums, east->west. Feed on red-berry bush, barley & wheat around silos.
B. Rudd		Grenfell	Fairly common. Not unusual to see 8-10 fly over. Feed on spilt grain & <i>Eucalyptus</i> spp.
M.A. Salmon	20.12.85	'Swansea', Wagga Wagga	1 pair with 1 immature bird feeding on road.
G. Schnieder	1.5.86	'Summer Hill', Grenfell	6 feeding beside road. Common in district. Regularly appear on roadside during harvest time. Seen all year except breeding period? Flock size usually 4-12. Present for last 10-12 years S.E. of Grenfell.
C.L. Smith	10.4.86	Deniliquin	2 pairs in Deniliquin S.F.?
C. Turner		R.M.B. 106, Marrar	Present spring until end of summer. 6-family groups. Birds observed between Marrar & Temora where wheat is spilt. Increased in last 2-3 years.
W.D. Warren*			

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National Parks & Wildlife Service



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