



**Birds Australia**

**BIRDS ON FARMS PROJECT IN WESTERN AUSTRALIA**

**1996 - 1999**

**Brenda Newbey**

**Western Australian Bird Notes, Supplement No. 5.**

**Published by Birds Australia, 1000 High Street, Perth, Western Australia 6000**

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The expanded Western Australian farms segment of this project was only possible as a result of grants. Most of the funding was from the Gordon Reid Foundation for Conservation.

Sponsored by The Gordon Reid Foundation for Conservation:  
***A Lotteries Commission Initiative***



The Gordon Reid Foundation for Conservation was established in 1990 by the Lotteries Commission. The basic function of the Foundation is to stimulate and sustain community action to conserve indigenous plants, animals and micro-organisms, and their natural environments, in Western Australia.

Thanks to Healthways for their support for the country Bird Days



Birds Australia (WA Group) supplied funding to keep the project running while grants were sought.



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## **BIRDS AUSTRALIA**

### **BIRDS ON FARMS PROJECT IN WESTERN AUSTRALIA 1996 - 1999**

#### **ACKNOWLEDGEMENTS**

The Birds on Farms project could not have been accomplished without the contribution of a great deal of volunteer time and effort. Correct bird identification was striven for and great care was taken in filling out the registration forms. Both these factors have enhanced the quality of the results. A commitment of two years is a long time but sixty percent of the farms and most of the road verges were surveyed eight times. I do apologize for any omissions in the impressively long list below.

The volunteer surveyors of farm and/or road verge sites that I became aware of were: Susan Abbotts, Heather Adamson, George Agar, Pam Agar, Fran Alcock, George Allen, Pam Allen, Barbara Anderson, Deborah Badger, Margaret Basford, Phyllis Bentley, Peter Binstead, Freda Blakeway, Donna Blyth, John Blyth, Judy Blyth, Wendy Bradshaw, Carolyn Bramham, Lesley Brent-White, Norah Brockman, Beth Broun, Michael Burns, Geoff Burrow, Gisela Cannon, Andrew Chapman, Chloe Church, Robert Clare, Helen Clark, Desrae Clarke, Wayne Clarke, Bob Clarke, Rae Clarke, Brad Cox, Jean Craig, Michael Craig, Bronwyn Crouch, Les Cruickshank, Max Cussons, Vivienne Dare, Charlie Davies, Liz Davies, Robert Davis, Colin Davis, Alison Doley, Ernie England, Fiona Falconer, Marjorie Joy Fleay, Lee Fontanini, David Free, Pam Free, Peter French, Mary Frith, Beth Gaze, Mike Gibbs, Terry Giles, Ina Godwin, Cheryl Gole, Martin Gole, Jan Gray, Olga Green, Sallie Green, Joan Higham, Margaret Hutchinson, Max Howard, Jay Humphries, Timothy Hunt, Paul Hynes, Archie Jackson, Sue Jaensch, Juanita Jones, Erik Jorgensen, Ann Jorgensen, Buddy Kent, Sue Keogh, Terri Lloyd, Penny London, Liz Marshall, Greg Marston, Kath Mathwin, Ken Mazzucchelli, Charmaine Mazzucchelli, Tony McAleer, Vivian McCormick, Sue McDougall, Jock McLean, Eileen Melville, Claire Mercer, Penny Mossop, Wendy Napier, Clive Napier, Gloria Neal, Stephen Newbey, Michael Nield, Ada Nield, Mavis Norgard, Sue Osborne, Kerry Oliver, John Oliver, Vera Patterson, Deborah Perry, Helen Pierce, Wendy Porter, Frank Pridham, Raymond Richter, Dick Rule, Waladek Sarafin, Ai-Ai Sarafin, George Schmidt, Leon Silvester, Valerie Spence, Anne Staniforth-Smith, Val Talbot, Jeremy Talbot, John Taylor, Anne Todd, N. Tyrer, Jan-Paul van Moort, Jane Venter, Bill Waldron, Barbara Waldron, Winifred Walker, Ernie Walker, Helen Walter, Rita Watkins, Ray Watson, Viv Wells, Gillian Wheatley, Joyce White, Joy Williams, Brian Wilson, Phil Worts, Jan Worts, Boyd Wykes, Helen Young, Wayne Zadow.

It is essential to have a cash flow and Allan Jones not only talked me into doing this job but also ensured that there was funding to carry it through. He is always assisted in his efforts by Rose Jones. Funding has mostly come from the Gordon Reid Foundation with lesser though essential amounts from Birds Australia (WA Group) and Healthways.

Geoff Barrett and Ken Hancock from the Birds Australia national office, Melbourne, kept me supplied with information and data on disk as requested.

Most data entry was done in the Birds Australia national office, but towards the end some data were entered locally by Rod Smith and David Smithdale.

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When I was out of action for a while Phyllis Bentley very capably kept the show on the road.

I have been fortunate in preparing the report to have very helpful on-going advice from Michael Brooker. Michael and Lesley Brooker did some statistical analysis and prepared the section describing the results of that analysis. John Blyth read an early draft and offered constructive comments as well as later editing with Allan Burbidge and Michael Brooker.

As well as illustrating the report so attractively, Judy Blyth prepared the *Birds on Farms in Southern Western Australia* display.

Bird Days were organized by Alison Doley (Coorow) and Heather Adamson (Merredin).

The Birds Australia (WA Group) office volunteers dealt with queries, mail and some photocopying.

A major input has been by Stephen Fryc who, although a professed non-birder, has accompanied and assisted me on several field trips. His main contribution has been with the computer - organizing and operating the databases. The mini-reports and this report, including the layout, owe a great deal to his efforts.

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## 1.0 INTRODUCTION

Farming can not be done without clearing. Consequently large areas of bushland have been removed to create the agricultural, fruit and vegetable growing and intensive grazing areas of Australia. To create the farms of Western Australia millions of hectares of temperate woodland, mallee and heath were stripped back to the soils so that economic production could begin. That process of simplification of the landscape more than any other has resulted in major disruption of the existing systems and has led to major problems (e.g. salinity, erosion and waterlogging) on many farms.

It is now generally accepted that the clearing was too wholesale and that farm health is now dependent on restoration of the landscape by re-introduction of woody plants. As well, frequently grazed vegetation is being regenerated by eliminating or cutting back on grazing. Woody plants are beneficial in combatting salinity, erosion and waterlogging. Additionally the planted trees and shrubs may allow many other forms of life from soil microbes to birds, to proliferate throughout the farming areas, thereby strengthening the linkages which should help to combat some of the problem pest outbreaks and decrease reliance on pesticides.

The simplification of the farm environment by replacement of many plant species by few has been echoed by a reduction in the numbers of bird species to be found on the farm as compared with nearby reserves. However the reserve system has often been inadequate for retaining all the bird species of a district. It now seems clear that all remnant native vegetation is valuable not only for combatting land degradation but also for providing habitat for birds and other animals.

As birds are near the top of the food chain, the diversity of bird species could be said to indicate health of the environment as a whole.

Wild birds are always to be found on farms and in the rural landscape. Some bird species have been favoured by farming and have become more common and widespread. Others have declined in abundance and range. This project looked at the distribution of birds on farms and country road verges, their relative abundance and their habitat choices.

It is the land managers who are involved in the revegetation programs on farms. As with all projects it is useful to measure progress. Birds are part of the process but also as the most visible class of native fauna, are potentially useful for monitoring restoration progress.

The Birds on Farms project has generated a great deal of valuable data. This report offers a preliminary look at some of those data. It is designed to be of interest both to land managers in rural Western Australia, and also to others working towards maintaining the quality and diversity of farming land.

## 2.0 THE SURVEY

### 2.1 GOALS

The project was designed to look at birds in the rural environment and to address questions such as these. What birds occur on Western Australian farms and how common are they? Are revegetation and other practices effective in attracting woodland birds onto the farm? Does bird diversity from farm to farm vary in a predictable way? Are there species which are not being attracted onto farms? Which species could be most useful for monitoring?

### 2.2 HISTORY

The Birds on Farms Project was an initiative of Birds Australia. Birds Australia, formerly the Royal Australasian Ornithologists Union (RAOU), is Australia's premier national bird organization. Its focus is Australia's wild birds with the aims of research, conservation, education and enjoyment. At the head office, Melbourne, Dr Geoff Barrett was appointed project co-ordinator in mid 1995. By 1996 the project design was complete and the project was extended beyond north-east Victoria to farming areas elsewhere in Australia.

Birds Australia (WA Group) decided to support the project strongly for three main reasons.

\* There is a lot of activity at present on WA farms with regard to revegetation and much effort towards sustainability.

\* There had been a recent study on birds in farming areas (Saunders and Ingram 1995) which highlighted the dramatic changes that have occurred in WA's bird fauna between the 1930s and 1980s mainly as a result of the extensive clearing for agriculture. As Saunders and Ingram point out: it is not possible to clear over 90% of a landscape and retain the fauna intact. They listed all bird species in wheatbelt farming areas, and comparing old records with recent survey results, were able to show many changes in distribution and abundance. It was hoped that the Birds on Farms Project would be able to look especially at species found by Saunders and Ingram to be in decline to get a picture of their current situation across the farming areas of southern Western Australia.

\* Birds Australia (WA Group) is interested in worthwhile community-based projects that will both offer an opportunity for members to utilize their bird-identifying skill and to assist non-members to add to their level of bird-awareness and knowledge.

The WA co-ordinator was appointed in August 1996. Data collection began in earnest in WA in spring 1996 and ended in autumn 1999.

In March 1997, Main Roads WA joined the project. The Main Roads department has run a program of land acquisition (strips of farmland adjacent to main roads) and revegetation of the resultant wider verge for thirteen years in some regions. A study of bird use of these verges has not previously been undertaken. Main Roads data collection ended in winter 1999.

A total of 138 volunteers took part in the project, some for a short time, many for the duration. A few volunteers took on more than one farm, with one couple doing a circuit of over 1 000 km to survey four farms. Some surveyors undertook both farm and road verge surveys.

Data entry for both farms and road verges was done at the Birds Australia national office in Melbourne until November 1998 (farms) and June 1999 (verges). Thereafter, data were entered by volunteers from the WA Group.

## 2.3 OUTCOMES AND PROJECTED OUTCOMES

The project will result in the production of a scientific report produced by Birds Australia on the project at the national level. The book will be ready early in 2000. One scientific paper (Barrett and Davidson in press) is a chapter in a soon-to-be released book on temperate woodlands. There have been two articles in *Wingspan* and a related *Wingspan* supplement. ('Renaissance on Lanark' vol. 9 no. 1, March 1999). *Wingspan*, a quarterly, is the membership magazine of Birds Australia.

In WA feedback is being offered to the participants in the project in the form of this report. Participants are also to receive Mini-reports which are being individually prepared to include some data from their farm or the farm that they surveyed. There will be only one or two copies of each Mini-report - one if the farmer surveyed his/her own farm, two if the surveyor was not the farmer. The WA data are to be incorporated into the Birds Australia (WA Group) database and landcare officers and others will be encouraged to make use of them. Some of the data will be used in the current Birds Australia Bird Atlas project.

In spring 1999, Bird Days were held at Coorow and Merredin (Plate 1). Bird Days comprised a school visit with the Birds on Farms display, a bird walk, and in the evening a talk with the display and slides. The Birds on Farms display was on show in the Ongerup-Needilup Museum for the final week of the Ongerup Wildflower Show.

The process of surveying led to several farmers becoming more familiar with the birdlife on their properties, which in turn enriches the local knowledge base. Several city birdwatchers had the opportunity to visit farms regularly, offering a different perspective to both parties.

Although this report contains information based on most of the Main Roads data, a separate and more detailed report will be prepared for Main Roads WA.



## 2.4 FUNDING

Birds Australia obtained funding from Environment Australia's Save the Bush Fund and the Thyne Reid Education Trust.

In WA the majority of the funding has been from the Gordon Reid Foundation. Some funding was obtained from Birds Australia (WA Group) and some from Healthways. Main Roads WA has supplied funding for the road verge segment of the project.

## 2.5 METHODS

Methods will be described more fully in the national report on Birds on Farms which is to present a detailed scientific analysis of the project results. It is to be produced by Birds Australia (Melbourne office) and should be complete early in 2000.

**Species order and scientific name** follows Christidis and Boles (1994) in this report. Neither white-tailed black-cockatoos nor corellas were consistently differentiated to species level throughout the survey so each is presented only to genus level with all records being grouped. The Yellow-rumped Pardalote is not now considered to be a separate species and records are combined with the Spotted Pardalote.

**Status** refers to change in the range and numbers of a species. Those that have increased in numbers and/or in range over agricultural areas are status 1 and those that have decreased in numbers and/or in range as a result of clearing and other practices related to agriculture are status 3. Those species for which there has been no discernable historical change brought about by the introduction and practice of farming or for which there has been insufficient evidence on which to make a clear allocation to status 1 or 3, are listed as status 2. *Status* follows Saunders and Ingram (1995) where these categories are represented with symbols +, -, and 0.

**Differences** between this list and Saunders and Ingram are as follows. A few species appear on this list which were not on the original list or not allocated a category. These are Mallard, Pied

Cormorant, Buff-banded Rail, Sulphur-crested Cockatoo, White-breasted Robin and Grey-crowned Babbler. Each has been placed in category 2. The Black-winged Stilt has been changed from category 1? to category 2. Red-tailed Black-cockatoo refers here to both the northern and the forest subspecies and so 1, which referred only to the northern subspecies, is replaced with 2. The Western Corella, herein included with the Little Corella, retains the Little Corella category 1. Spotted Pardalote retains category 3 although it now includes a few Yellow-rumped Pardalote (status 2) records.

**Survey sites:** The project was based on two types of survey site: the fifty hectare site comprising diverse habitat and the twenty-minute site of more uniform habitat and only half a hectare in size. It was suggested that the fifty hectare site be surveyed in three hours. The twenty-minute sites could be within a fifty hectare site or separate from it. Ideally surveys were to be undertaken once per season over a period of two years, resulting in eight surveys per farm.

Surveys involved both identification of bird species and counting the birds of each species present on the site during the survey. There was no constraint on recording birds flying over a site. However it was suggested that counting need not continue after forty birds of one species had been recorded. Most but not all surveyors ignored this suggestion. Consequently, count data for species that occur in large numbers is conservative.

The road verge sites were all twenty-minute sites (half hectare). They were all along one side of a road. Because of the variation in width of the verge their shape varied, the narrowest being 10 metres wide, and the widest 50 metres. As they were main roads, all had a hard surface with a bare gravel shoulder. The width of the bare area (road plus shoulder) varied from 12 to 35 metres.

**Site registration:** There were comprehensive registration forms for both the fifty hectare sites and the half hectare sites. The fifty hectare registration form covered such information as tree cover and clumping, age of trees, land-use, and changes in bird populations. The uniform half hectare site registration forms (Appendix 1) were designed to enable detailed analyses to be made, listing various characteristics of the site such as tree history and understorey with a



(a)



(b)

**PLATE 1: BIRD DAYS, SEPTEMBER 1999**

- (a) A primary class at Coorow is introduced to the Regent Parrot now scarce in their district.  
 (b) High school students at Merredin take a close look at the Birds on Farms display.

Photos: (a) F. Falconer (b) B.J. Newbey

choice of response options. As the form (Appendix 1) was designed for Australia-wide use, not all the options were applicable here.

The farm survey site registrations were filled out by the farmers and/or surveyors so for the 265 half hectare farm sites on eighty-five farms there were at least eighty different people involved. The 161 road verge survey site registrations were all filled out by the WA project co-ordinator.

Site characteristics that are examined to some extent in this report are discussed briefly below.

**Tree history:** The main options were *Revegetation* and *Remnant*. For most of this report, *Regeneration* has been combined with *Remnant* as it is difficult to find a remnant that has not regenerated (after fire or grazing) in the last fifty years. Many of the verge sites have a mix of remnant and revegetation where Main Roads WA have added an understorey or filled in gaps between remnants with the intent of improving the quality of the verge as habitat and wild-life corridor. So verge revegetation could be up to 40% remnant and vice versa. It is probable that most farm revegetation sites are close to 100% revegetation.

**Patch shape:** Refers to the patch of vegetation that the survey area was within and used in this report to compare farm sites with road verge sites when patch on a farm was a *Broad strip* or *Narrow strip*.

**Area of patch:** Is self explanatory and was probably estimated well on farms.

**Isolation:** The search area was evaluated for isolation relative to surrounding vegetation. Although a diagram was provided the selection from three alternatives was necessarily very subjective though there should be a clear differentiation between the two extremes - *Isolated* and *Not isolated*.

**Connection:** Options were *Yes* or *No* and referred to a corridor effect. Connection to only a smaller patch of vegetation than the one containing the survey area would lead to *No*.

**Tree type:** *Native* and *local* was the most frequently selected option. There is an element of confusion here. Sometimes *local* was taken to mean within a few hundred kilometres which is misleading in an area with a flora as diverse as

southern Western Australia. Many of the verge sites had a mix of local and non-local species.

**Grazed:** Relevant to farms only. Options were *Always*, *Often*, *Seldom* and *Never*. Half the sites were in the *Never* category.

**Understorey:** Three options with a diagram. As *Sparse* to *Present* is a continuum it was a subjective choice between those two although the *Present* diagram probably represented the minimum understorey required for that choice. *Present* was the most frequently used category on both farms and verges.

**Tree species mix:** There was an element of confusion due to the wording of two of the three options (*Dominated by two or three species* and *A mix of at least three common species*). There was a similar number of each of these in the farm sites.

**Shrub species mix:** Wording similar to *tree species mix*.

**Average age of trees:** Several sites did not have trees. Usually respondents counted mallee and sheoak and *Acacia acuminata*, for example, as trees, and this was the case for all verges.

**Verge width:** Applies to road verges only. It refers to the width of the woody vegetation from the roadside bare area. Often the verge width is the same as the site width. Typically a cleared farm paddock is adjacent to the verge. Occasionally, and more often with remnants, the verge site is part of an extensive bush block. One revegetation site is alongside a well-grown bluegum plantation which extends the verge width.

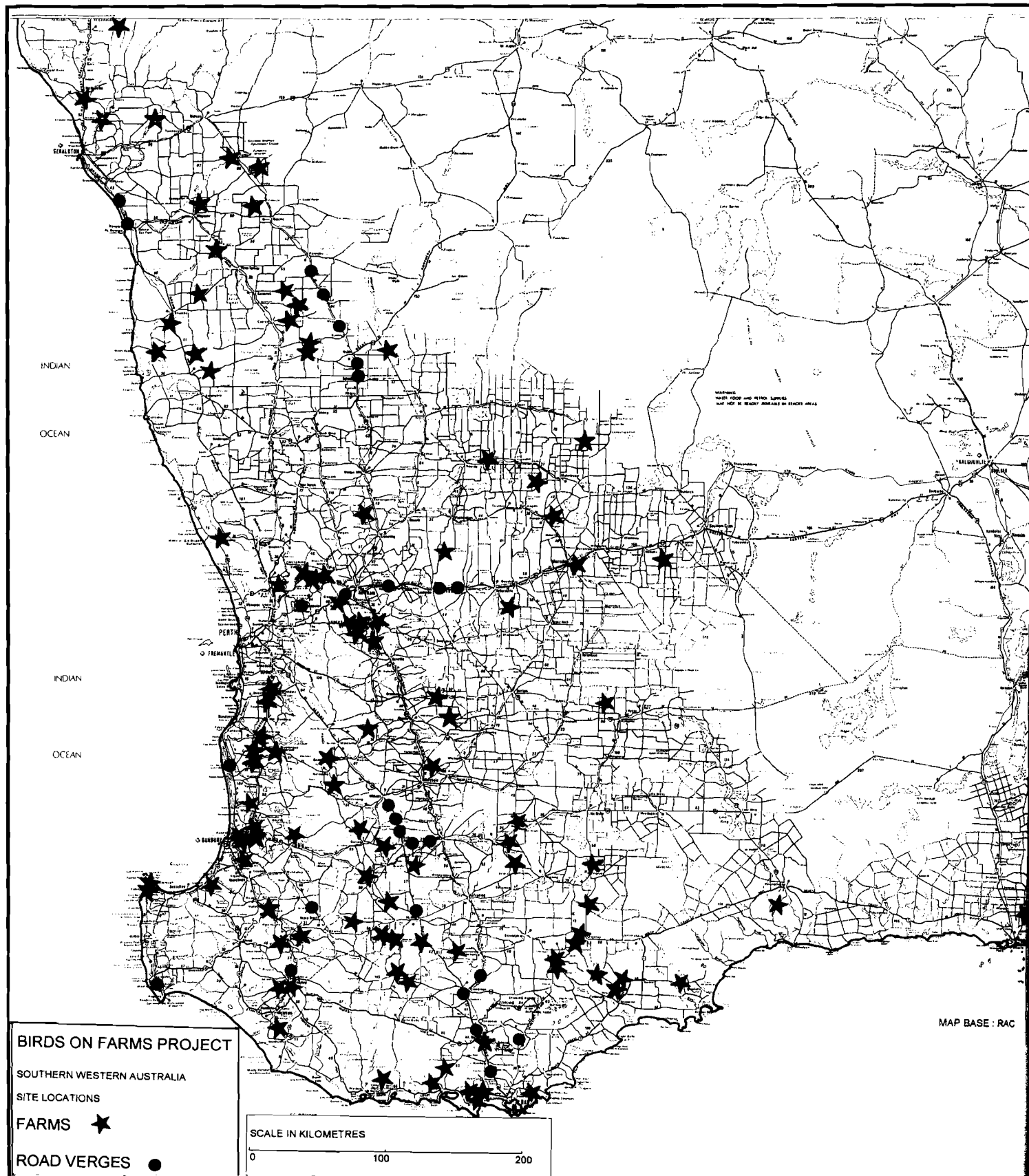
**Habitat characteristics not examined** at all in this report were survey site shape, type of vegetation strip that the site is in (e.g. creekline, windbreak), land-use adjacent to or surrounding the site, time since grazing ceased, distance from the nearest water, common tree and shrub species, number of old trees in the site, number of fallen trees in the site, ground cover, leaf litter, prevalence of tall grass tufts, slope of the survey area.

**Breeding records** were accepted when birds were sitting on nests, if there were eggs or dependent young, or distraction displays.

**FIGURE 1: SITE LOCATIONS - SOUTHERN WESTERN AUSTRALIA**

Location of each participating farm is shown by a star

The circles show location of two or more road verge sites.  
(Road verge sites were usually selected in loose clusters.)





Surveying a road verge site on Toodyay Road, near Gidgegannup.  
Photo: Judy Blyth

## 2.6 LOCATION OF SITES AND SURVEY COVERAGE

Figure 1 shows the location of participating farms and the approximate location of road verge sites.

**Farms:** A total of 110 farms participated in WA. One hundred and eight were from Ajana southwards. The other two were in Exmouth and Kununurra. This report will be focussed on the 108 southern farms. On the southern farms there were 732 surveys, averaging 6.8 surveys per farm.

**Road verges:** One hundred and sixty-one sites were selected on a total of fourteen roads, approximate locations being suggested by a then Main Roads WA environment officer, Anna Napier. There was particular interest in birds use of revegetation of different age, structure and composition. Figure 1 shows the general location of sites. These are usually clumps of sites.

For this report it was necessary to use the verge data before the project was complete. This report considers 1147 verge surveys, averaging 7.1 surveys per site. There were 292 surveys in spring, 274 in summer, 280 in autumn and 301 in winter.

## 3.0 RESULTS AND DISCUSSION

### 3.1 BIRD SPECIES RECORDED

A total of 179 species (94 non-passerine and 85 passerine) was recorded on the 108 farms surveyed, and 111 species (45 non-passerine and 66 non-passerine) on the 161 road verges sites surveyed (Tables 1 and 2).

Most farm sites were fifty hectares, of diverse habitat and surveyed for three hours. The remaining farms all had three or four half-hectare sites surveyed for twenty minutes. Some of the habitat surveyed on farms does not occur on verges e.g. dams and creeklines. The road verge sites were each only uniform habitat half-hectare sites. While a twenty minute survey for half a hectare is more thorough than three hours for fifty hectares, these sites could not be expected to individually yield as many species as any farm.

However, taking the farm total as the maximum, it is interesting to note that in verges there is a similar proportion of status 1 species (0.78) as status 3 species (0.75). This would suggest that the verges are favouring neither the species that have benefitted from farming nor the native vegetation dependent species. The proportion of status 2 species is much lower (0.32).

**TABLE 1: BIRD SPECIES RECORDED IN SITES IN SOUTHERN WESTERN AUSTRALIA ON FARMS AND ROAD VERGES DURING THE SURVEY PERIOD (1996 TO 1999)**

In Table 1 introduced species are marked with an asterisk (\*). The birds were recorded in sites on 108 farms and there were 161 road verge sites. The *farms* column lists the number of farms on which the species was recorded; the *verges* column lists the number of verge sites in which the species was recorded.

Status follows Saunders and Ingram (1995): see section 2.5.

The x in *farm* column indicates species that were not recorded in 0.5ha. sites on farms.

COMMON NAME	SCIENTIFIC NAME	Farms	Verges	Status
		108	161	
<b>NON-PASSERINES</b>				
Emu	<i>Dromaius novaehollandiae</i>	8	0	3
Malleefowl	<i>Leipoa ocellata</i>	2	0	3
Stubble Quail	<i>Coturnix novaezelandiae</i>	34	6	1
Brown Quail	<i>Coturnix australis</i>	5	0	2
Musk Duck	<i>Biziura lobata</i>	6	0	2
Black Swan	<i>Cygnus atratus</i>	10	0	3
Australian Shelduck	<i>Tadorna tadornoides</i>	74	11	1
Australian Wood Duck (Maned Duck)	<i>Chenonetta jubata</i>	64	3	1
*Mallard	<i>Anas platyrhynchos</i>	1	0	2
Pacific Black Duck	<i>Anas superciliosa</i>	50	5	3
Australasian Shoveler	<i>Anas rhynchotis</i>	5	0	2
Grey Teal	<i>Anas gibberifrons</i>	45	3	2
Chestnut Teal	<i>Anas castanea</i>	5	0	2
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>	5	0	2
Hardhead (White-eyed Duck)	<i>Aythya australis</i>	3	0	2
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	30	0	2
Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>	6 x	0	3
Darter	<i>Anhinga melanogaster</i>	3	0	2
Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>	24	2	3
Pied Cormorant	<i>Phalacrocorax varius</i>	2	0	2
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	11	0	2
Great Cormorant	<i>Phalacrocorax carbo</i>	5	0	2
Australian Pelican	<i>Pelecanus conspicillatus</i>	3 x	0	2
White-faced Heron	<i>Ardea novaehollandiae</i>	68	10	3
White-necked (Pacific) Heron	<i>Ardea pacifica</i>	3	0	2
Great Egret	<i>Egretta alba</i>	7	0	1
Cattle Egret	<i>Ardeola ibis</i>	1	0	1
Nankeen Night Heron	<i>Nycticorax caledonicus</i>	4 x	0	2
Australian (Sacred) White Ibis	<i>Theskiornis molucca</i>	20	2	1
Straw-necked Ibis	<i>Theskiornis spinicollis</i>	25	0	1
Yellow-billed Spoonbill	<i>Platalea flavipes</i>	8	0	1
Black-shouldered Kite	<i>Elanus axillaris</i>	42	20	1
Square-tailed Kite	<i>Elanus scriptus</i>	2	0	2
Whistling Kite	<i>Haliastur sphenurus</i>	7	5	3
Spotted Harrier	<i>Circus assimilis</i>	8	1	2
Swamp Harrier (Marsh)	<i>Circus aeruginosus</i>	8	0	3
Brown Goshawk	<i>Accipiter fasciatus</i>	34	4	3
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>	8	1	3
Wedge-tailed Eagle	<i>Aquila audax</i>	57	9	2
Little Eagle	<i>Hieraaetus morphnoides</i>	9	5	3
Brown Falcon	<i>Falco berigora</i>	21	2	3
Australian Hobby (Little Falcon)	<i>Falco longipennis</i>	12	2	3
Peregrine Falcon	<i>Falco peregrinus</i>	11	1	2
Nankeen (Australian) Kestrel	<i>Falco cenchroides</i>	59	21	3

COMMON NAME	SCIENTIFIC NAME	Farms	Verges	Status
Australian Bustard	<i>Ardeotis australis</i>	2	0	3
Buff-banded Rail	<i>Gallirallus philippensis</i>	1	0	2
Purple Swamphen	<i>Porphyrio porphyrio</i>	9	0	3
Dusky Moorhen	<i>Gallinula tenebrosa</i>	4	0	2
Black-tailed Native-hen	<i>Gallinula ventralis</i>	3	0	2
Eurasian Coot	<i>Fulica atra</i>	18	0	2
Little Button-quail	<i>Turnix velox</i>	5	0	2
Painted Button-quail	<i>Turnix varia</i>	6	1	3
Common Sandpiper	<i>Actitis hypoleucos</i>	1 x	0	2
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	1 x	0	2
Bush Stone-curlew	<i>Burhinus grallarius</i>	1	0	3
Black-winged (Pied) Stilt	<i>Himantopus himantopus</i>	5	0	2
Red-capped Plover	<i>Charadrius ruficapillus</i>	1 x	0	2
Black-fronted Dotterel	<i>Elsyornis melanops</i>	21	0	3
Banded Lapwing (Plover)	<i>Vanellus tricolor</i>	20	0	2
Silver Gull	<i>Larus novaehollandiae</i>	1	0	1
*Rock Dove (Feral Pigeon)	<i>Columba livia</i>	0	2	1
*Laughing Turtledove	<i>Streptopelia senegalensis</i>	13	12	1
Common Bronzewing	<i>Phaps chalcoptera</i>	76	36	3
Brush Bronzewing	<i>Phaps elegans</i>	4	0	3
Crested Pigeon	<i>Ocyphaps lophotes</i>	66	29	1
Red-tailed Black-Cockatoo	<i>Calyptrorhynchus banksii</i>	33	1	2
Short-billed Black-Cockatoo (Carnaby's) & Long-billed Black-Cockatoo (Baudin's)	<i>Calyptrorhynchus latirostris</i> & <i>C. baudinii</i>	39	11	3
Galah	<i>Cacatua roseicapilla</i>	64	38	1
Little Corella & Western Corella	<i>Cacatua tenuirostris</i> & <i>C. pastinator</i>	17	7	1
Major Mitchell's Cockatoo	<i>Cacatua leadbeateri</i>	4	0	3
*Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	2 x	0	2
Cockatiel	<i>Nymphicus hollandicus</i>	3	2	2
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>	29	14	3
Regent Parrot	<i>Polytelis anthopeplus</i>	27	14	3
Western Rosella	<i>Platycercus icterotis</i>	49	47	3
Australian Ringneck	<i>Barnardius zonarius</i>	105	121	1
Red-capped Parrot	<i>Purpureicephalus spurius</i>	50	41	3
Mulga Parrot	<i>Psephotus varius</i>	12	2	1
Elegant parrot	<i>Neophema elegans</i>	41	22	1
Budgerigar	<i>Melopsittacus undulatus</i>	1	0	2
Pallid Cuckoo	<i>Cucullus pallidus</i>	28	3	2
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	29	2	3
Black-eared Cuckoo	<i>Chrysococcyx osculans</i>	3	0	3
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>	19	1	3
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>	17	4	3
Barking Owl	<i>Ninox connivens</i>	2	0	2
Southern Boobook	<i>Ninox novaeseelandiae</i>	8	0	3
Barn Owl	<i>Tyto alba</i>	4	1	2
Tawny Frogmouth	<i>Podargus strigoides</i>	9	1	3
Spotted Nightjar	<i>Eurostopodus argus</i>	1	0	2
Australian Owlet-nightjar	<i>Aegotheles cristatus</i>	4	0	3
*Laughing Kookaburra	<i>Dacelo novaeguineae</i>	68	15	1
Sacred Kingfisher	<i>Todiramphus sancta</i>	29	1	3
Rainbow Bee-eater	<i>Merops ornatus</i>	44	5	2

COMMON NAME	SCIENTIFIC NAME	Farms	Verges	Status
PASSERINES				
Rufous Treecreeper	<i>Climacteris rufa</i>	22	1	3
Splendid Fairy-wren	<i>Malurus splendens</i>	69	51	3
Variegated Fairy-wren	<i>Malurus lamberti</i>	20	1	3
Blue-breasted Fairy-wren	<i>Malurus pulcherrimus</i>	9	3	3
Red-winged Fairy-wren	<i>Malurus elegans</i>	16	7	3
White-winged Fairy-wren	<i>Malurus leucopterus</i>	11	1	2
Southern Emu-wren	<i>Stipiturus malachurus</i>	2 x	1	3
Spotted Pardalote	<i>Pardalotus punctatus</i>	19	5	3
Striated Pardalote	<i>Pardalotus striatus</i>	72	60	3
White-browed Scrubwren	<i>Sericornis frontalis</i>	45	40	3
Shy Heathwren (Hylacola)	<i>Hylacola cauta</i>	2	0	3
Rufous Fieldwren	<i>Calamanthus campestris</i>	3	0	3
Redthroat	<i>Pyrrholaemus brunneus</i>	8	0	3
Weebill	<i>Smicromis brevirostris</i>	51	73	3
Western Gerygone (Warbler)	<i>Gerygone fusca</i>	75	90	3
Inland (Broad-tailed) Thornbill	<i>Acanthiza apicalis</i>	61	62	3
Chestnut-rumped Thornbill	<i>Acanthiza uropygialis</i>	16	4	3
Western Thornbill	<i>Acanthiza inornata</i>	43	38	2
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	96	98	3
Southern Whiteface	<i>Aphelocephala leucopsis</i>	3 x	0	2
Red Wattlebird	<i>Anthochaera carunculata</i>	85	90	3
Little Wattlebird	<i>Anthochaera chrysoptera</i>	21	15	3
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	15	6	3
Yellow-throated Miner	<i>Manorina flavigula</i>	46	29	1
Singing Honeyeater	<i>Lichenostomus virescens</i>	72	88	1
White-eared Honeyeater	<i>Lichenostomus leucotis</i>	11	5	3
Purple-gaped Honeyeater	<i>Lichenostomus cratitius</i>	1	0	3
Yellow-plumed Honeyeater	<i>Lichenostomus ornatus</i>	16	4	3
Grey-fronted Honeyeater	<i>Lichenostomus plumulus</i>	2 x	0	2
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	3	0	2
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	24	30	3
White-naped Honeyeater	<i>Melithreptus lunatus</i>	30	12	3
Brown Honeyeater	<i>Lichmera indistincta</i>	73	118	3
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>	52	65	2
White-cheeked Honeyeater	<i>Phylidonyris nigra</i>	14	20	3
White-fronted Honeyeater	<i>Phylidonyris albifrons</i>	9	7	3
Tawny-crowned Honeyeater	<i>Phylidonyris melanops</i>	9	0	3
Western Spinebill	<i>Acanthorhynchus superciliosus</i>	21	13	3
Black Honeyeater	<i>Certhionyx niger</i>	8	0	2
Pied Honeyeater	<i>Certhionyx variegatus</i>	6 x	0	2
Crimson Chat	<i>Epthianura tricolor</i>	3 x	0	2
White-fronted Chat	<i>Epthianura albifrons</i>	46	10	1
Jacky Winter	<i>Microeca fascinans</i>	18	2	3
Scarlet Robin	<i>Petroica multicolor</i>	47	18	3
Red-capped Robin	<i>Petroica goodenovii</i>	51	28	3
Hooded Robin	<i>Melanodryas cucullata</i>	4	0	3
Western Yellow Robin	<i>Eopsaltria griseogularis</i>	38	6	3
White-breasted Robin	<i>Eopsaltria georgiana</i>	15	3	2
Southern Scrub-robin	<i>Drymodes brunneopygia</i>	3	0	3
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	1 x	0	2
White-browed Babbler	<i>Pomatostomus superciliosus</i>	37	11	3
Chestnut Quailthrush	<i>Circlosoma castanotus</i>	1 x	0	3
Varied Sittella	<i>Daphoenositta chrysoptera</i>	28	8	3
Crested Bellbird	<i>Oreoica gutturalis</i>	10	3	3
Gilbert's Whistler	<i>Pachycephala inornata</i>	1 x	0	3
Golden Whistler	<i>Pachycephala pectoralis</i>	47	16	3
Rufous Whistler	<i>Pachycephala rufiventris</i>	75	51	3
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	67	44	3



COMMON NAME	SCIENTIFIC NAME	Farms	Verges	Status
Restless Flycatcher	<i>Myiagra inquieta</i>	21	0	3
Magpie-lark	<i>Grallina cyanoleuca</i>	97	72	1
Grey Fantail	<i>Rhipidura fuliginosa</i>	93	115	2
Willie Wagtail	<i>Rhipidura leucophrys</i>	101	89	1
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	84	45	2
White-winged Triller	<i>Lalage sueurii</i>	21	2	3
Black-faced Woodswallow	<i>Artamus cinereus</i>	44	23	1
Dusky Woodswallow	<i>Artamus cyanopterus</i>	33	9	3
Grey Butcherbird	<i>Cracticus torquatus</i>	57	20	3
Pied Butcherbird	<i>Cracticus nigrogularis</i>	33	7	1
Australian Magpie	<i>Gymnorhina tibicen</i>	105	84	1
Grey Currawong	<i>Strepera versicolor</i>	24	10	3
Australian Raven	<i>Corvus coronoides</i>	108	126	1
Little Crow	<i>Corvus bennetti</i>	6	0	2
Richard's Pipit	<i>Anthus novaeseelandiae</i>	66	21	1
Zebra Finch	<i>Taeniopygia guttata</i>	15	2	1
Red-eared Firetail	<i>Stagonopleura oculata</i>	10	4	3
Mistletoebird	<i>Dicaeum hirundinaceum</i>	12	16	3
White-backed Swallow	<i>Cheramoeca leucosternus</i>	15	3	1
Welcome Swallow	<i>Hirundo neoxena</i>	70	42	1
Tree Martin	<i>Hirundo nigricans</i>	77	56	3
Fairy Martin	<i>Hirundo ariel</i>	3 x	3	3
Clamorous Reed-Warbler	<i>Acrocephalus stentoreus</i>	2	1	2
Little Grassbird	<i>Megalurus gramineus</i>	4	0	2
Rufous Songlark	<i>Cincloramphus mathewsi</i>	18	4	3
Brown Songlark	<i>Cincloramphus cruralis</i>	23	4	2
Silvereye	<i>Zosterops lateralis</i>	70	79	3

Forty-nine additional species were recorded on two farms in the north of Western Australia, one near Exmouth and the other at Kununurra.

**TABLE 2: NUMERICAL SUMMARY**

	NON-PASSERINES	PASSERINES	ALL BIRD SPECIES
<b>FARMS (108)</b>			
Status 1	19	13	32
2	38	18	56
3	37	54	91
Total	94	85	179
<b>ROAD VERGES (161)</b>			
Status 1	14	11	25
2	9	9	18
3	22	46	68
Total	45	66	111

### 3.2 MOST FREQUENTLY RECORDED SPECIES

Table 3 shows the ten bird species found on the most farms and the top ten found in road verges. A top ten based on count would be very different.

There are three status 3 or 'decliner' species in the farm top ten (Yellow-rumped Thornbill, Red Wattlebird and Tree Martin) and four (Brown Honeyeater, Yellow-rumped Thornbill, Red Wat-

tlebird and Western Warbler) in the road verge list. This suggests that remnant vegetation or revegetation on many farms is proving to be a valuable habitat for some of the species thought to be declining in the wheatbelt.

Grey Fantails are known to be somewhat nomadic and these results suggest that they may travel in verges. Brown Honeyeaters appear to favour verges over farmland and were recorded breeding in them in winter, spring and summer.

**TABLE 3: THE TEN MOST FREQUENTLY RECORDED SPECIES IN FARM AND ROAD VERGE SITES**

In round brackets ( ) is the number of farms or verge sites in which the species was recorded, and in square brackets [ ] is the total count of individuals.

FARMS (108)	VERGES (161 SITES)
Australian Raven (108) [3 973]	Australian Raven (126) [615]
Australian Ringneck (105) [10 008]	Australian Ringneck (121) [889]
Australian Magpie (105) [3 788]	Brown Honeyeater (118) [1 119]
Willie Wagtail (101) [1 765]	Grey Fantail (115) [339]
Magpie-lark (97) [1 547]	Yellow-rumped Thornbill (98) [800]
Yellow-rumped Thornbill (96) [4 443]	Red Wattlebird (90) [521]
Grey Fantail (93) [2 479]	Western Warbler (90) [395]
Red Wattlebird (85) [1 482]	Willie Wagtail (89) [258]
Black-faced Cuckoo-shrike (84) [471]	Singing Honeyeater (88) [385]
Tree Martin (77) [3 531]	Australian Magpie (84) [253]



Australian Raven

### 3.3 BIRD SPECIES DIVERSITY IN RELATION TO VARIOUS HABITAT CHARACTERISTICS

The 0.5 ha. sites were of relatively uniform habitat. The registration form for these sites (Appendix 1) listed several variables defining aspects of the site as bird habitat. The number of sites in some of these categories and the number of species recorded overall in each is shown in Table 4 (farms), and 5a and 5b (verges). Additionally the species are shown by status. For ready comparison some of these data are presented as bar-graph diagrams. Also shown is the average number of species recorded over the survey period in each site category [ ].

Tables 4 (farms), and 5a and 5b (verges) are based on the presence of bird species in a site during the survey.

Figure 2 is drawn from Table 4. It shows the percentage of bird species in each of the three status groups in some of the listed habitat parameters. The sample size is quite varied and the larger sample size tends to be in sites that could be expected to be more productive of bird-life. This is not the case for *Tree species mix*.

Note also that there are approximately 2.7 times as many status 3 species as status 1 species. A difference of 10% in status 1 represents 3.2 species; in status 2, 4.5 species; and in status 3, 8.6 species.

**TABLE 4: BIRD SPECIES DIVERSITY IN RELATION TO VARIOUS HABITAT PARAMETERS - FARMS**

Data from the two hundred and sixty-five 0.5 ha. farm sites. The number of sites in each category is shown. The category segments (e.g. *connected* yes [151], *connected* no [53]), do not add up to the total number of sites (265) because some participants failed to return their site registration forms and others did not fully fill them in. Average number of species per site recorded over the survey period [ ].

PARAMETER	No. of sites (265)	No. of species (163)	No. of species Status 1 (32)	No. of species Status 2 (45)	No. of species Status 3 (86)
<b>TREE HISTORY</b>					
Revegetation	43	115 [18.7]	27 [7.2]	24 [2.2]	64 [9.3]
Regeneration & remnant	153	155 [21.7]	31 [7.1]	39 [2.8]	85 [11.8]
<b>TREE TYPE</b>					
Native local	198	162 [21.8]	32 [7.2]	44 [2.9]	86 [11.7]
Native non-local	25	90 [17.9]	24 [7.5]	13 [1.6]	53 [8.9]
Non-native	8	76 [18.8]	24 [6.5]	12 [2.3]	40 [10.0]
<b>AVERAGE AGE TREES (years)</b>					
< 5	12	71 [16.8]	24 [7.7]	7 [1.3]	40 [7.8]
5 - 10	23	101 [21.0]	26 [7.7]	19 [2.4]	56 [10.8]
10 - 20	20	90 [18.5]	23 [6.0]	16 [2.5]	51 [10.1]
20 - 50	54	123 [19.6]	28 [7.2]	30 [2.6]	65 [9.9]
50 - 100	53	121 [22.5]	30 [7.1]	22 [2.8]	69 [12.6]
>100	14	83 [19.7]	25 [7.8]	14 [2.6]	44 [9.4]

PARAMETER	No. of sites (265)	No. of species (163)	No. of species Status 1 (32)	No. of species Status 2 (45)	No. of species Status 3 (86)
<b>ISOLATION</b>					
Isolated	50	112 [19.4]	28 [8.3]	22 [2.2]	62 [8.8]
Semi-isolated	62	137 [23.0]	31 [7.8]	32 [3.1]	74 [12.1]
Not isolated	128	149 [20.9]	29 [6.5]	37 [2.7]	83 [11.7]
<b>CONNECTED</b>					
Yes	151	153 [22.2]	29 [7.2]	39 [2.8]	85 [12.1]
No	53	127 [18.9]	31 [7.0]	24 [2.2]	72 [9.6]
<b>GRAZING FREQUENCY</b>					
Always	24	95 [18.7]	25 [6.8]	20 [2.9]	50 [9.0]
Often	54	120 [19.5]	29 [6.6]	24 [2.4]	67 [10.4]
Seldom	45	115 [20.1]	29 [7.6]	23 [2.3]	63 [10.2]
Never	120	154 [22.3]	31 [7.6]	39 [2.9]	84 [11.9]
<b>UNDER- STOREY</b>					
None	60	105 [17.4]	26 [6.7]	24 [1.9]	55 [8.7]
Sparse	76	141 [22.6]	30 [8.1]	34 [2.7]	77 [11.8]
Present	90	150 [22.9]	30 [6.9]	34 [3.2]	86 [12.8]
<b>TREE SPECIES MIX (dominants)</b>					
One species	59	114 [18.9]	27 [6.9]	24 [2.1]	63 [10.0]
Two-three spp.	82	127 [20.8]	28 [7.1]	30 [2.6]	69 [11.1]
Three plus spp.	76	149 [23.8]	31 [7.6]	34 [3.3]	84 [13.0]
<b>SHRUB SPECIES MIX (dominants)</b>					
One species	28	96 [20.7]	23 [7.0]	14 [2.5]	59 [11.2]
Two-three spp.	50	122 [19.9]	29 [7.6]	26 [2.4]	67 [9.8]
Three plus spp.	75	141 [24.7]	30 [7.6]	33 [3.3]	78 [13.8]
<b>AREA OF PATCH (ha.)</b>					
< 2	68	136 [21.3]	29 [7.2]	32 [2.8]	75 [11.3]
2 - 3	31	116 [21.7]	27 [7.5]	28 [3.1]	61 [11.1]
4 - 5	19	101 [20.8]	25 [7.3]	19 [2.5]	57 [11.0]
6 - 10	18	103 [25.3]	26 [9.5]	17 [2.8]	60 [13.0]
11 - 20	25	106 [21.4]	26 [7.3]	15 [2.6]	65 [11.5]
21 - 50	18	91 [19.0]	25 [6.7]	14 [2.3]	52 [10.0]
51 - 100	10	66 [19.0]	17 [5.0]	8 [2.7]	41 [11.3]
100 - 400	8	67 [18.6]	22 [7.6]	9 [2.0]	36 [9.0]
> 400	7	54 [21.4]	10 [3.9]	10 [3.6]	34 [14.0]

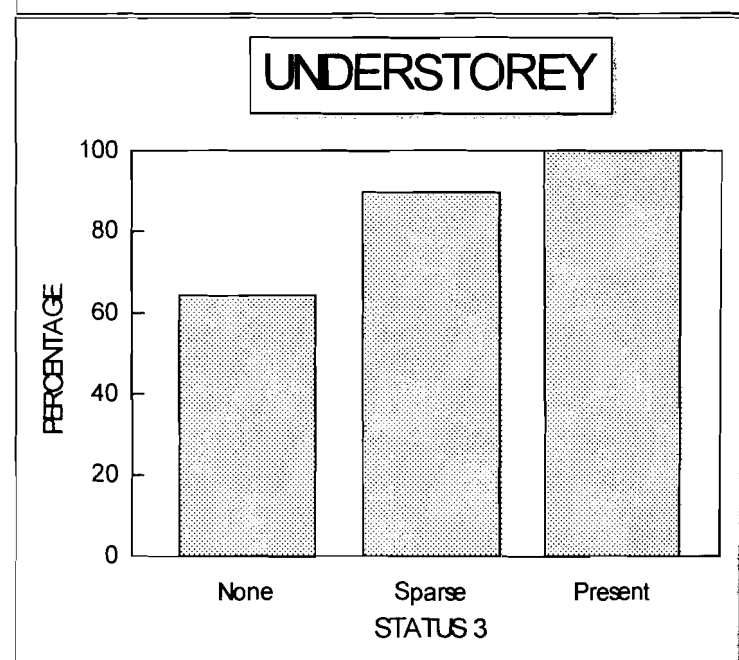
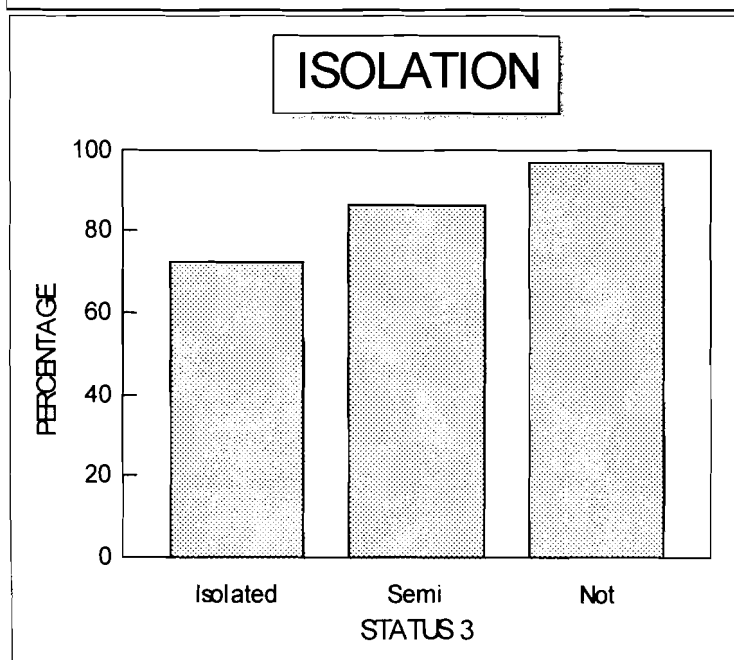
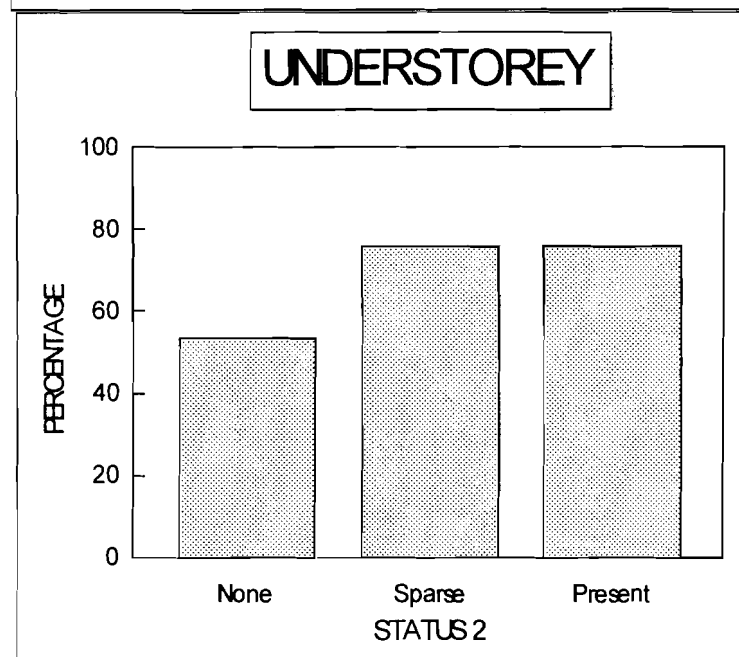
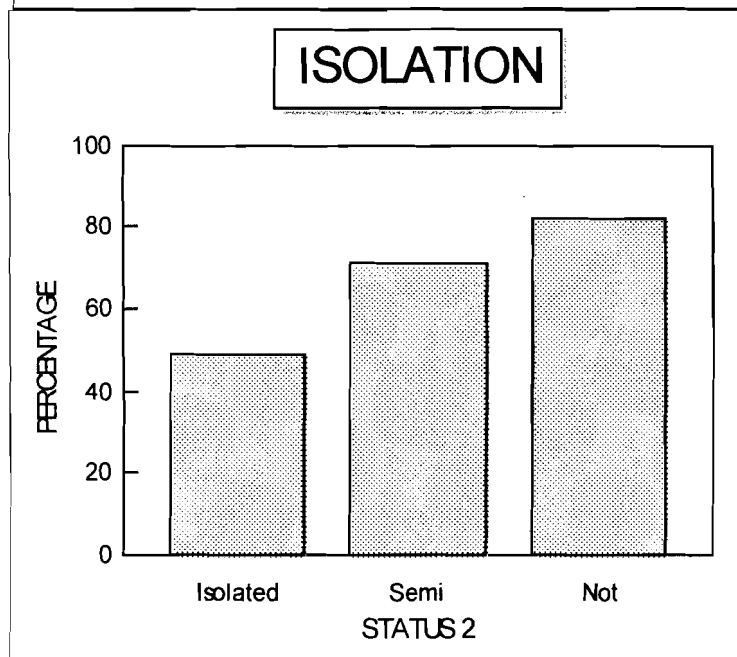
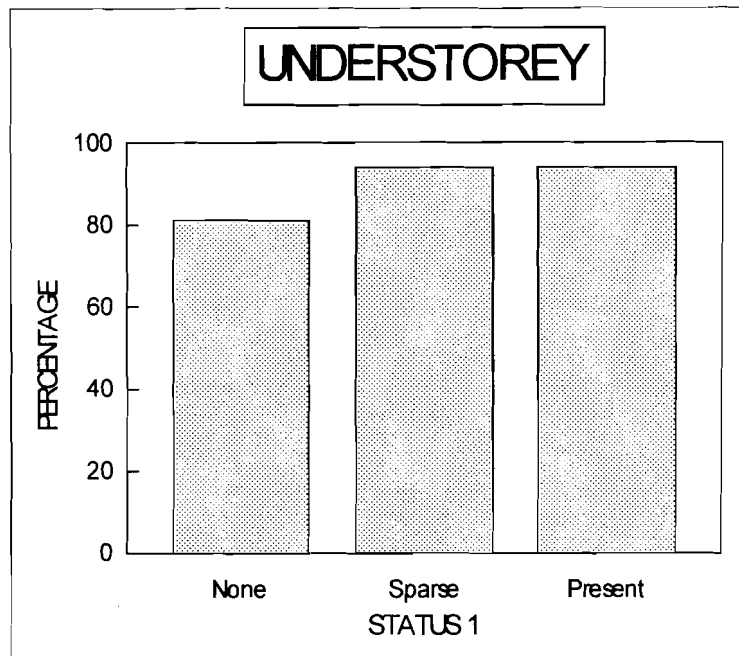
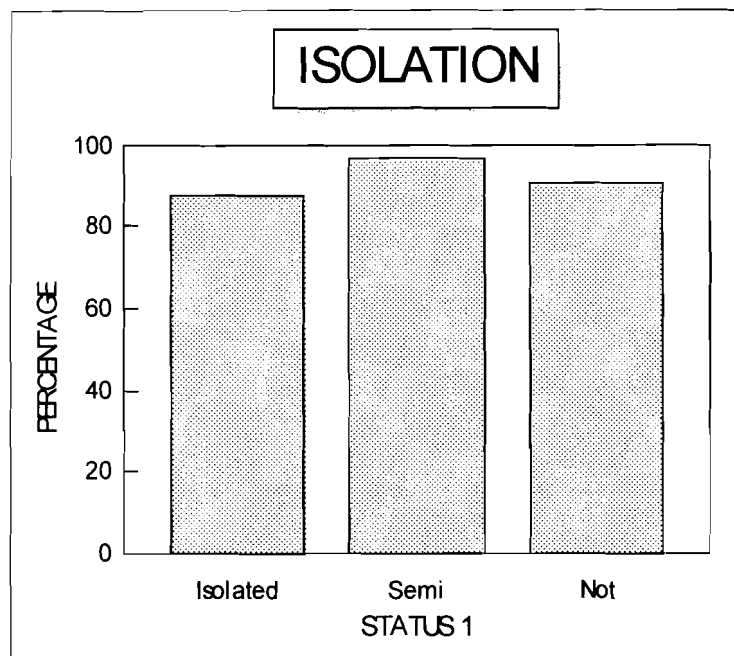
**TABLE 5a: BIRD SPECIES DIVERSITY IN RELATION TO VARIOUS HABITAT PARAMETERS  
- ALL VERGES**

PARAMETER	No. of sites (161)	No. of species (111)	No. of species Status 1 (27)	No. of species Status 2 (17)	No. of species Status 3 (67)
<b>TREE HISTORY</b>					
Revegetaton	106	103 [17.1]	26 [5.8]	16 [1.9]	61 [9.2]
Regeneration & remnant	46	93 [15.8]	25 [5.0]	9 [1.8]	59 [8.7]
<b>UNDER-STOREY</b>					
None	22	63 [15.5]	18 [4.9]	6 [1.8]	39 [8.5]
Sparse	60	100 [15.8]	26 [5.8]	14 [1.7]	60 [8.1]
Present	79	99 [17.4]	25 [5.5]	12 [2.0]	62 [9.7]
<b>VERGE WIDTH (m.)</b>					
10 -15	28	77 [18.2]	23 [6.3]	9 [2.4]	44 [9.3]
16 -21	33	73 [17.2]	21 [5.6]	6 [1.9]	46 [9.4]
22 - 29	34	83 [16.0]	25 [5.3]	11 [1.8]	47 [9.3]
30 - 40	32	81 [16.6]	22 [5.8]	11 [1.6]	48 [8.1]
41 +	34	81 [15.3]	19 [4.7]	8 [1.8]	54 [8.6]

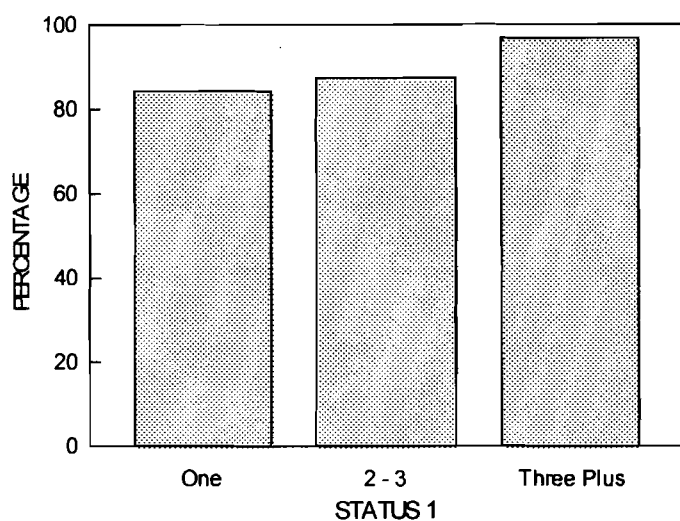
**TABLE 5b: BIRD SPECIES DIVERSITY IN RELATION TO HABITAT PARAMETERS  
- REVEGETATED VERGES**

PARAMETER	No. of sites (107)	No. of species (103)	No. of species Status 1 (26)	No. of species Status 2 (16)	No. of species Status 3 (61)
<b>AVERAGE AGE TREES (years)</b>					
<5	19	70 [17.1]	22 [6.5]	8 [1.3]	40 [8.8]
5 - 10	59	89 [17.0]	23 [5.8]	12 [2.1]	54 [9.0]
10 - 20	25	69 [17.0]	19 [5.5]	6 [1.8]	44 [9.8]
<b>UNDER-STOREY</b>					
None & Sparse	51	87 [15.1]	25 [5.9]	13 [1.5]	49 [7.5]
Present	56	85 [18.6]	21 [5.7]	10 [2.1]	54 [10.6]
<b>TREE SPP. MIX</b>					
One species	14	56 [14.7]	16 [5.6]	9 [1.9]	31 [7.2]
Two-three spp.	23	79 [17.3]	21 [5.1]	11 [2.2]	46 [9.7]
Three plus spp.	70	92 [17.3]	24 [6.1]	10 [1.7]	57 [9.3]
<b>VERGE WIDTH (m.)</b>					
10 - 15	21	71 [18.6]	23 [6.7]	8 [2.3]	40 [9.4]
16 - 21	26	72 [17.5]	21 [5.7]	6 [2.0]	45 [9.5]
22 - 29	24	71 [15.4]	20 [4.9]	10 [1.7]	41 [8.7]
30 - 40	24	73 [16.9]	21 [6.6]	10 [1.5]	42 [8.7]
41 +	12	61 [16.7]	17 [4.6]	6 [1.8]	38 [9.7]

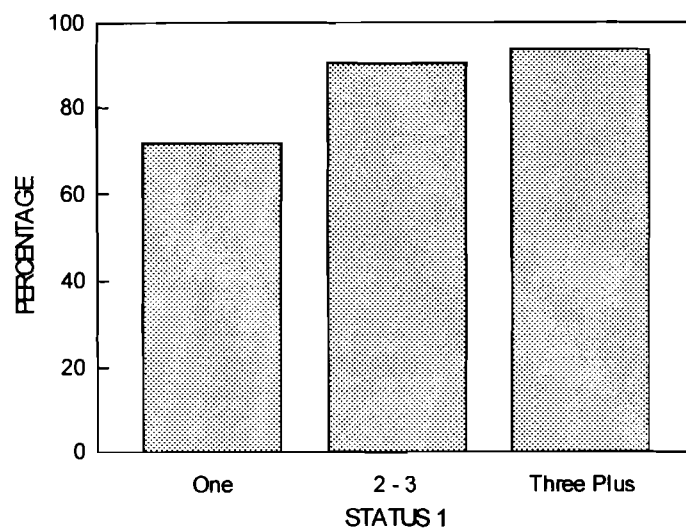
FIGURE 2: PERCENTAGE OF BIRD SPECIES IN EACH STATUS GROUP IN VARIOUS HABITAT PARAMETERS - FARMS



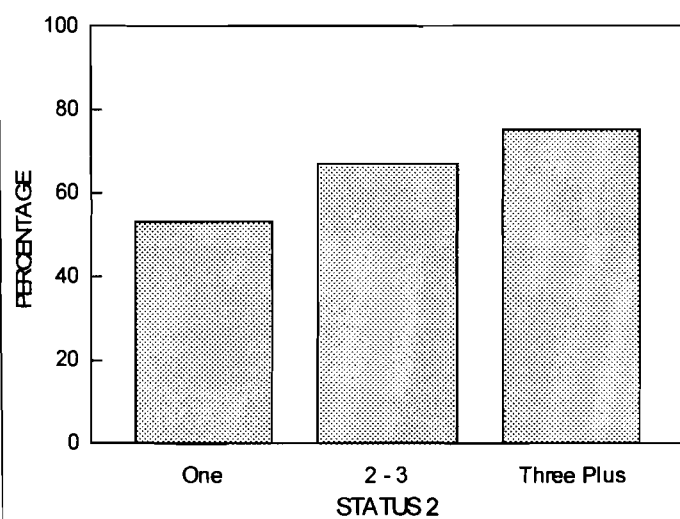
### TREE SPECIES MIX



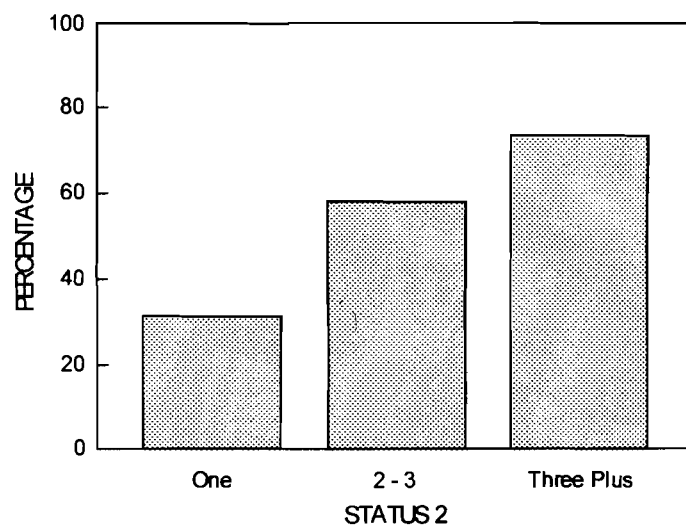
### SHRUB SPECIES MIX



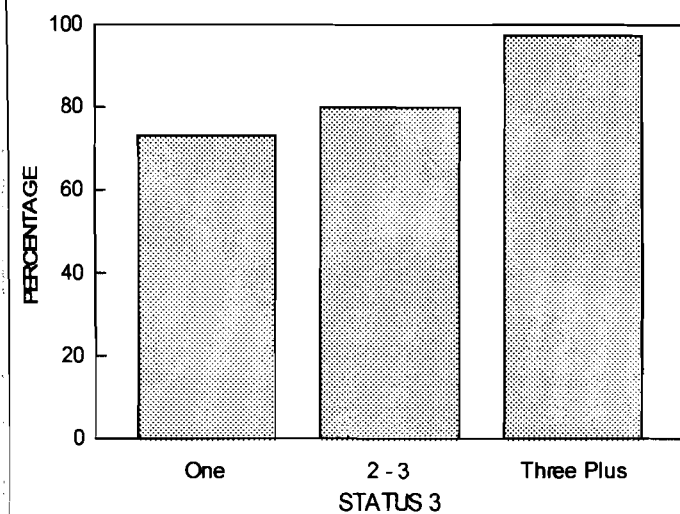
### TREE SPECIES MIX



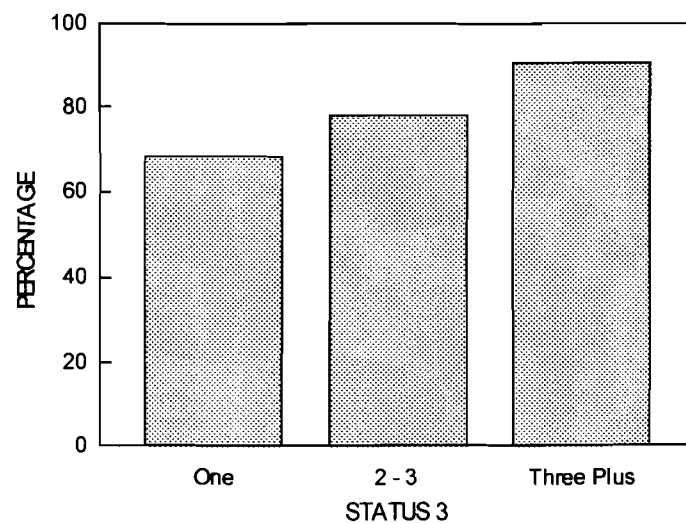
### SHRUB SPECIES MIX



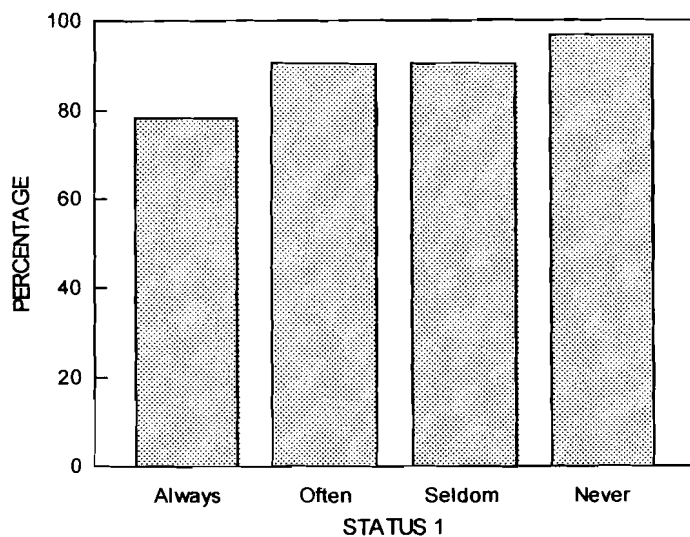
### TREE SPECIES MIX



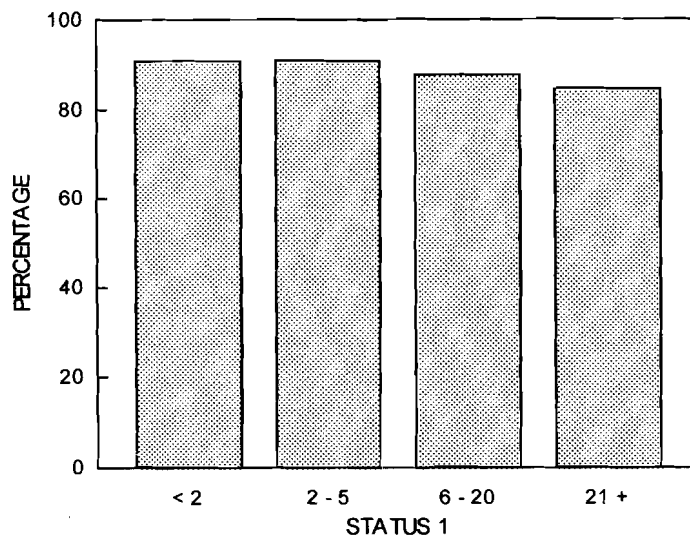
### SHRUB SPECIES MIX



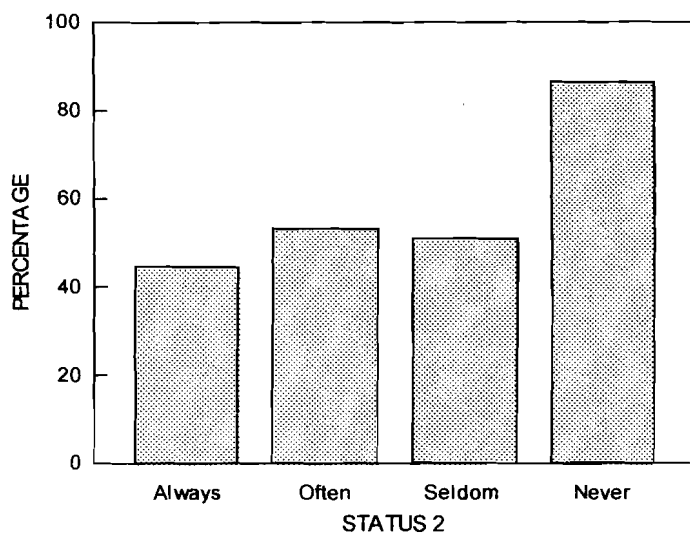
### GRAZING FREQUENCY



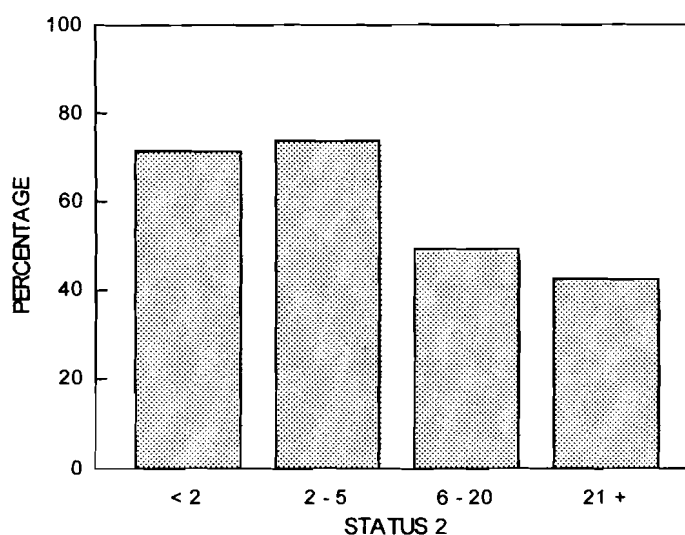
### AREA OF PATCH (ha.)



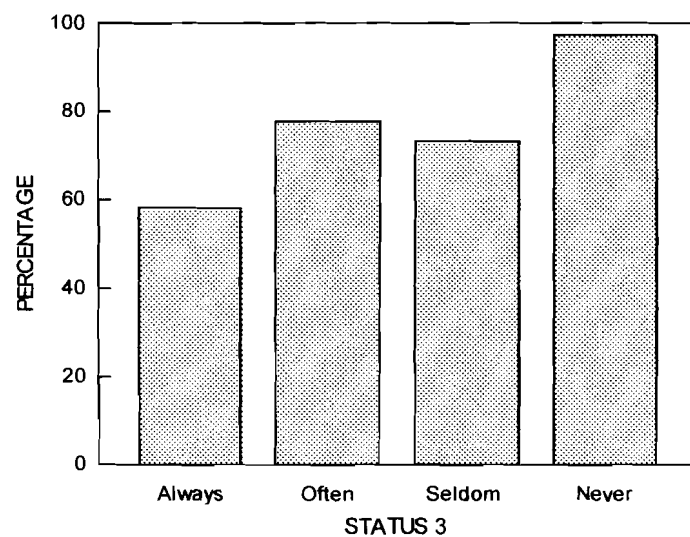
### GRAZING FREQUENCY



### AREA OF PATCH (ha.)



### GRAZING FREQUENCY



### AREA OF PATCH (ha.)

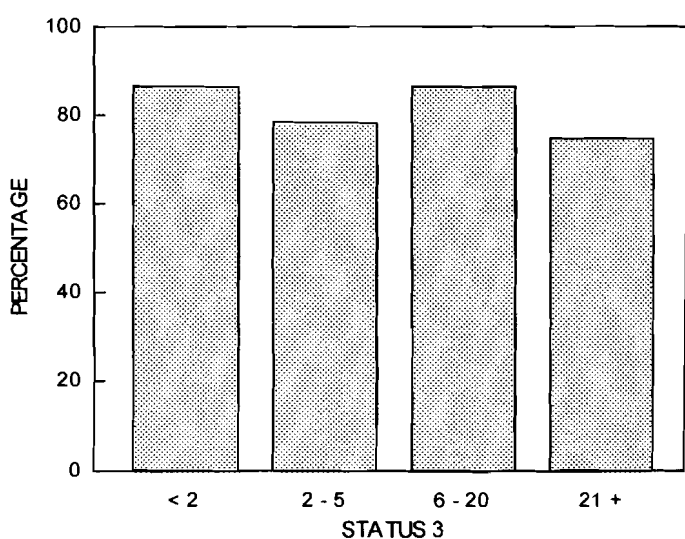
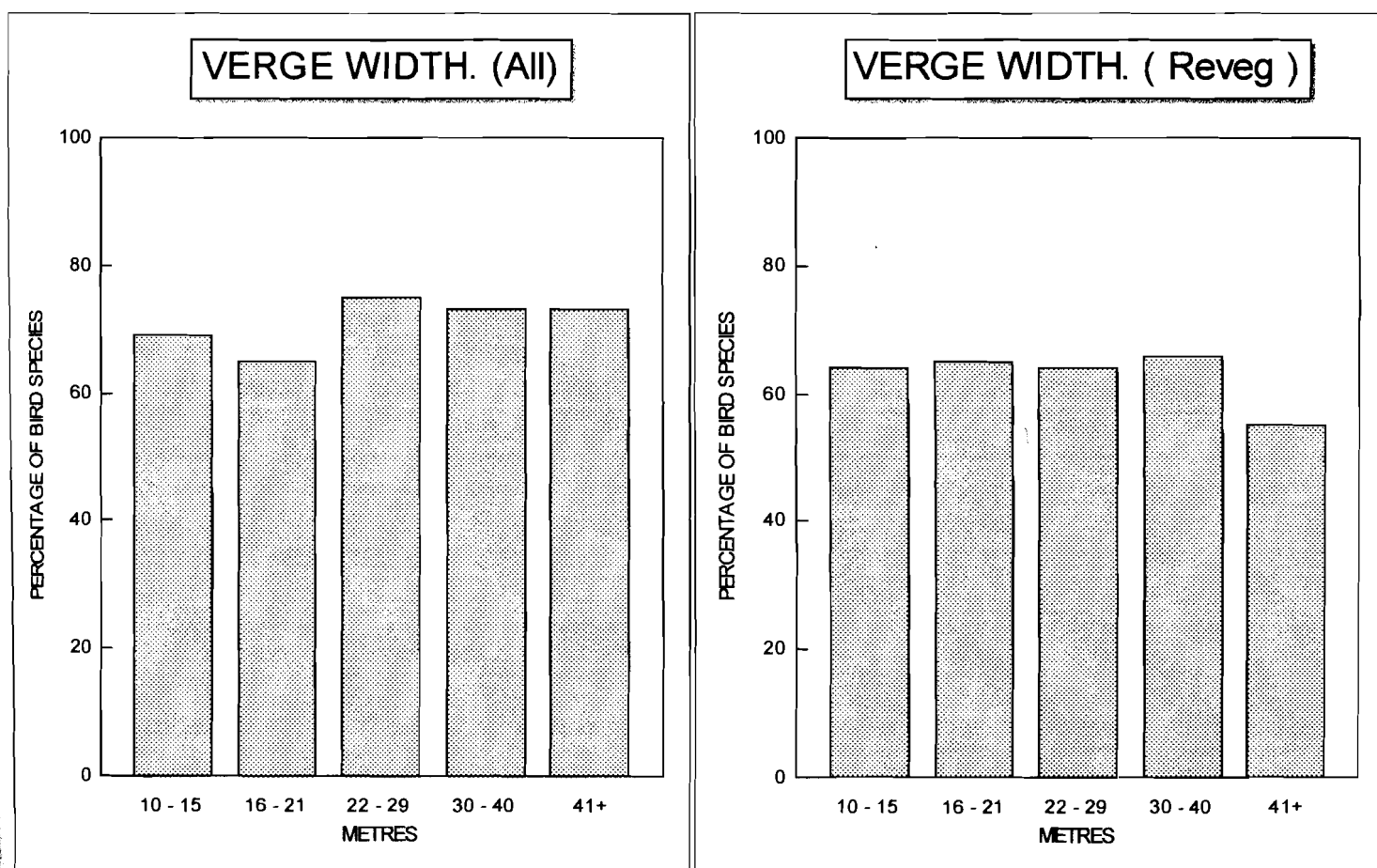




Figure 3 is drawn from Tables 5a and 5b. It shows the percentage of all bird species in various verge widths both in all verge sites and in the verge revegetation sites.

Frequency of occurrence and numbers of individuals are not considered here except for a small sample of species occurrence in verge sites of different widths (Table 6) and a list of average bird numbers counted per survey also in verge sites of differing widths (Table 7). The species selected for Table 6 are all status 3 passerines. They are numbers 9 - 21 in Figure 7 (Section 3.10).

**FIGURE 3: PERCENTAGE OF BIRD SPECIES IN VARIOUS VERGE WIDTHS (ALL VERGES AND REVEGETATION)**



**TABLE 6: NUMBER OF SITES OF EACH VERGE WIDTH CATEGORY RECORDING SELECTED STATUS 3 SPECIES**

In brackets ( ) is the total number of sites in each category

SPECIES	VERGE SITES - WIDTH IN METRES				
	10 -15 (28)	16 - 21 (33)	22 - 29 (34)	30 - 40 (32)	41+ (34)
Splendid Fairy-wren	13	18	8	6	6
White-browed Scrub-wren	11	13	4	6	6
Inland Thornbill	12	16	10	11	13
Brown-headed Honeyeater	4	4	6	8	8
Red-capped Robin	3	5	4	8	8
Western Yellow Robin	1	4	1	0	0
Varied Sittella	2	3	0	1	2
Golden Whistler	3	5	4	0	2
Rufous Whistler	10	4	12	11	14
Grey Shrike-thrush	5	9	12	10	8
Dusky Woodswallow	3	4	0	1	1
Grey Butcherbird	5	3	2	6	4
Grey Currawong	3	2	2	1	2

**TABLE 7: AVERAGE COUNT OF BIRDS PER SURVEY IN VERGE SITES OF VARIOUS WIDTHS**

Verge width categories (m.)	No. of surveys	Average count of individuals	Average count Status 1	Average count Status 2	Average count Status 3
10 - 15	213	13.6	4.2	1.7	7.7
16 - 21	247	12.9	3.3	2.6	7.1
22 - 29	225	11.2	3.5	1.3	6.3
30 - 40	230	10.8	3.9	1.2	5.8
41+	233	10.0	3.3	1.1	5.6

## Figure 2 - is it misleading?

Is the sample size for those characteristics shown by the histograms too disparate? An indication that it is not at least in *Isolation* and *Connected* (not graphed), can be seen in the status 1 results where these farm-suited species are more diverse in *semi-isolated* and *not connected* sites despite there being many fewer such sites than *not isolated* and *connected*. *Tree Species Mix* results (status 1 and 3) also are predictable rather than according to sample size. *Understorey* has a comparable sample size mix and the results should be quite reliable. However, *Shrub Species Mix one* ( $n = 28$ ), and *Grazing Frequency always* ( $n = 24$ ) may be too small to be confident in the result.

**Tree history:** On farms there were almost four times as many remnant sites as revegetation; with verges there were over twice as many revegetation sites as remnant so overall there was a considerable representation of both types of site.

Despite 74% fewer revegetation sites than remnant sites on farms, there were only 28% fewer bird species in the revegetation sites.

In verges there were 103 species in revegetation sites of a total of 111 in all verge sites. Some of the verge revegetation sites are up to 40% remnant. Also verge revegetation is often very dense.

The eight species recorded in verge remnant but not in verge revegetation comprised one status 1, one status 2 and six status 3. The status 3 species were Fan-tailed Cuckoo, Horsfield's Bronze-cuckoo, Crested Bellbird, Southern Emu-wren, Variegated Fairy-wren, Rufous Tree-creeper.

Of these the Variegated Fairy-wren and Rufous Tree-creeper were not recorded in revegetated sites on farms. The two cuckoos and the Crested Bellbird were recorded on revegetation sites on farms. There was no Southern Emu-wren record in a 0.5 ha. site on a farm so there is no record of exactly which vegetation type it was in.

**Tree type:** Not a very useful category both for reason outlined in *methods* and because of the very uneven spread of sites within the categories. Some of the status 3 passerines recorded in non-native sites were Golden Whistler, Grey Shrike-thrush, Grey Butcherbird, Inland Thornbill,

Dusky Woodswallow, Red-eared Firetail, Scarlet Robin, Western Spinebill, Splendid Fairy-wren, Red-winged Fairy-wren, Mistletoebird.

**Average age of trees:** It appears that birds are prepared to make use of trees in all age categories (Tables 4 and 5b). Other research (e.g. Hollick 1996) has shown that it is the structure of vegetation rather than the age that makes a significant difference to the number of bird species using the vegetation. However this would not apply to all species and at all times. Many species such as Rufous Treecreepers need older trees for nesting. In the farm sites, there is a peak of status 3 diversity in the 50 - 100 years category both overall and by site average.

In the revegetated verge sites (Table 5b), although overall species diversity is greater in the 5 - 10 year range, the average number of species per site is very similar in the three variables listed. The younger sites are likely to have a larger number of status 1 species than the more established sites. The reverse applies to status 3 species.

**Isolation:** Table 4 and Figure 2 shows that status 1 birds are less affected by isolation than status 3 bird species as would be expected. The status 2 birds also appear to be affected by isolation. Status 1 birds are those undeterred by wide open spaces and are often to be seen flying across paddocks.

**Connection:** Again the status 1 birds appear less affected by connection, or lack of it, than status 3 species and status 2 species (Table 4).

**Grazing frequency:** It seemed to make little difference whether a site was grazed often or seldom. In all categories, *always* yielded lowest number of species and *never* the highest. Status 1 species appeared little affected by grazing frequency. It is likely that the *always* result may be affected by low sample size.

**Understorey:** It is clear that understorey is necessary for higher bird diversity. Lynch and Saunders (1991) found that a well-developed shrub understorey is the single most important vegetation related factor that increases the carrying capacity of corridors. It can be seen in Figure 2 that even a sparse understorey gives a higher species diversity than no understorey. The most dramatic difference is in the native vegetation

dependent species (status 3) between no understorey and a well-developed understorey. In Table 5b the combination of *none* and *sparse* gives a similar sample size to *present*. Both the overall result and the site averages show higher diversity in status 3 *present* than the combined *none* and *sparse*.

**Tree species mix and shrub species mix:** Both appear to make a difference especially to the diversity of status 2 and status 3 species. The *one dominant shrub* category is probably affected by low sample size.

**Area of patch:** The most commonly chosen patch size on farms was < 2 ha. These small patches were remarkable for their diversity. However it would be completely misleading to assume that small patches lead to higher diversity. At least four factors could have contributed to this undoubtedly skewed result. Farmers would have selected a patch well known to be a bird favourite. Secondly, in a small patch, all species can more readily be found. Thirdly, in small patches, edge effects are more pronounced. Lastly, it would be very tempting in such a small patch to record all the birds located and not just those within the designated half hectare. Further checking is warranted.

**Verge Width:** Figure 3 (all sites) shows that verge width (to a low of 10 m.) has very little effect on the number of species within a site. However, the 41+ category in Table 5a has not only the lowest status 1 number but also the highest number of status 3 species.

There were only half as many revegetated sites in the 41+ width category and it is most probable that this more than any other factor resulted in the lower number of species in that category (Figure 3 - revegetation).

There was a higher number of species per site in the narrower verges (Table 5a). Also the count of individual birds per survey was higher in the narrower verges (Table 7). The reasons for this are not yet clear. Those results appear to support the edge-effect theory that there are more species at edges and also higher numbers of birds. A recent study in mallee country in South Australia (Luck *et al.* 1999) has shown that this does not always apply. Although they found an increase of *edge-users* (e.g. Red Wattlebird, Singing Honeyeater), there was often a corre-

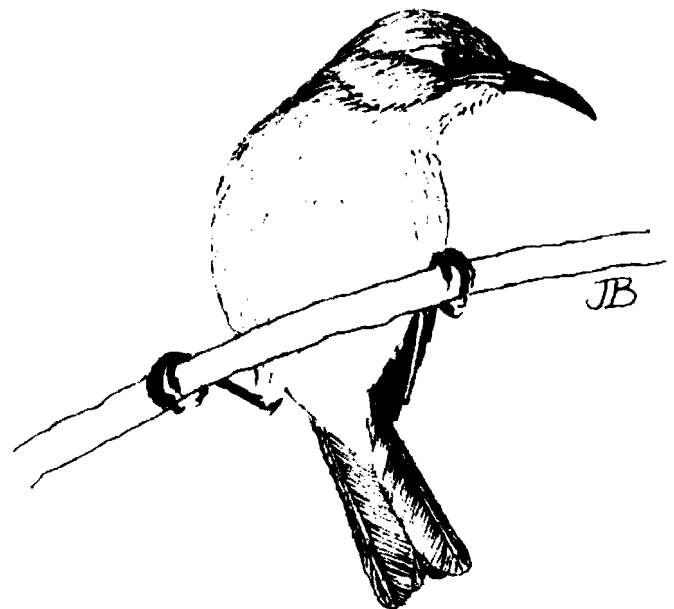
sponding decrease in *edge-avoiders* (e.g. Spotted Pardalote, Southern Scrub-robin).

All except two verge sites had one edge against the bare area of a road shoulder. Most were also adjacent to a completely or partly cleared paddock. Narrower verge sites were necessarily longer and were more likely to be adjacent to a paddock. It seems likely that effects connected with edges are factors in the results shown in Tables 5, 6 and 7. Sites where the verge was greater than 40 metres wide were not usually surveyed to the edge.

Revegetated verges often appear to have a higher density of flowering plants than remnant bushland. At flowering they are visited by large numbers of honeyeaters.

Many of the fairly vulnerable status 3 species, use verges of all the widths surveyed. **Note however that there were many species not recorded at all in verges (Table 1).**

These results will be examined in more detail in the Main Roads report.



Brown Honeyeater

### 3.4 HABITAT CHOICES OF PARTICULAR SPECIES - STATISTICAL ANALYSES

The following statistical analyses were prepared by Michael and Lesley Brooker. It is presented as a small sample of what may be done with the data. Broader and more detailed analysis will form a large part of the national Birds on Farms report.

#### Single species analyses

Presence/absence data for 69 species were analysed. Only those species that had been recorded at least 18 times during the surveys of the 0.5 ha. farm sites were used. Of waterbirds, only the White-faced Heron was included.

Data for 44 species with 18 or more records in verge sites were analysed in the same manner.

The aim was to test for significant relationships between the presence/absence data and the various habitat variables and to comment on the relevance of the findings for conservation.

The habitat variables were:

AREA: < 2 ha (66); 2-3 ha (31); 4-5 ha (19); 6-10 ha (18); 11-20 ha (25); 21-50 ha (18); 51-100 ha (10); 100-400 ha (8); > 400 ha (7) [202]

ISOLATION: isolated or semi-isolated (112); not isolated (128) [240]

CONNECTED: yes (151); no (53) [204]

GRAZED: always or mostly or seldom (123); never (120) [243]

TREE HISTORY: Farm - revegetated (43); not-revegetated (153) [196]

Verge - revegetated (108); not-revegetated (44) [152]

TREE TYPE: native, local (198); native, not local (25) [223]

TREE SPP MIX: Farm - one (59); two (82); three or more (76) [217]

Verge - one (28); two (45); three or more (85) [158]

TREE AGE: <10 yrs (35); 10-50 (74); >50 (67) [176]

SHRUB SPP MIX: Farm - one (28), 2-3 (50); 4 or more (75) [153]

Verge - one (13), 2-3 (20); 4 or more (111) [144]

UNDERSTOREY: Farm - no or sparse (136); yes (90) [226]

Verge - no or sparse (82); yes (79) [161]

Sample size ( ); Total sample size [ ]

For variables with two classes, we used a  $\chi^2$  test with Yates correction. For variables with three or more classes (continuous or categorical) we used logistic regression models, assuming binomially distributed errors (computer package GLIM; Baker and Nelder 1978). Only those results with a sound ecological explanation, with  $P < 0.05$ , are shown in Table 8.

**TABLE 8: RELATIONSHIPS BETWEEN THE RECORDING RATE AND THE SELECTED SITE VARIABLES FOR 69 SPECIES ON FARMS.** (Only significant differences,  $P < 0.05$ , are shown; + indicates a positive relationship; - indicates a negative relationship. For example + in the isolation column for White-fronted Chats indicates that they were present in the more isolated sites.)

	AREA	ISOLATION	GRAZED	TREE MIX	TREE AGE	SHRUB MIX	UNDER-STOREY
Stubble Quail		+					
White-faced Heron		+					
Black-shouldered Kite							
Wedge-tailed Eagle							
Nankeen Kestrel		+	+				
Common Bronzewing							
Crested Pigeon							
Red-tailed Black Cockatoo		-			+		
White-tailed Black Cockatoo							
Galah							
Corella							
Purple-crowned Lorikeet							
Regent Parrot					+		+
Western Rosella							
Australian Ringneck							
Red-capped Parrot						+	
Elegant Parrot							
Sacred Kingfisher							
Rainbow Bee-eater				+	+		
Rufous Treecreeper							
Splendid Fairy-wren							+
Variegated Fairy-wren							
Blue-breasted Fairy-wren							
Red-winged Fairy-wren							+
Spotted Pardalote							
Striated Pardalote			-		+		
White-browed Scrubwren	-					+	+
Weebill		-	-				
Western Gerygone		-					
Inland Thornbill							+
Western Thornbill					+		
Yellow-rumped Thornbill							
Red Wattlebird						+	
Yellow-throated Miner							
Singing Honeyeater							
Brown-headed Honeyeater			-				
White-naped Honeyeater			-				
Brown Honeyeater			-				
New Holland Honeyeater		-	-				+
Western Spinebill						+	

	AREA	ISOLATION	GRAZED	TREE MIX	TREE AGE	SHRUB MIX	UNDER-STOREY
White-fronted Chat	-	+					-
Scarlet Robin							
Red-capped Robin		-					
Western Yellow Robin				+			+
White-browed Robin							+
Southern Scrub-robin							
White-browed Babbler							
Varied Sitella							
Crested Bellbird			-				+
Golden Whistler							+
Rufous Whistler		-					
Grey Shrike-thrush		-					
Restless Flycatcher							
Magpie-lark	-	+					
Grey Fantail		-			+		+
Willie Wagtail	-	+					
Black-faced Cuckoo-shrike							
Black-faced Woodswallow		+					
Dusky Woodswallow							
Grey Butcherbird							
Pied Butcherbird							
Australian Magpie							
Grey Currawong							
Australian Raven							
Richard's Pipit		+					
Zebra Finch							
Red-eared Firetail							
Tree Martin							
Silvereye							

## Results and comments - habitat choice analyses

**Area:** No species showed a positive relationship between the recording rate and area containing the site. This requires further examination.

**Isolation:** Initial analyses showed few differences. However, when *semi-isolated* and *not isolated* were combined, eight species (Table 8) showed a significant negative relationship with isolation (Red-capped Robin, Rufous Whistler, Grey Shrike-thrush, Grey Fantail, New Holland Honeyeater, Weebill, Western Warbler, Rufous Tree-creeper). These are birds of shrublands and woodlands. Six of them are status 3 species. The Grey Fantail and the New Holland Honeyeater are status 2.

A further 8 species showed the opposite effect - they were more common in isolated sites (Stubble Quail, Willie Wagtail, Magpie Lark, White-fronted Chat, Black-faced Woodswallow, Yellow-throated Miner, Nankeen Kestrel, White-faced Heron). These are birds that prefer open areas. Six are status 1 and the Nankeen Kestrel and White-faced Heron are status 3.

**Connection:** There were only two significant results with connection. The Galah was recorded more often in sites that were not connected; the Grey Butcherbird more often in sites that were connected.

No differences were found for the other 67 species, probably because of the way connection was defined on the site registration form (Appendix 1). Connectivity is difficult to measure, and is confounded by degree of isolation and patch size. This is an example of where multivariate analysis may tease out the various effects.

**Grazing:** For this analysis the categories *always* and *most of the time* and *seldom* were combined into the one category *grazed* and compared with *never*. Six species were seen more frequently in the *never grazed* (Crested Bellbird, White-naped Honeyeater, Weebill, Brown Honeyeater, Brown-headed Honeyeater and Striated Pardalote). These are all status 3 species. Only one species was seen more frequently in the *grazed*

(Nankeen Kestrel). All seven species of honeyeater in this analysis showed a tendency to frequent *never grazed* but not all were significant.

**Tree History:** Western Thornbills and Grey Fantails were seen more frequently in remnant vegetation; ravens and White-fronted Chats were seen more frequently on revegetated sites. For verges, Yellow-rumped Thornbill, Willie Wagtail and three species of honeyeater (Brown, New Holland and Singing Honeyeaters) were more often recorded in revegetated sites.

**Tree Type:** There was only one significant result - Australian Ravens were seen more frequently on non-native sites!

**Tree Species Mix:** For Rainbow Bee-eaters and Western Yellow Robins, there was a significant positive relationship with tree mix. This result is too meagre to comment on.

**Tree Age:** There were five positive relationships with older trees. These were White-tailed Black Cockatoos, Western Rosellas and Striated Pardalotes which all need older trees for nesting hollows. The other two were the Rainbow Bee-eater which can often be found perching on older trees in open woodland between feeding flights, and the Western Thornbill. Only the White-fronted Chat showed a negative relationship.

**Shrub Species Mix:** There was a positive relationship with number of dominant shrub species i.e. a preference for a mix of three or more shrub species as against one or two, for four species. These were the White-browed Scrubwren, Western Thornbill, Red Wattlebird and Red-capped Parrot, all shrubland/woodland birds. There were no negative relationships.

**Understorey:** Categories *none* and *sparse* were combined and compared with *present*. Eleven species were recorded more often in sites with an understorey. These were the Western Yellow Robin, White-breasted Robin, Golden Whistler, Crested Bellbird, Red-winged Fairy-wren, White-browed Scrubwren, Splendid Fairy-wren, Western Rosella, Grey Fantail, New Holland Honeyeater and Inland Thornbill. Verge data was available only for the last six species which,



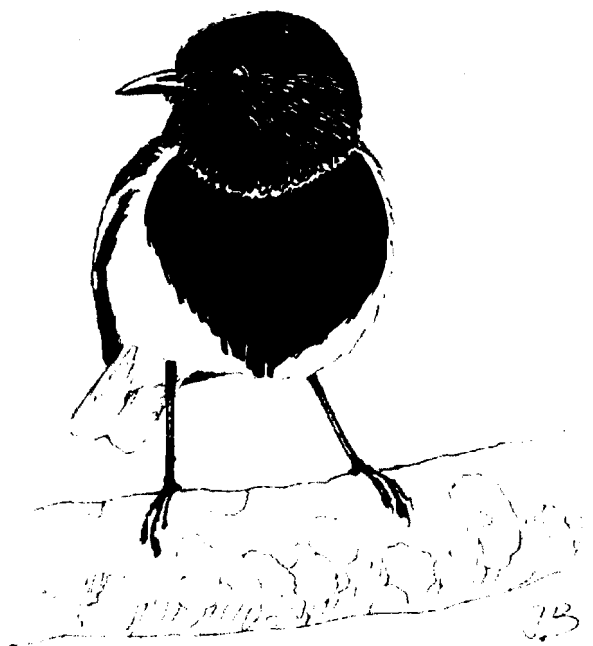
except for the Grey Fantail, showed the same significant relationship.

Six species, including three honeyeaters, were recorded more frequently on *never grazed* (woodland) sites with understorey. Of the six, only Crested Bellbirds and Brown Honeyeaters forage mainly in the ground and shrub layers. It may be that the other four (White-naped Honeyeater, Brown-headed Honeyeater, Weebill, Striated Pardalote) prefer woodland with understorey because the canopy there provides a more productive foraging substrate than woodland with no or little understorey.

\* Most of the species (14 of 18) that preferred the undisturbed types of habitat (e.g. not grazed, not isolated and so on) are in the conservation status 3 category.

\* The species-area relationship needs further examination, as a positive result might have been expected. Nevertheless, the fact that there were several significant negative relationships suggests that small sites are not without conservation value. (See also Table 4).

\*The recording rates for a number of species was positively related to the presence of understorey (both on farms and in verges). This finding has important implications when planning revegetation for species conservation.



Red-capped Robin

### 3.5 SEASONAL VARIATION IN BIRD NUMBERS IN VERGES

The overall count of individual birds in verges over the course of the survey shows remarkably small variation from season to season. The total count for each season has been adjusted according to the number of surveys per season.

summer	2962 (274 surveys)
autumn	3363 (280 surveys)
winter	3453 (301 surveys)
spring	3543 (292 surveys)

There is a variation of about 17% between highest (spring) and lowest (summer) (Figure 4).

Most individual bird species show a much greater variation between seasons.

FIGURE 4: TOTAL NUMBER OF BIRDS COUNTED IN VERGES, BY SEASON

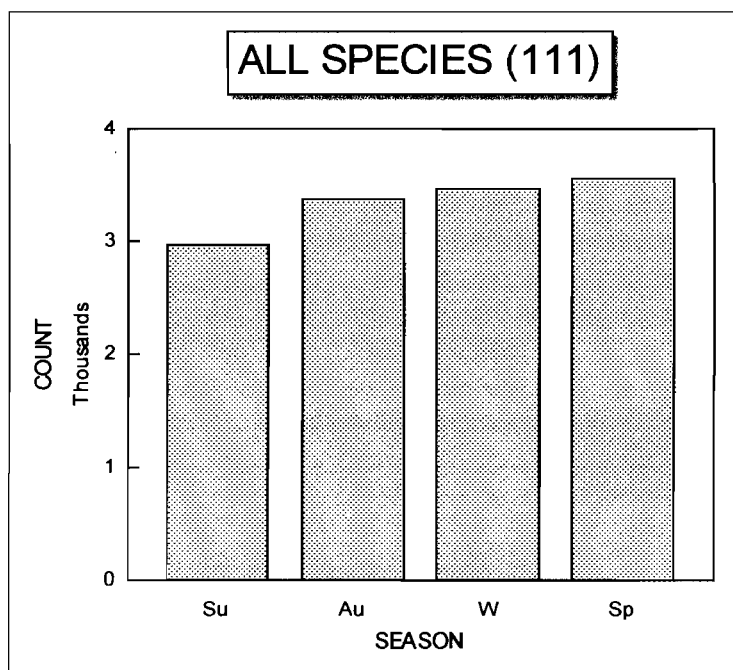


Figure 5 shows the seasonal count of individuals of seven widespread species. The count has been adjusted to eliminate the relatively small difference in the number of surveys in each season. (The adjustment was made by averaging the number of surveys, multiplying the average [287] by the total number of birds counted in a season, then dividing by the actual number of surveys for that season.)

With a survey such as this there could be some under-recording of species in the non-breeding season when they tend to call less. However as the highest numbers for several species occur out of the breeding season it can not be regarded as a serious problem.

It appears from these few examples that the pattern of seasonal use of the verges is different for each species.

Although there are two breeding records of Red-capped Robin in verges, it can be seen that their use of verges peaks in autumn. This is the same result as shown for this species by Newbey and Newbey (1987) and by Cale (1990). There is little doubt that the autumn peak is an indicator of dispersal.

The much higher number of Splendid Fairy-wrens recorded in summer may seem to suggest that this is the time that they disperse. Russell and

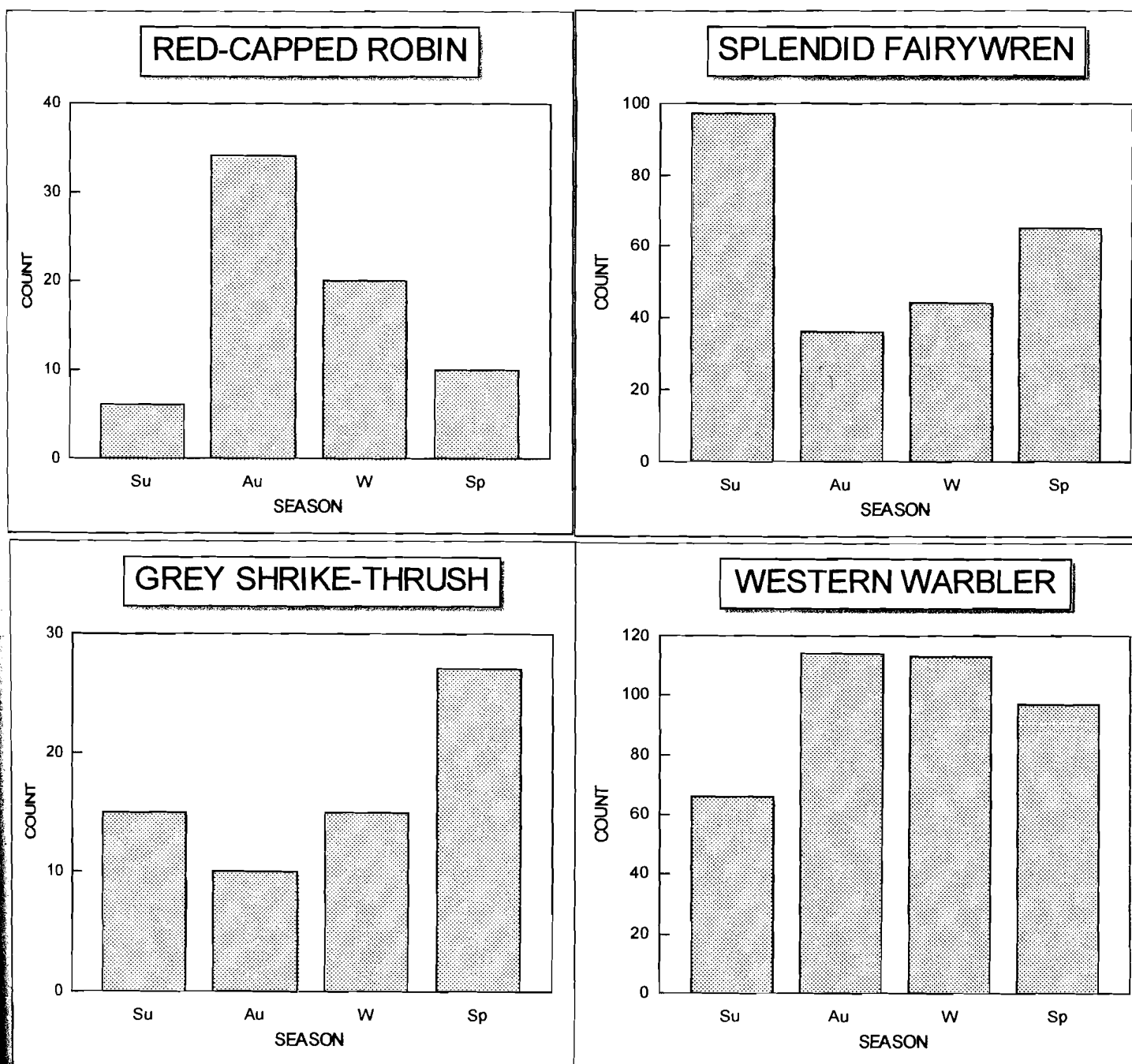
Rowley (1993) found that Splendid Fairy-wrens mostly disperse when they are six months old (autumn). In summer, after successful breeding, the numbers will have built up.

The Grey Shrike-thrush is quite able to live in suitable verges (Lynch *et al.* 1995). They found that Rufous Whistlers were less inclined to have their entire home range within a verge. Both these species peak in spring suggesting that they will breed in verges. Breeding of these species was not recorded in this survey. Newbey and Newbey (1987) recorded the Grey Shrike-thrush breeding in a verge.

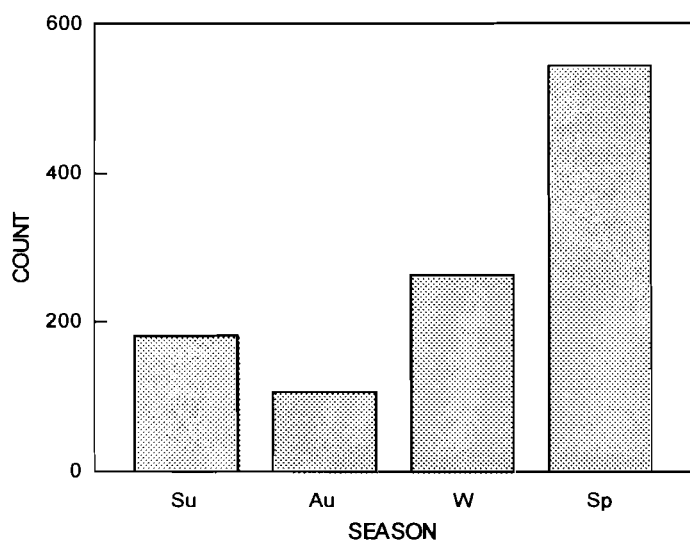
Autumn and winter counts for the Western Gerygone and the Grey Fantail were very similar, and higher than spring and summer counts. This is consistent with the statement by Lynch and Saunders (1991) that these species are non-breeding seasonal migrants in the wheatbelt. Both showed a substantial residual number in spring and summer and for each there were two breeding records.

Brown Honeyeaters were very frequently found in verges with a big peak in spring and breeding records in spring, winter and summer.

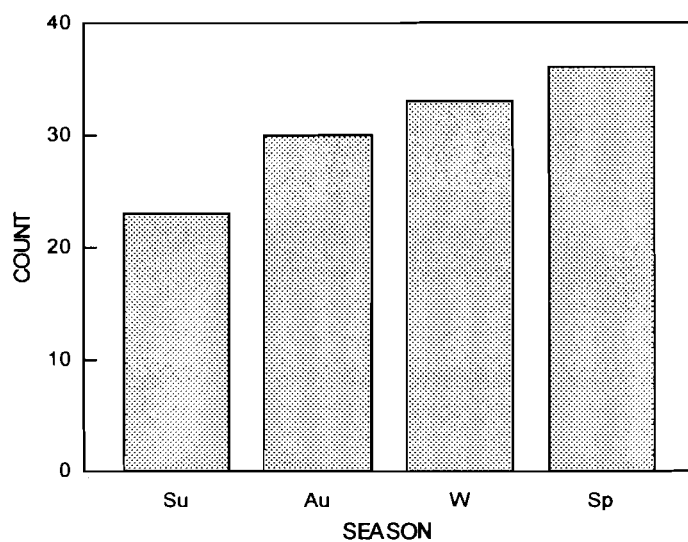
**FIGURE 5: TOTAL COUNT OF SOME SEPARATE BIRD SPECIES BY SEASON**



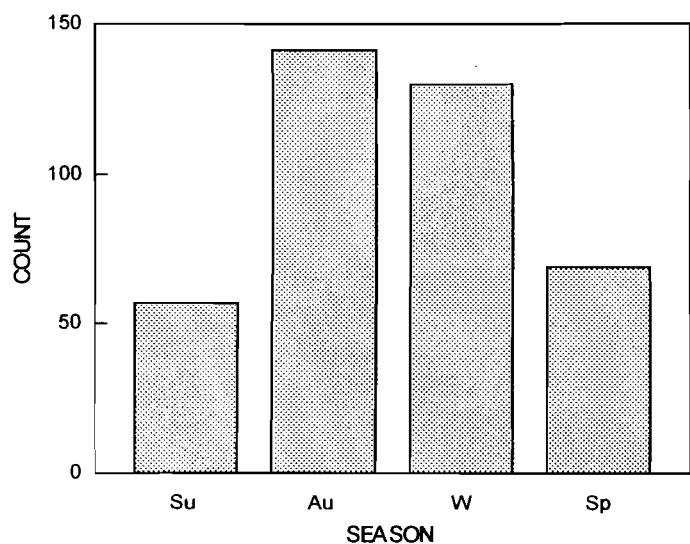
### BROWN HONEYEATER



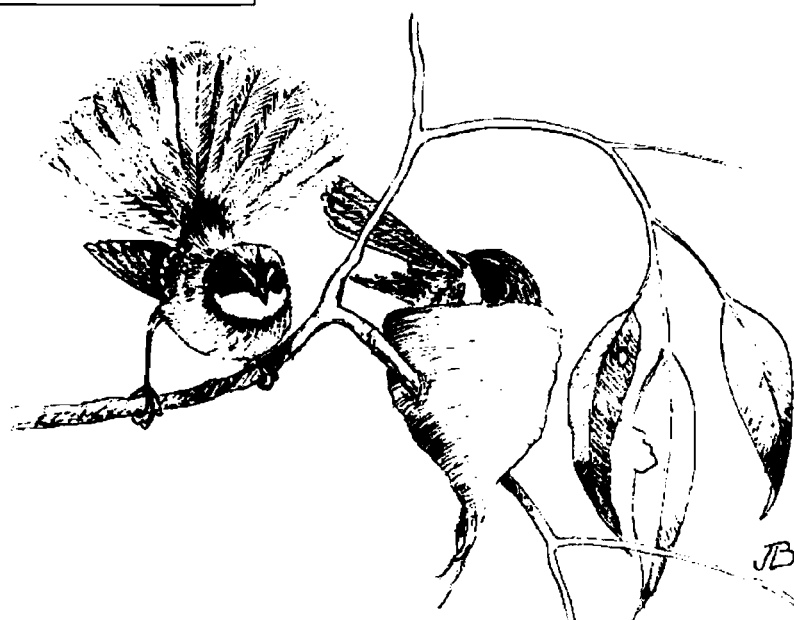
### RUFIOUS WHISTLER



### GREY FANTAIL



It would appear that verges provide a year round habitat for some of each of these species but that a form of time-sharing occurs concurrently with peak use varying from species to species.



Grey Fantail

### 3.6 COMPARISON OF BIRD DIVERSITY IN DIFFERENT REGIONS

Almost all of the farms included in this report were within the agricultural, fruit-growing and mixed farming areas of southern Western Australia, an area extending almost 1 000 km from north to south, with farms from the coast to 330 km inland (Figure 1).

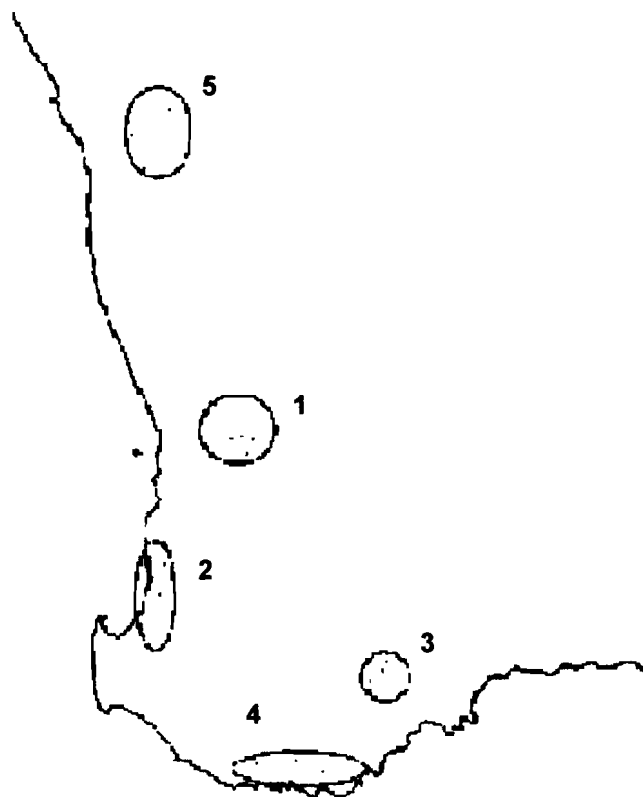
Factors such as annual rainfall and percentage of the land which has been cleared, type of farming, width and vegetation structure of road verges and distance from other extensive land uses, vary over this large area.

To look at the question of regional variation, five groups of five farms were selected. Each farm had been surveyed 6-8 times and each had a fifty ha. survey area. Only the fifty ha. survey areas were examined, including any 0.5 ha. sites that were within the fifty ha. site, but excluding any that were outside. The groups were:

- |    |                       |                 |            |
|----|-----------------------|-----------------|------------|
| 1. | Toodyay - York        | (Avon)          |            |
| 2. | Harvey - Capel        | (Coastal Plain) |            |
| 3. | Ongerup - Borden      | (SE Wheatbelt)  |            |
| 4. | Denmark - Nanarup     | (South Coast)   |            |
| 5. | Three Springs - Canna | (NE Wheatbelt)  | (Figure 6) |

**FIGURE 6: LOCATION OF REGIONS COMPARED FOR BIRD DIVERSITY**

1=Avon, 2=Coastal Plain, 3=SE Wheatbelt,  
4=South Coast, 5=NE Wheatbelt



**Avon:** The Toodyay - York area was settled and cleared early in Western Australia's colonial history. By 1850 it was the centre of sheep, hay and grainfarming in Western Australia (Anon. 1979). Little land was reserved and even road verges were typically very narrow with a narrow strip of remnant vegetation. Most of the understorey in the road reserves has long since gone, replaced with wild oats. Now this area is on the western edge of the wheatbelt with farms to the west specializing in grazing.

**Coastal Plain:** The Harvey - Capel area has been farmed since 1850. The area has a mix of fair and poor soils; much is rocky and suited only to clearing of shrubs and grazing mostly of cattle under the remaining trees. On the better soils and often with irrigation, vegetable and fodder crops for dairy cattle are grown. Around Capel are extensive mineral sands mining ventures. Road verges are often narrow. Adjacent to this region are substantial belts of forest.

**SE Wheatbelt:** This area was partly cleared by 1919, but much more extensively in the fifties and sixties. Many of the road verges are quite wide often with the road running along one side so that effectively the width of the ensuing corridor is maximized.

**South Coast:** Much of the land was cleared from the twenties to the fifties and local species such as the Western Ground Parrot and the Western Bristlebird became very rare mainly as a result of the frequent burning for grazing even prior to that. However nearby timber and coastal reserves have enabled many species to persist in the area.

**NE Wheatbelt :** This region almost crosses the wheatbelt from east to west. Agriculture became established in some of this area by 1919 and has extended since (Anon. 1979). However, rainfall has limited extension to the north and east of Canna which is not far from the less cleared pastoral country. There is a wide remnant running through much of the region in the form of a railway reserve in part extended in width by being adjacent to a road. Here ranges of bird species that thrive in arid country and those that prefer more temperate conditions meet and overlap. Consequently there is a large pool of species available.

Results are listed in Table 9 below with the breakdown in status categories and an approximation of average annual rainfall. Waterbirds are separated from bushbirds.

**TABLE 9: REGIONAL VARIATION IN BIRD SPECIES NUMBERS**

REGION		NO. OF BIRD SPECIES	STATUS category 1	STATUS category 2	STATUS category 3	Average annual rainfall (mm)
Avon	Waterbirds	14	4	6	4	500
	Bushbirds	64	20	9	35	
Coastal Plain	Waterbirds	22	5	10	7	900
	Bushbirds	69	16	10	43	
South Coast	Waterbirds	24	8	10	6	1 000
	Bushbirds	69	13	10	46	
SE Wheatbelt	Waterbirds	8	2	3	3	400
	Bushbirds	76	18	12	46	
NE Wheat-belt	Waterbirds	10	3	3	4	350
	Bushbirds	89	21	20	48	

It appears that the number of waterbird species correlates quite closely with the rainfall i.e. the more water about, the more waterbird species are to be found.

Bushbirds present a different picture. There is a considerable difference between the highest and lowest in all status groups. The NE Wheatbelt scores highest overall and in all groups. Avon is a close second to highest in status 1, those species favoured by farming, but lowest in the other two categories being very much the lowest in status 3. It is species from status 3 that are at most risk from being lost from a farming district. In Avon, the reasons are historical (early clearing with little attention paid to conservation) and being surrounded by other highly cleared areas.

Of course some of the species not recorded in

farm sites are still present in the district and on some of the farms but the survey gives an indication of the relative abundance of a species.

There are other highly fragmented and long cleared regions within the wheatbelt e.g. the Kellerberrin area. Those far from the edge of the farm-cleared land are most vulnerable to loss of bird species.

Factors such as railway and other reserves and even salt lake systems have enabled a wider range of bird species, especially those of status 3, to remain in some districts than would have otherwise been possible. It is essential for their continued survival that they are able to move between the remaining fragments of suitable habitat.

### 3.7 SCARCE BIRDS

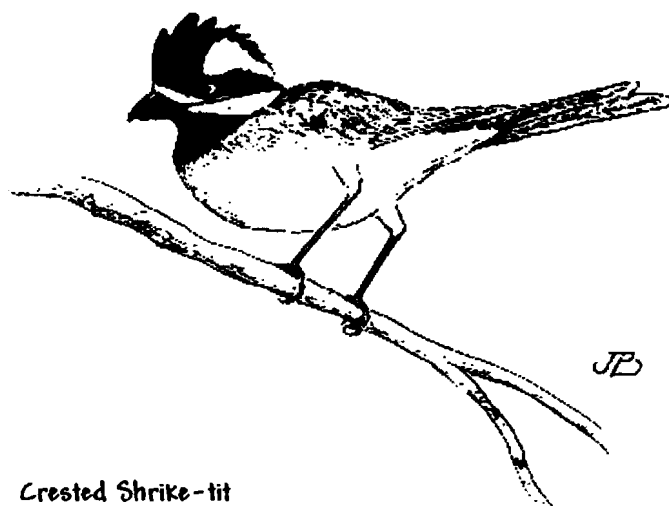
From 1985 to 1989 a detailed study of birds in a fragmented landscape was made in the Kellerberrin district (Saunders and de Rebeira 1991). Birds found to be vulnerable were those resident (not migrant or vagrant) species that are dependent on remnant vegetation. By studying past records it was found that fifteen species had become extinct as breeding species in the Kellerberrin, Cunderdin, Wyalkatchem area in the eighty years since clearing began, some within only the last ten years. A further nine species had become very scarce in the area and Saunders and de Rebeira predicted that these species had a bleak future in the district and other highly fragmented districts like it.

Two of those species found to be extinct as breeding species in the Kellerberrin district (Ground Cuckoo-shrike and Crested Shrike-tit) were not recorded at all in the Birds on Farms surveys in Western Australia. The former may never have been a breeding species in the farming areas of southern Western Australia (more of a winter visitor). The Crested Shrike-tit is probably sedentary and lives in eucalypt woodland where it feeds by tearing bark from trees to search for invertebrates - very much a native vegetation dependent bird.

Five of the fifteen species that have gone from Kellerberrin as breeding species, were recorded on less than nine farms and in no verges (Emu, Malleefowl, Hooded Robin, Chestnut Quail-thrush, Gilbert's Whistler).

The Kellerberrin study (Saunders and de Rebeira 1991) also listed eight species that were considered locally scarce and threatened. Four of these (Shy Heathwren, Rufous Field-wren, Redthroat, Southern Scrub-robin) were recorded on less than nine farms during the Birds on Farms surveys.

It could be predicted that species that were present in fewer than 18 half-hectare sites, that is too few records to analyse meaningfully (as in section 3.4), would be more likely to be found in remnant sites. They would also be less likely to occur in the verge sites. These are the species that it will be difficult to attract to a farm or which once lost may not return. The above four species were not recorded in verges. Neither were they recorded in revegetation sites. The Southern



Crested Shrike-tit

Scrub-robin was in three remnant sites, and the Shy Heath-wren, Rufous Fieldwren and Redthroat in one each.

Many birds as individuals have a long lifespan so even if there is little reproductive success it may take several years before a decline becomes evident. It has been found that many woodland species are declining in areas where habitat still remains. If a small population remains in a remnant it can often last for twenty to thirty years (Traill 1999). So species can continue to be lost locally even twenty or thirty years after most clearing has occurred. If fragmentation is too great there will be no chance of repopulation.

Extinction time lag after major and extensive environmental alteration has been documented in other parts of the world e.g. the Atlantic forests of South America (Brooks *et al.* 1999). These forests have been fragmented over several centuries but accelerating rapidly this century. Although there is not one known extinction of a bird species, the mathematical models tested point conservatively to a loss of 21 species or one sixth of the total avifauna for the region within the next century. This seems to be assuming no further habitat fragmentation.

Australia has lost only one species of bird to date - the Paradise Parrot from Queensland. Recher (1999) states that restoration of functional ecosystems with an emphasis on native vegetation to 30% of the landscape is one of the measures essential to stem the march to otherwise inevitable extinction of many more species. He

predicts that without this and other actions such as feral animal control, Australia will lose half its terrestrial bird species in the next century.

In Western Australia the Noisy Scrub-bird came very near to extinction but with nearly forty years of special effort it now seems in a much more secure state. The species now closest to extinction in southern Western Australia is the Western Australian subspecies of the Ground Parrot. It is now restricted to a few localities along the south coast. It is very dependent on native mallee heath vegetation and has never been found living on a farm.

As pointed out by Lynch and Saunders (1991), the regional demise of some species in farming areas is entirely due to effects of clearing and fragmentation of habitat. Many species now scarce in the wheatbelt are still thriving in the woodlands of the goldfields.

However local extinction should be taken as a warning of a species' vulnerability.

### 3.8 COMMON BIRDS

Just as the native vegetation dependent species have declined, other species have multiplied. It is not surprising that grain and fruit eating species and carrion feeders that also are prepared to fly across wide open spaces have benefitted by the introduction of farming. As seen in section 3.1 (most frequently recorded bird species), the num-

ber of Australian Ringnecks counted far exceeds that of any of the other common widespread species. Some species are locally common e.g. corellas at Coorow and Carnamah.

### 3.9 BREEDING

The emphasis on breeding records in the Birds on Farms Project was minor. As observation was timed there was insufficient time within the survey period to search for nests or allow the birds to show them. Time was limiting for the 0.5 ha. sites which were surveyed in only twenty minutes. Fifty hectare sites were surveyed in three hours which made nest searching even more problematical. Nevertheless, a number of breeding records were obtained.

#### Breeding records in Main Roads verge sites

In Main Roads verge sites, a total of twenty-three species were recorded as breeding. There were no autumn breeding records.

Verge width refers to the width of the patch of vegetation that comprises the verge. Plantings do not exceed fifty metres wide; wider sites are invariably remnant, not revegetation. In the road verge sites, tree history is either remnant or revegetation. Tree history is not always only one or the other, and may be up to 40% of the other category.

All verge breeding records are shown below.

**TABLE 10: BREEDING RECORDS FROM MAIN ROADS VERGE SITES**

V.W. = verge width; U = understorey; T.H. = tree history; remn. = remnant; reveg. = revegetation

BREEDING BIRD SPECIES Status ( )	SPRING			SUMMER			WINTER		
	V.W.	U	T.H.	V.W.	U	T.H.	V.W.	U	TH.
Laughing Turtledove (1)	40	some	reveg.	-	-	-	-	-	-
Australian Ringneck (1)	28	some	remn.	-	-	-	-	-	-
Elegant Parrot (1)	27	yes	reveg.	-	-	-	-	-	-
Striated Pardalote (3)	35	yes	reveg.	-	-	-	-	-	-
	251	no	remn.						
White-browed Scrubwren (3)	25	yes	reveg.	-	-	-	-	-	-
Weebill (3)	40	some	reveg.	-	-	-	-	-	-
Western Gerygone (3)	18	yes	remn.	-	-	-	-	-	-
	20	yes	reveg.						
Inland Thornbill (3)	35	yes	reveg.	-	-	-	-	-	-
	20	some	reveg.						
Yellow-rumped Thornbill (3)	-	-	-	-	-	-	28	some	reveg.
	-	-	-				28	yes	remn.
Red Wattlebird (3)	30	yes	reveg.	-	-	-	-	-	-
	25	yes	reveg.						



BREEDING BIRD SPECIES Status ( )	SPRING			SUMMER			WINTER		
White-naped Honeyeater (3)	-	-	-	24	yes	reveg.	-	-	-
Singing Honeyeater (1)	35	yes	reveg.	-	-	-	-	-	-
Brown Honeyeater (3)	30	yes	reveg.	24	yes	reveg.	100 15	yes some	remn. reveg.
Red-capped Robin (3)	50 150	some no	reveg. remn.	-	-	-	-	-	-
Golden Whistler (3)	-	-	-	21	yes	reveg.	-	-	-
Magpie-lark (1)	12 30	no yes	reveg. reveg.	-	-	-	-	-	-
Grey Butcherbird (3)	-	-	-	15	some	reveg.	-	-	-
Grey Fantail (2)	-	-	-	14 15	yes some	reveg. other	-	-	-
Willie Wagtail (1)	17 40	some some	reveg. reveg.	-	-	-	-	-	-
Australian Raven (1)	40	some	remn.	25	some	reveg.	-	-	-
Welcome Swallow (1)	16	yes	reveg.	-	-	-	-	-	-
Tree Martin (3)	18	some	reveg.	28 301	some yes	remn. remn.	-	-	-
Silvereye (3)	301 25	some yes	remn. reveg.	-	-	-	-	-	-

Of the twenty-three species recorded as breeding, eight were status 1, one was status 2 and fourteen were status 3. Eighteen species bred in spring, six in summer and three in winter. Twenty-two of the species recorded as breeding were in predominantly revegetated sites, and nine in predominantly remnant sites. In eight species, breeding was recorded in both remnant and revegetated sites. Verge widths varied from 12 metres to over 300 metres. (The latter is in instances where a remnant block is adjacent to the road.) With the exception of one Red-capped Robin, all breeding records of status 3 bird species occurred where there was a sparse or better understorey.

Most breeding activity was noted in revegetation sites. Road verge revegetation sites frequently have a remnant component. A closer look at the status 3 breeding records showed that only four of the fourteen records were in 100% revegetation sites. Ten were in sites with a mix of revegetation from 60 -95% with a corresponding mix of remnant (40 - 5%). The Tree Martin record was in a 100% revegetation site with a line of very old trees on the opposite verge (where the nests could have been); a Red Wattlebird (fledgling) and a Brown Honeyeater (nest) were in 100% revegetation sites planted about twenty years ago and the Grey Butcherbird record (fledglings) was in younger vegetation.

### Breeding records on farms

Within the 0.5 ha. farm sites (which are the same site-size used for the road verges) fifty-eight species were recorded breeding. There were thirty-nine records of status 1 species, eighteen of status 2 species, and fifty-six of status 3 species.

Table 11 lists the species breeding in the 0.5 ha. sites on farms.

Where possible tree history is indicated, as is the average age of the trees in the site. As for most of this report, remnant and regeneration are combined. Some breeding record entries do not show this information as not all observers completed their registration forms. Also if there were no trees in the site, the average age was not marked.

Only where a different species is involved would a record with blank tree history and age be listed.

Note that the table **does not** show all breeding records but is rather a list of the diversity of breeding species. Records that are the same with regard to tree history or average age are not repeated.

**TABLE 11: BREEDING BIRD SPECIES ON FARMS SHOWING RANGE OF TREE HISTORY AND TREE AGE (sorted by status)**

reve = revegetation; remn = remnant

BREEDING SPECIES	TREE HISTORY		AV. AGE
STATUS 1	reve	remn	years
Australian Magpie		x	75
Australian Magpie-lark	-	-	75
Australian Magpie-lark	x		15
Australian Magpie-lark		x	35
Australian Raven	-	-	7.5
Australian Ringneck	-	-	15
Australian Ringneck		x	35
Australian Ringneck		x	75
Australian Shelduck	-	-	7.5
Black-faced Woodswallow		x	-
Black-shouldered Kite		x	4
Galah		x	35
Galah		x	75
Maned Duck		x	-
Richard's Pipit	x		35
Singing Honeyeater	x		7.5
Stubble Quail	-	-	7.5
Welcome Swallow	-	-	-
White-backed Swallow		x	75
White-fronted Chat	-	-	7.5
White-fronted Chat	-	-	35
White-fronted Chat		x	75
Willie Wagtail	-	-	75
Willie Wagtail	x		7.5
Willie Wagtail	x		15
Willie Wagtail		x	4
Zebra Finch	x		15
TOTAL 17 species	6	12	

STATUS 2	reve	remn	years
Australasian Grebe		x	35
Black-faced Cuckoo-shrike	-	-	75
Black-faced Cuckoo-shrike		x	120
Brown Songlark	-	-	-
Eurasian Coot	-	-	-
Grey Fantail		x	-
Grey Teal		x	120
New Holland Honeyeater	-	-	75
New Holland Honeyeater		x	35
Rainbow Bee-eater	-	-	-
Red-tailed Black-Cockatoo		x	120
Western Thornbill	-	-	-
White-winged Fairy-wren	x		2.5
White-winged Fairy-wren		x	75
TOTAL 11 species	1	7	

BREEDING SPECIES	TREE HISTORY		AV. AGE
STATUS 3			
Nankeen Kestrel		x	35
Black-fronted Plover	-	-	35
Brown Goshawk	-	-	35
Brown Goshawk		x	75
Brown Honeyeater	-	-	15
Brown Honeyeater		x	-
Dusky Woodswallow		x	75
Grey Butcherbird	-	-	75
Inland Thornbill	x		7.5
Inland Thornbill		x	-
Mistletoebird		x	-
Pacific Black Duck		x	75
Red Wattlebird	x		7.5
Red Wattlebird		x	75
Red-capped Parrot	x		7.5
Red-capped Parrot		x	35
Red-capped Robin		x	120
Redthroat		x	75
Sacred Kingfisher		x	35
Scarlet Robin		x	-
Silvereye	-	-	35
Silvereye		x	-
Splendid Fairy-wren		x	7.5
Splendid Fairy-wren		x	75
Striated Pardalote		x	-
Tawny Frogmouth		x	-
Tree Martin		x	35
Tree Martin		x	75
Varied Sittella		x	75
Variegated Fairy-wren	-	-	15
Weebill		x	-
Western Gerygone	x		7.5
Western Gerygone		x	15
Western Gerygone		x	75
Western Rosella	-	-	75
Western Spinebill		x	-
White-browed Babbler		x	-
White-browed Scrubwren	-	-	75
White-browed Scrubwren		x	35
White-faced Heron		x	-
White-naped Honeyeater		x	7.5
Yellow-rumped Thornbill		x	35
Yellow-rumped Thornbill		x	75
TOTAL 31 species	4	31	
COMBINED TOTAL 59 species	11	50	

As breeding records include dependent young, the table does not always show where the nest was. However the fledgling stage of breeding is also a vital part of the bird's life cycle.

Table 11 shows that most breeding sites found on farms were in remnants. Of the thirty-one status 3 (more vulnerable) species only four had a breeding record in a revegetation site and all of these were also recorded breeding in remnant sites as well.

It should be noted that there were approximately 3.3 times as many remnant 0.5 ha. sites on farms as revegetation sites. When the revegetation breeding records of status 1 species are multiplied by 3.3, the result is 165% of the remnant total. The same procedure for status 3 species gives a result of 43%. This seems to indicate that while status 1 species are more likely to be found breeding in revegetation, status 3 species are more likely to be found breeding in remnants. However the sample numbers are low and breeding records were not a priority.

The status 3 bird species were recorded as breeding only in vegetation with trees aged 7.5 years or more, with the average of 75 years being most common.

This does suggest that status 3 birds prefer older remnant vegetation for nesting.

### **Additional breeding records on farms in southern Western Australia**

The following records were in fifty hectare sites, but not within 0.5 ha. sites.

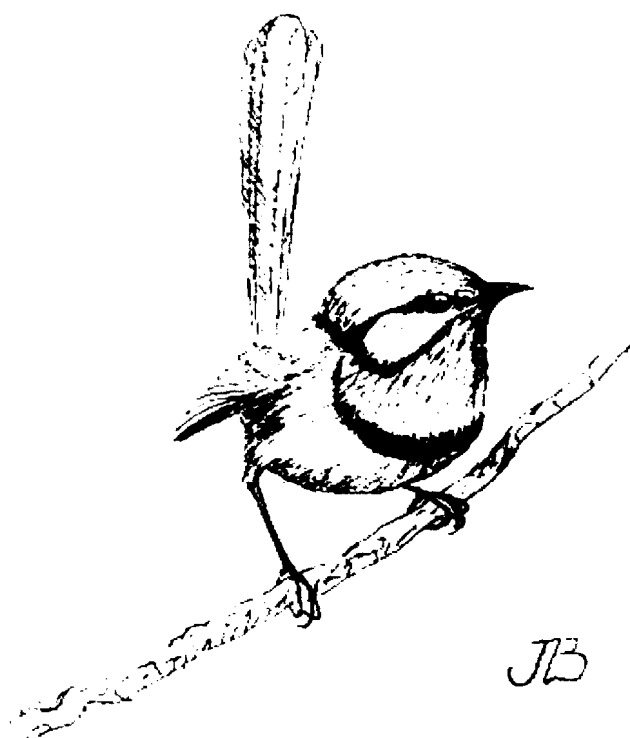
Status 1 (7 species): Crested Pigeon, Elegant Parrot, Laughing Kookaburra, Mulga Parrot, Sacred Ibis, Straw-necked Ibis, Yellow-throated Miner.

Status 2 (7 species): Chestnut Teal, Hoary-headed Grebe, Pallid Cuckoo, Pink-eared Duck, Red-capped Plover, Wedge-tailed Eagle, White-plumed Honeyeater.

Status 3 (12 species): Black Swan, Chestnut-rumped Thornbill, Common Bronzewing, Jacky Winter, Malleefowl, Purple Swamphen, Tawny-crowned Honeyeater, Western Yellow Robin, Whistling Kite, White-cheeked Honeyeater, White-tailed Black-Cockatoo, White-

winged Triller.

Splendid Fairy-wren



### **3.10 INDICATOR BIRDS**

Much has been written about the loss of bird species due to the needs of farming and the ravages of feral mammals. In recent years, planting of trees and shrubs has become a widespread part of farm practice. One of the goals is to add to the biodiversity of the farm or the catchment area so that it offers more resilience to the many physical and biological problems that occur. Monitoring is recommended.

The Birds on Farms Project had farm participation from a large part of southern Western Australian farmlands with an average of almost seven surveys per farm. The road verge surveys covered a lesser area but were nevertheless widespread and averaged seven surveys per site (Figure 1). From the results of all the surveys, a broad-scale picture can be seen.

It is well understood that some bird species have thrived on the farm situation and these have increased in numbers and or range following the land being opened up for farming (status 1 species). Many of them are the species that will fly across many hundreds of metres of open paddock.

Some species (status 2) appear to be unaffected

by the clearing: their numbers and range are in some cases more influenced by rainfall events or drought, or the farming areas were never a major part of their range. A few species are placed in status 2 due to lack of information.

Of particular interest when seeking bird species that will be useful for monitoring success in bringing birds back into the farm environment are the status 3 species i.e. those that have declined in numbers and/or range because of clearing for farming and subsequent changes.

### **Requirements for indicator birds**

Indicator birds (species useful for quick monitoring) should be fairly easily located and identified. They should indicate that the area is offering something for birds that will not be found on the typical broad-acre farm of the eighties i.e. they will be species that will require some understorey, and perhaps litter to forage in. On the other hand they should be species that do hang on quite well in disturbed situations and/or disperse effectively so as to locate areas that are suitable for them in a fragmented environment. They should be resident species, available for checking throughout the year.

### **What do they indicate?**

If they are present and are known to have been present all along, then they indicate that some of the less successful survivors of the farm habitat may also still be present.

If they have been present but are now gone they indicate that several other species of birds and other plants and animals have also gone.

If they return (and stay) after an absence it indicates an improvement in the habitat quality. A return for only part of the year on a regular basis could also be interpreted as a positive sign of habitat improvement.

Some species (especially ground dwellers) indicate low levels of cat or fox predation while their decline may indicate the need for predator control measures.

### **Determining indicator birds**

A selection of twenty-eight status 3 passerines was made including only those that are

widespread through the survey area i.e. their range includes at least 90% of that area. References to determine the range were Saunders and Ingram (1995), and Blakers *et al.* (1984). For these publications the survey period was 1987 - 1990 and 1978 - 1981 respectively.

Figure 7 shows the number of farm and verge sites in which the species were recorded, converted to percentages. The tendency for higher percentages in farm sites is because most farms had a fifty hectare site of diverse habitat surveyed for three hours at a time. The verge sites were all fairly uniform and less diverse as a whole, and were surveyed for only twenty minutes each season.

Juxtaposing the farm and verge results does give a unique picture of species distribution throughout the survey area. Finding species in verge sites gives an indication that they are likely to move through the landscape in verges.

### **What the graph reveals**

One way of looking at it is to divide the selected status 3 species into three groups: those that are to be expected on most farms and make much use of verges - common (C); those in the mid-range that are less adapted to farm or verge (M); and those that are scarce both on farms and in verges (S). It is from the M group that the birds for monitoring would best be selected though some from group S are also useful.

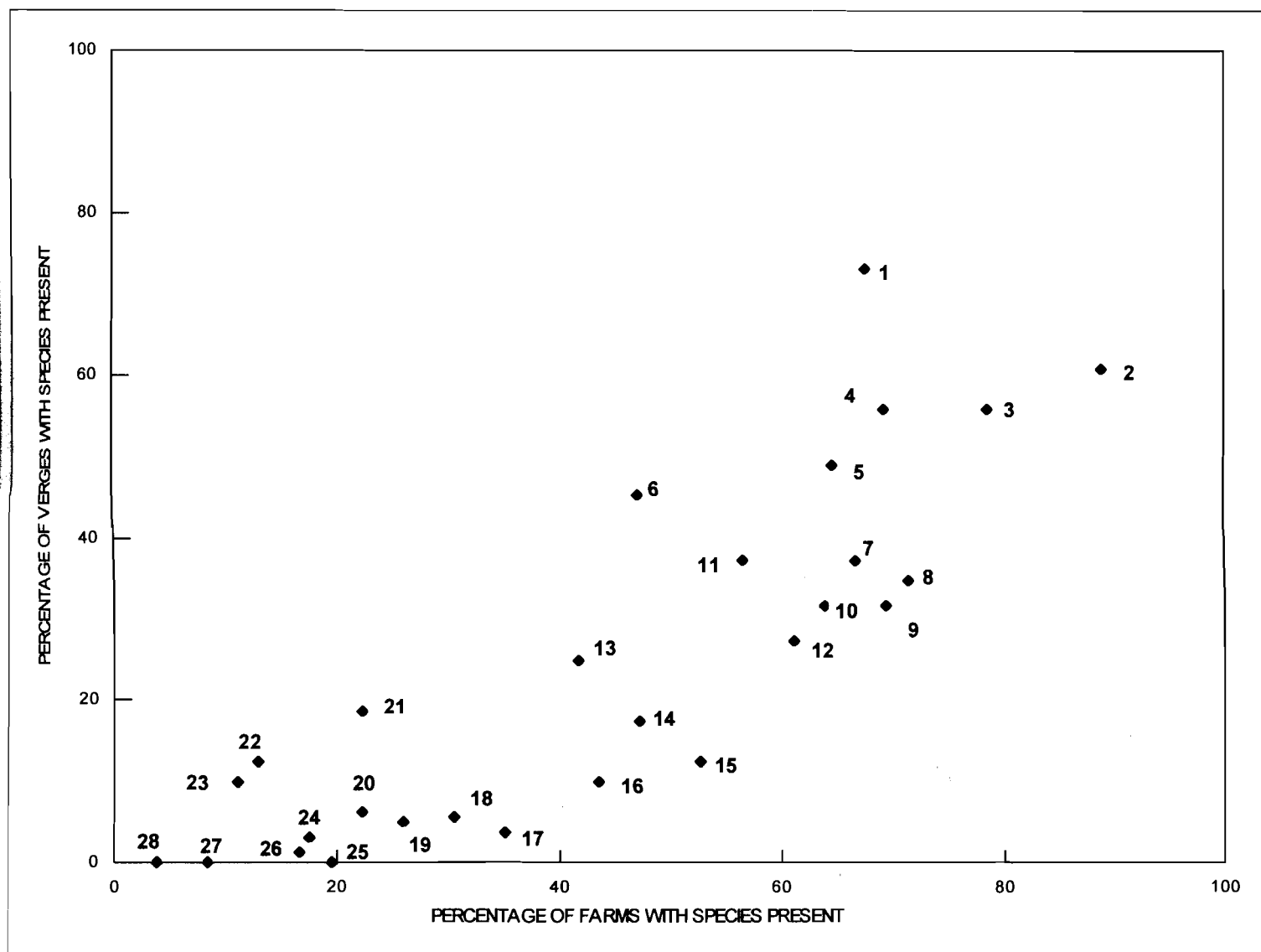
**Group C:** Brown Honeyeater, Yellow-rumped Thornbill, Red Wattlebird, Western Gerygone, Silveryeye, Weebill, Tree Martin, Striated Pardalote. Six or more from this group could be expected on **any** farm over the course of a year.

The Brown Honeyeater appears to seek out road verges especially in spring. The Weebill with its size (Australia's smallest bird) and the almost-as-small Striated Pardalote with their canopy habit were possibly under-recorded on farms.

**Group M:** Rufous Whistler, Splendid Fairy-wren, Inland Thornbill, Grey Shrike-thrush, White-browed Scrubwren, Red-capped Robin, Grey Butcherbird, Golden Whistler.

Birds in this group are more inclined to be resident in suitable habitat than almost all (except Yellow-rumped Thornbill) of group C. Conse-

**FIGURE 7: WIDESPREAD STATUS 3 PASSERINES - PRESENCE IN FARM AND VERGE SITES**



**KEY**

- |                             |                              |                               |
|-----------------------------|------------------------------|-------------------------------|
| 1 = Brown Honeyeater        | 11 = Inland Thornbill        | 21 = Brown-headed Honeyeater  |
| 2 = Yellow-rumped Thornbill | 12 = Grey Shrike-thrush      | 22 = White-cheeked Honeyeater |
| 3 = Red Wattlebird          | 13 = White-browed Scrub-wren | 23 = Mistletoebird            |
| 4 = Western Gerygone        | 14 = Red-capped Robin        | 24 = Spotted Pardalote        |
| 5 = Silvereye               | 15 = Grey Butcherbird        | 25 = Restless Flycatcher      |
| 6 = Weebill                 | 16 = Golden Whistler         | 26 = Jacky Winter             |
| 7 = Striated Pardalote      | 17 = Western Yellow Robin    | 27 = Tawny-crowned Honeyeater |
| 8 = Tree Martin             | 18 = Dusky Woodswallow       | 28 = Hooded Robin             |
| 9 = Rufous Whistler         | 19 = Varied Sittella         |                               |
| 10 = Splendid Fairy-wren    | 20 = Grey Currawong          |                               |

quently they need better quality habitat e.g. more cover, a greater range of plant species, a greater age-range of vegetation. The smaller ground feeding (robins and wrens) or low nesting (wrens) species are very susceptible to cats and foxes. Any of group M can be used for monitoring.

The Inland Thornbill and White-browed Scrubwren are small and inconspicuous (though often noisy). Though also small, the Splendid Fairy-wren and Red-capped Robin are colourful and operate at human eye level and often out in the open. The whistlers are a little larger, not especially fast moving and the males are colourful. Both males and females call quite loudly and distinctively. The shrike-thrush is even larger and although often hidden amongst the vegetation it has loud calls. The Grey Butcherbird is inclined to choose an obvious perch and both looks and sounds distinctive.

**Group S:** Western Yellow Robin, Dusky Woodswallow, Varied Sittella, Grey Currawong, Restless Flycatcher, Spotted Pardalote, Jacky Winter, Tawny-crowned Honeyeater, Hooded

Robin, Mistletoebird, White-cheeked Honeyeater, Brown-headed Honeyeater.

In some districts some of these species are still common while in others they are very rarely if ever seen. The Western Yellow Robin, Dusky Woodswallow and Grey Currawong could all be considered as good indicator birds. However, if these are present, some of the group M birds should also be present.

Other species with a more limited distribution (85% of the study area) but which are also conspicuous and recorded on farms and verges can be used for monitoring. These are the Scarlet Robin (which is more likely than the Red-capped Robin in some south west areas), and the White-browed Babbler. The Scarlet Robin would fit on the graph near the Golden Whistler, the babbler near the Western Yellow Robin. In some districts, another species of fairy-wren is more likely than the Splendid Fairy-wren. Either the Blue-breasted or the Variegated Fairy-wren could be useful indicator species.



Scarlet Robin

### 3.11 CASE STUDIES

Below is a closer look at three of the farms that participated in the survey. All had 50 ha. survey sites with some 0.5 ha. sites within.

#### FARM 1: 6 km NW of Ongerup (Figure 8)

Landuse within 50 ha. site: Sheep 50%; wheat, barley, conservation - equal parts of the remaining 50%. The dominant landuse in the district is cereal production.

Survey period: 1996 -1998

Rainfall over last three years (up to 1996): Below average.

Trees in survey area: Dense and scattered trees to a density of 10 - 30%; trees native and local, mostly under 10m high, with a mix of six species of eucalypt (*Eucalyptus annulata*, *E. astringens*, *E. flocktoniae*, *E. gardneri*, *E. platypus*, *E. spathulata*) and a mix of very old and very young trees.

Dead trees are left standing and litter from trees left where it falls.

Corridors (fenced) are between vegetation patches. Corridors planted 1996.

Number of bird species recorded during the survey: 43 (17 status 1, 6 status 2, 20 status 3)

Figure 9 shows the fifty hectare site and the 0.5 ha. sites.

Site 1 (6 ha. remnant with sparse understorey) had 25 bird species.

Site 2 (2ha. remnant with no understorey) had 22 species.

Site 3 (5 - 10 year-old revegetated salt patch with understorey) 17 species.

Both remnant sites were fenced shortly before the Birds on Farms survey began.

#### Indicator birds (as described in section 3.10)

Five of the eight species common (group C) on farms were recorded and five of group M. Two of the suggested indicator birds (from group

M) were recorded in all seasons: Grey Butcher-bird and the less conspicuous Inland Thornbill. The White-browed Babbler (a suitable indicator bird in its range) was also present in all seasons. As these birds have always been present on this farm they indicate that some of the more susceptible species from group S may still be present on this farm. They are.

The Grey Currawong was present in all seasons and the Restless Flycatcher in autumn and winter. The Restless Flycatcher is among fifteen species found to be extinct as breeding species in the Kellerberrin district during an extensive survey from 1985 to 1989 (Saunders & de Rebeira, 1991). The Grey Shrike-thrush was recorded in two successive springs. It now appears to be resident on the farm with two birds present. They move between patches of now-fenced remnant vegetation and are often in the houseyard which includes an arboretum of native local and non-local plants (Stephen Newbey, personal comment). The Grey Shrike-thrush was not present on the farm between 1978 and 1988 but was resident and breeding in an adjacent road reserve in which a year long survey was conducted (Newbey and Newbey 1987).

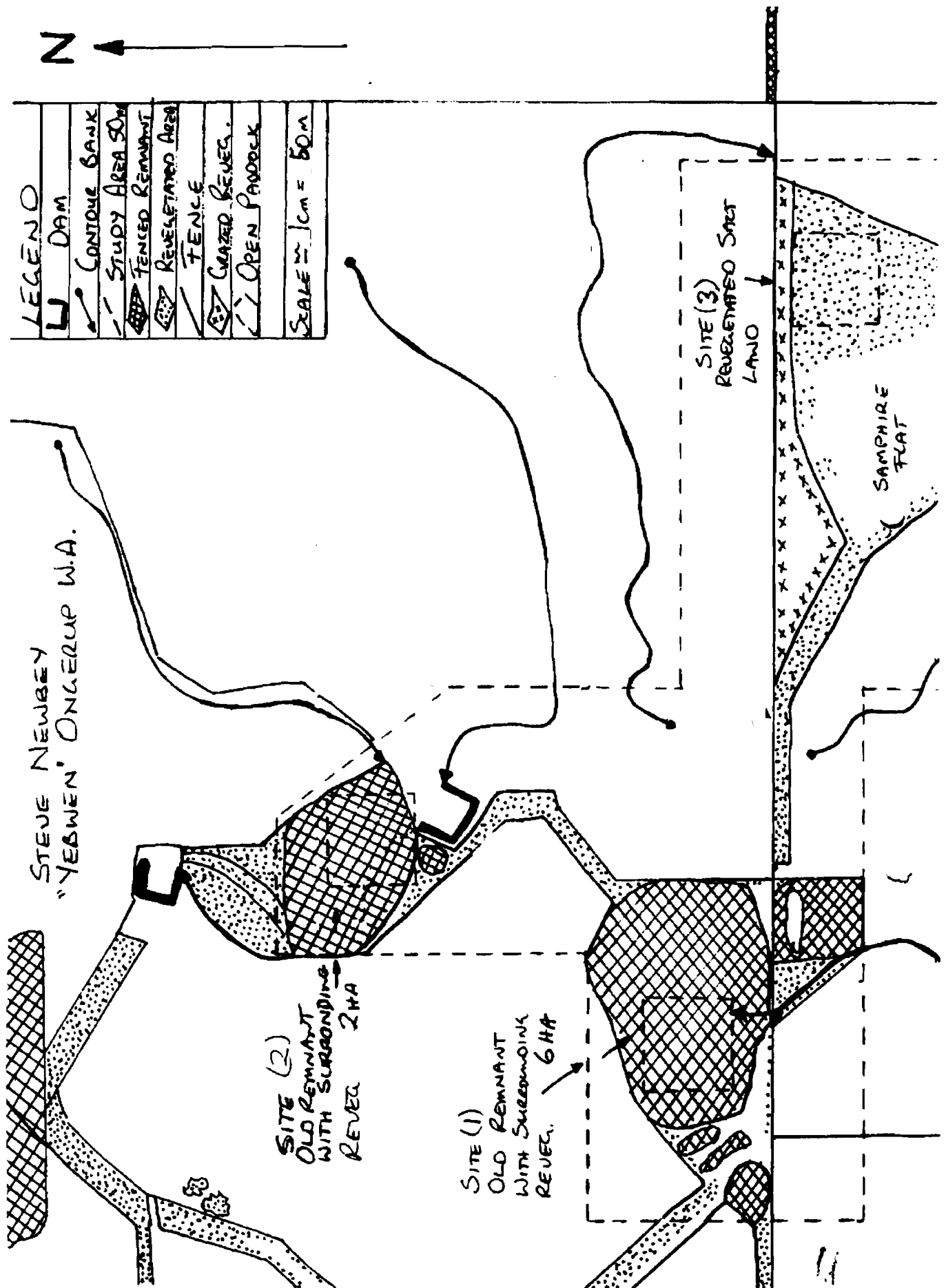
That survey was in two kilometres of road reserve and was carried out in 1978/79. A total of 44 species was recorded (43 in the Birds on Farms survey). However only 28 of the species were common to both surveys. Of the sixteen species in the road reserve that were not recorded in the Birds on Farms survey, only two were present in all seasons. These were Yellow-plumed Honeyeater (breeding) and Purple-gaped Honeyeater.

The Yellow-plumed Honeyeater used to be widespread throughout much of the wheatbelt (Saunders and Ingram 1995). It has now disappeared from the Kellerberrin district (Saunders and de Rebeira 1991). The Purple-gaped Honeyeater was never so widespread but is very dependent on dense to mid-dense mallee and has declined.

One species seen in the road reserve in late summer and autumn was the Red-capped Robin. None has been recorded on the farm for many years.

The Western Yellow Robin was not recorded in the road reserve survey. However it was

FIGURE 8: CASE STUDY 1 - SITE PLAN





recorded one winter in the Birds on Farms survey in site 1.

The Western Yellow Robin was not present on the farm between 1978 and 1988. However, it was in a 200 ha. patch of high quality bush complete with Malleefowl, Western Whipbird, Southern Scrub-robin, Blue-breasted Fairy-wren, Shy Heathwren, six kilometres away and connected by the same narrow but fairly consistently-vegetated road reserve.

In part because of the connection to this source of supply, it seems very likely that as the fencing of some remnant patches takes effect and the revegetation patches and corridors grow that the number of species will increase. Perhaps even the Bush Stone-curlew will return.

#### **FARM 2: 13 km E of Coorow (Plate 2)**

Landuse within the fifty hectare site: cattle 10%, mixed cropping (wheat, lupins, canola, chick peas) 55%, conservation 35%. The dominant landuse in the district is cereal cropping.

Survey period: 1996 -1998

Rainfall over the last three years (to 1996): Average

Trees in survey area: About 60% of the survey area was covered with sparse woodland, a mix of very young and very old. Of that woodland, about 80% was old timber, and 20% revegetation. There were three main eucalypts (*Eucalyptus salmonophloiea*, *E. loxophleba*, *E. camaldulensis*) and some acacia species. Plate 2 (a) shows a solitary old salmon gum in a cleared paddock adjacent to the fifty hectare site. The paddock is now edged on three sides by fenced corridors of remnant and revegetation (various widths).

Dead trees and litter left to break down naturally.

Corridors (fenced) between vegetation patches: Some remnant, some revegetation.

Number of bird species recorded during the survey: 44 (18 status 1; 6 status 2; 20 status 3)

Site 1 [Plate 2(b)]: Young trees on revegetated salt patch. This site had 20 bird species. The

trees are being planted from the outside in. Planting was begun in 1990 and continued in following years. The acacia which was self sown, is proof of success at lowering the water table. When the current managers took over the farm, the salt patch was a bare sheep camp, with only one york gum which subsequently died.

Site 2: Saline creekline with a little remnant vegetation, fenced and planted. Number of species: 19

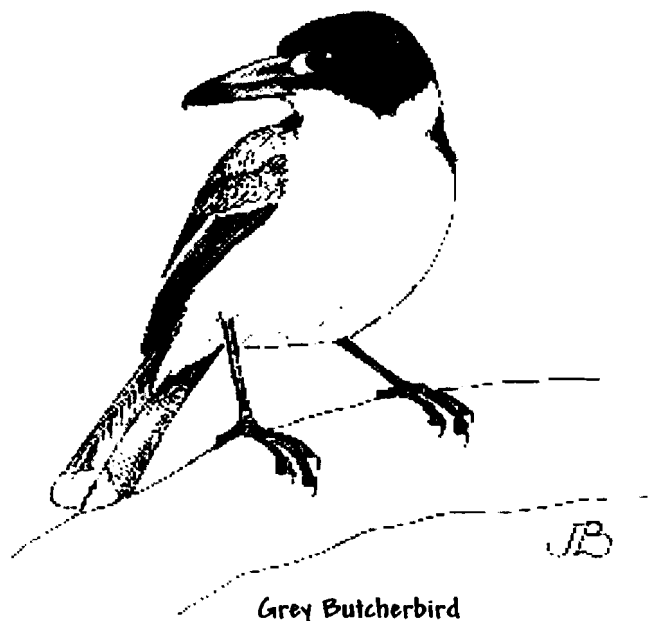
Site 3: Old vegetation continuously grazed by cattle. Number of species: 26

Site 4: Old timber; stock excluded for more than five years. Number of species: 19

#### **Indicator species**

Six of the species from Group C were recorded and three of the suggested indicator species from Group M (Red-capped Robin, Grey Shrike-thrush and Grey Butcherbird). A Brown-headed Honeyeater recorded once in summer, was the only species from Group S. The Variegated Fairy-wren, a more localised indicator bird was also present.

The Grey Butcherbird only appeared shortly before the commencement of the Birds on Farms survey (F. Falconer, personal comment) and was recorded in all seasons. The Red-capped Robin was not always present and is now a regular winter visitor (F. Falconer, personal comment). It does appear that the fencing and plantings over the past nine years are gradually enabling some birds to live on this farm.



### **FARM 3: 21 km N of Denmark (Figure 9)**

Landuse within the fifty hectare site: Bluegum (*Eucalyptus globulus*) plantation 45%; marri (*Corymbia calophylla*) remnant 40%; tracks, fire-breaks and grazing area for sheep 15%. The bluegums are planted on cleared farmland. The main surrounding landuse is also bluegum plantation which is becoming as significant in the district as grazing had been.

Survey period: 1997 -1999

Rainfall over the last three years (up to 1997):  
Below average

Trees in the survey area: 85% dense forest - bluegum 45%, marri 40%.

Dead trees and litter: Logs and sticks are left in the natural forest areas but not in the bluegum plantation.

Number of bird species recorded during the survey: 54 (10 status 1; 8 status 2; 36 status 3).

Site 1 (Paperbark woodland). Number of species: 11

Site 2 (Creek with middle-aged marri trees).  
Number of species: 20

Site 3 (Marri forest). Number of species: 17

#### **Indicator species**

Seven species from Group C were recorded. These were Tree Martin, Western Gerygone, Yellow-rumped Thornbill, Silvereye, Brown Honeyeater, Red Wattlebird and Striated Pardalote. As might be predicted, the indicator species were also well represented.

Six of the indicator species (Group M) were recorded (Golden Whistler, Grey Shrike-thrush, Inland Thornbill, White-browed Scrub-wren, Splendid Fairy-wren and Grey Butcherbird). Four of the scarce but widespread species (Group S) were recorded (Western Yellow Robin, Rufous Treecreeper, Spotted Pardalote, Grey Currawong). The Scarlet Robin was also present and in this district could replace the Red-capped Robin as a bird to use in monitoring.

This tree-plantation has a large component of

status 3 birds (67%). Both the Ongerup and the Coorow farms had about 46% of status 3 birds.

The surveyor, Tim Hunt, was very interested in the question of bird use of bluegum plantations. The following is an extract from a report that he prepared for the plantation owners (Hunt 1998).

*Bluegum in their first year, continue to attract some of the birds that are associated with grassland habitat. Elegant Parrots were only recorded in the younger bluegums from April to September when the grass understorey was green.....Grassland was the only other habitat that they were seen in. Welcome Swallows hawked for insects over young bluegums and adjacent grassland but were not seen over older bluegums. Common Bronzewing were seen in both ages of bluegums, but were more numerous in the younger bluegums especially after the grass had died off. They were also frequently in grassland.*

*The older bluegums tended to have the same birds that were found in the lower and middle levels of the large marri forest. In particular Inland Thornbills, White-breasted Robins, White-browed Scrubwrens, Golden Whistlers and Grey Fantails were frequently recorded and were found well into this habitat. These five species were all seen feeding dependent young in the older bluegums and almost certainly nested in this habitat. - it is also likely that a pair of Brown Honeyeaters also nested here. Two species of Parrots, Western Rosellas and Australian Ringnecks were also frequently recorded. However they were generally only in small numbers and don't seem to have caused much damage to the bluegums. The presence of 3 species of Australian robins in this habitat is pleasing, as this group of birds has become scarcer since settlement. The species missing from this habitat were those associated with the older trees in the large marri forest. Rufous Treecreepers and Sittellas forage on trunks and branches of larger trees and White-tailed Black-cockatoos on seeds of mature trees and shrubs. Honeyeaters are generally attracted to plants in flower. They will no doubt be attracted to bluegum plantations if they manage to flower before they are harvested.*

*The results indicate that if bluegums are planted in areas of grassland formerly used for sheep or cattle grazing, the number of bird species will*

FIGURE 9: CASE STUDY 3 - SITE PLAN



FIGURE 1. THE 50 HECTARE STUDY SITE AT WILSON FARM.

— • —	BOUNDARY OF 50 Ha. STUDY AREA.
	BLUE GUMS 32 TO 44 MONTHS OLD.
	BLUE GUMS 8 TO 20 MONTHS OLD.
	PAPERBARK WOODLAND. - 20 MINUTE SURVEY.
	MARRI CREEKLINE. - 20 MINUTE SURVEY.
	SMALL MARRI FOREST. - 20 MINUTE SURVEY.
	LARGE MARRI FOREST.
	PAPERBARK SWAMPLAND.
	GRASSLAND.
	DAMS.

increase and will resemble the mix of species found in the lower and middle levels of native forest. The small number of species that rely on grazed grassland will tend to be eliminated, unless some of this habitat remains. The species of birds found in the bluegums will change as the trees age, so it seems to be important that a mixture of natural habitats remain in or close to the bluegum plantations, so that the birds are available when the bluegums are suitable for them. On the other hand, if areas of native forest are replaced by bluegum plantations, the number of bird species will decrease. Those species that rely on mature trees will be eliminated. The retention of dams required for fire control, helps to

increase the number of species by attracting some waterbirds. Obviously, the bigger the dam and the more protective vegetation around the edge, the more likely waterbirds will be attracted to the area. Seed eating birds also need to drink regularly and most birds like to bathe if water is available, so the retention of dams would help to increase the number of most bird species.

**A broader comparison** of bird species numbers on farms: Mini-reports for fifty farms have been prepared. These averaged out at a total of 42 species per farm (14 status 1, 7 status 2, and 21 status 3).

#### **4.0 BIRD-LIFE CHANGES OVER THE YEARS: FARMER OBSERVATIONS**

There was a section at the end of the Birds on Farms fifty ha. registration form for land managers to make a note of changes they had observed in bird-life on their properties over time prior to the Birds on Farms survey. Several long-term land holders filled in the increase/ decrease/ same table for a short list of bird groups and species, and several made comments in the space below. The Banded Lapwing was not on the list and appeared only in comments. The time perspective for land-holders varies and was not recorded.

Below is a summary of those bird species noted as increasing or decreasing in numbers.

Species noted only as increasing were Australian Wood Duck, Nankeen Kestrel, Galah, corellas, Australian Ringneck, Crested Pigeon, Laughing Kookaburra and New Holland Honeyeater.

Groups or species in which considerably more increases than decreases were observed included ibis, waterbirds (ducks, coots etc.), Purple-crowned Lorikeet, Red-capped Parrot, Western Rosella, cockatoos, Yellow-throated Miner, Australian Magpie, and Australian Raven.

Those in which a similar number reported increase as decrease were birds of prey, quail, White-browed Babbler, honeyeaters, small bush birds e.g. wrens and thornbills, and Grey Butcherbird.

Species noted as declining more than increasing were Bush Stone-curlew, Bustard, Red-capped Robin and Grey Currawong.

The species noted only as declining was Banded Lapwing (Plover).

The species most commonly recorded as remaining constant in numbers were Australian Magpie and Australian Raven. Next most frequently recorded in this category were birds of prey, owls, small bush birds, and butcherbirds. Three farmers recorded the Bush Stone-curlew in this category - at Nabawa, Kellerberrin and Tammin.

## FARMERS' COMMENTS

A selection of brief comments are listed with initials of the source, and location of the farm.

### Ducks

*Wild ducks have increased since people have stopped shooting them.* A.S.S., BOYUP BROOK

### Ibis and Spoonbills

*Straw-necked Ibis first seen in 1967; Sacred later. Both now regularly seen. Yellow-billed Spoonbill recent arrival.* L.F., MANJIMUP

*Ibis increase - dung beetle.* V.McC., ALBANY

*Ibis fewer - less fallowing, fewer grasshoppers.* A.D., COOROW

### Bustard

*...has increased over last few years.* G.N., EXMOUTH

*...declined.* M.F., ENEABBA

*...declined markedly despite reserve adjacent.* B.B., COOROW

### Bush Stone-curlew

*Vanished.* M.J.F., YORK

*...not seen or heard for about 15 years.* F.F., COOROW

*...have disappeared over the last 25 years.* H.Y., KOJONUP

*I have not heard them in my district since 1956.* H.K., BODALLIN

*The last pair disappeared from the farm about 5 years ago. I suspect walking the dogs did the trick. However a pair arrived at the neighbour's about the same time. They nest each year.* S.N., ONGERUP

*Increased soundings and sightings both here (YORK) and at PINGELLY. At Pingelly always around, seen with chicks.* L.B.W.

### Banded Lapwing (Plover)

*Banded Lapwing has gone from the district.* L.F., MANJIMUP

*There used to be Banded Plovers in the fifties, but none at all now.* H.P., DENMARK

*...disappeared entirely...* R.W., FRANKLAND

*...not seen for 4 or 5 years...* M.C., KOJONUP

*...all but disappeared...cats, foxes and continuous cropping program.* G.A., MORAWA

*I have not noticed a decline but if numbers are declining elsewhere it could be due to the use of wide machinery (farmers less likely to see and save nests) and continuous cropping programs.* H.K. BODALLIN

### **Crested Pigeon**

*Crested Pigeon a recent arrival. L.F., MANJIMUP*

### **Cockatoos**

*White-tailed and Red-tailed Black Cockatoos increasing round the farm - less habitat in native forest. M.F., BRIDGETOWN*

*White-tailed Black Cockatoos have become fewer; Red-tailed Black-Cockatoos now occur in the district. K.M., KOJONUP*

### **Galah**

*...arrived 1992. A.C., RAVENSTHORPE*

*...moved into area in dry years. M.J.F., YORK*

*...have increased because of availability of cereal and water. M.F., ENEABBA*

*...arrived with bulk handling of grain. Thrive on spilt grain, and Guildford Grass bulbs over winter. S.N., ONGERUP*

### **Purple-crowned Lorikeet**

*Have witnessed large coupe of karri forest cleared where a thousand were nesting. A.J., NORTHCLIFFE*

### **Australian Ringneck**

*increase...causing damage. D.C., TOODYAY*

*...increased so dramatically that they are killing the blackboys by chewing the crowns to pulp. B.A., DURANILLIN*

*...increased, destructive to blackboys, seedling trees, roses. F.A., CUBALLING*

*...almost plague proportions at times - easy access to grain, plenty of dead trees providing hollows for nesting. V.D., ARTHUR RIVER*

*Big increase since mid-70s as there was a major drought north of Perth at the time. K.V., ONGERUP*

### **Small Bush Birds and Honeyeaters**

Several mentioned population increase in small bush birds and honeyeaters as a result of suitable plantings, fox-baiting programs, and cat control.

*...round the house have increased since the cat has gone. M.H., TOODYAY*

*...have declined because rabbits and sheep prevent natural regeneration of vegetation. G.A., MORAWA*

*Red-eared Firetail...and honeyeaters and small bush birds have all increased due to plantings (vegies provide cover for Red-eared Firetail; grevilleas provide food for honeyeaters). G.W., BRIDGETOWN*

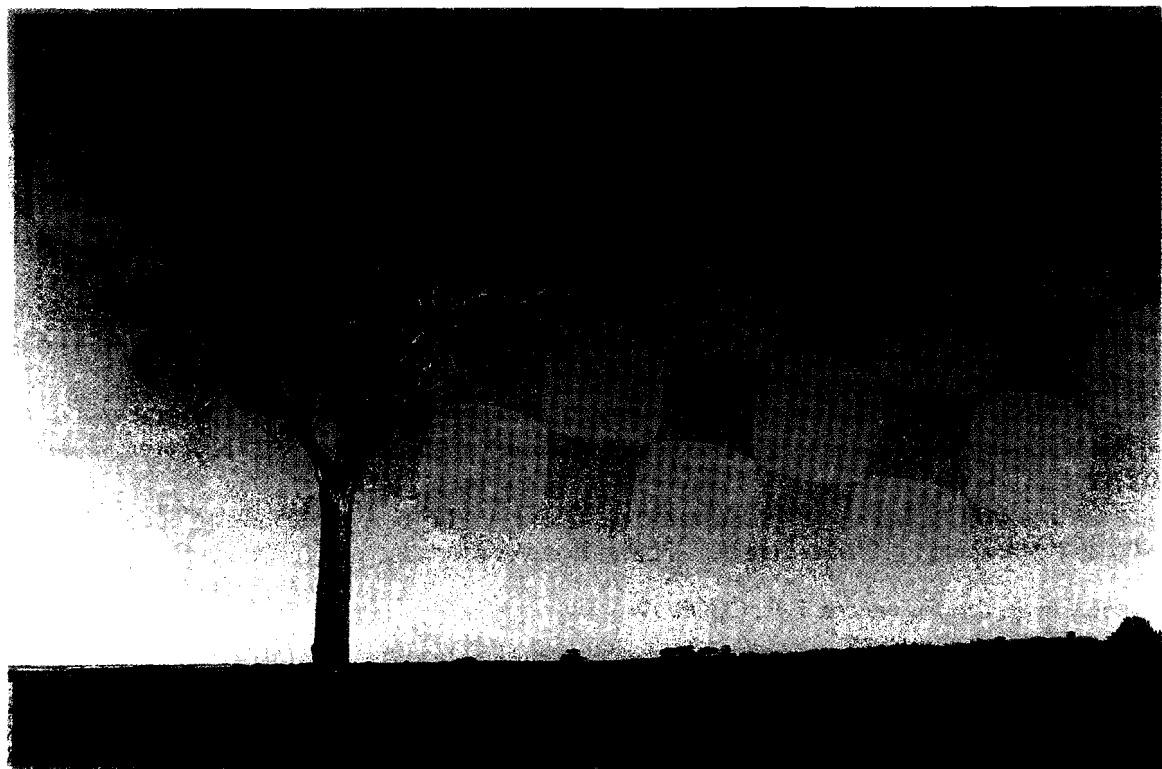
*White-browed Scrubwren has increased due to plantings. F.A., CUBALLING*

*Blue wrens and silvereyes increased where we have planted trees in a previously bare area. M.M., BULLSBROOK*

*Variegated Fairywren - summer visitor to house garden. F.F., COOROW*

*Fairywrens have increased because fallen branches have been left. P.L., ALBANY*

(a)



(b)



**PLATE 2: CASE STUDY FARM, COOROW**

(a) Salmon gum in cleared paddock

(b) Birdwatching in site 1. Trees and some shrubs were planted, but the acacia is self-sown.

Photos: B.J. Newbey

*More honeyeaters moving through - probably because of creation of corridors joining patches of remnant vegetation, planted with melaleucas and callistemons. F.F., COOROW*

## **Robins**

*Hooded Robin disappeared after stacked dead timber in which they were living was burned. R.W., FRANKLAND*

*Red-capped Robin gone (never common). L.F., MANJIMUP*

*...disappearance of the Red-capped Robin. B.C., KELLERBERIN*

*Red-capped Robin not seen for many years. S.N., ONGERUP*

*Scarlet Robin was quite common in home paddock until the locust plague of Nov. 1990 - no longer present. D.C., TOODYAY*

## **Grey Butcherbird**

*A new arrival in the last few months. F.F., COOROW*

Steve Newbey supplied the following account of Banded Lapwings (Plovers) on his farm 'Yebwen' at Ongerup.

*For many years I have dodged plover nests while going about my farm duties.*

*In recent years, since I started walking on a regular basis, I have taken more notice of all the bird life on the farm. As I usually walk with one to four dogs, plovers, quail and pipits are generally brought to my attention as the dogs flush them out.*

*Banded Plovers in particular are obvious when nesting and over the 1998-99 summer continued to nest with eggs and chicks observed in each month. This seemed unusual - I can't recall them nesting outside the April to October period previously. We did have a wetter than usual summer. The plovers usually form into flocks of 10 - 30 over the summer months but last summer remained paired, some with chicks.*

*They almost always lay four eggs on the ground and keep the pointed ends of the eggs pointing towards the middle of the nest. The nest is usually near a 'landmark' i.e. a small rock, tussock of grass or something similar but not too close to something very obvious such as a large rock.*

*Generally I notice two to four chicks shortly after hatching but this usually reduces to one or two chicks by half grown stage. Often each chick is looked after by one parent (one for each).*

*I have observed ravens and magpies taking small chicks. Foxes would also be a major predator. One of the pairs raised three chicks in January/February 1999, and this seemed exceptional. That pair did nest close to a fenced off area and were frequently seen in the taller grass in this area. I have not as yet noticed any nests in fenced off areas or remnant vegetation: they seem to prefer the open exposed paddocks.*

*During the summer I quite often observe plovers close to dams, seeking shade near dams, and even on the water's edge on hot days. Until recent years the plovers did not appear to stay over the summer months. They would form into flocks in November and returned in flocks shortly before the break of the season. At one stage I thought they may be able to predict the break of the season.*

*If plover numbers are in decline this is possibly due to modern farming methods such as continual cropping and in particular to the over-use of pesticides and herbicides.*



## 5.0 BIRD MOVEMENT

This information is included to point to the difficulty these few status 3 species have in moving through the landscape after farming has been established and also to the fact that they are mobile and will disperse successfully if there is somewhere to go.

To be certain that birds have moved from one place to another mist-netting and banding are necessary. The Birds on Farms project did not use these techniques.

Distances which a few species have been recorded as covering, particularly over open ground, are briefly described below.

Brooker and Brooker (1997) documents a study of the Blue-breasted Fairy-wrens in 200 square kilometres in the Tammin/ Kellerberrin/ Wyalcatchem area. It is 93% cleared and the remaining 7% of vegetation is extremely fragmented.

The Blue-breasted Fairywren is dependent on the lowest strata of native vegetation in which it feeds, shelters and breeds. It appears reluctant to move far into the open and is insectivorous.

Several movements were recorded, all between August and January. Young females were the most likely to travel. The route taken can not be ascertained but the shortest corridor route is far more likely to approximate the route a Blue-breasted Fairywren would choose. Using this calculation, the longest distance travelled and recorded was 13 km. This was certainly further than expected.

All of the longer journeys would have entailed some crossing of exposed areas but all destinations could have been reached without crossing gaps greater than about 90 metres.

The following data were obtained from Cale 1994 and Saunders and de Rebeira 1991. Both distances are based on the certainty that there was a movement from one place to another. The maximum long distance is the actually the minimum (for that particular bird) presuming that the bird took the shortest sheltered route. But it is the maximum distance that had been ascertained for that species at the time of writing. None of these species travels 'as the crow flies'.

Species	Minimum distance across unsuitable habitat (metres)	Maximum long-distance movement (metres)
White-browed Babbler	400	1 500
Rufous Whistler	450	3 600
Grey Shrike-thrush	150	1 200
White-eared Honeyeater	200	7 500

There is insufficient information about bird movement across gaps in woody vegetation and it is something worth recording if the opportunity is available. If a species appears in a new location and the nearest source of this species is known, a likely route can be plotted and the gap tolerance estimated.



White-browed Babbler

## 6.0 GENERAL DISCUSSION

Birds are habitat dependent - if they can't find the right food and the shelter they need they won't be there.

It is clear that as habitat changes occur, changes in the bird-life follow. *Farmers' observations* point to some of those changes locally and on a larger scale. The Banded Lapwing had benefitted by farming in earlier times and on cereal growing farms would reliably appear each year very soon after the break of the season. However Saunders and Ingram (1995) had enough evidence by the time they prepared their publication to classify the Banded Lapwing as status 2 rather than status 1. That is, the numbers were already declining in some areas due to a change in farming practice.

### Revegetation

Clearing is one change, revegetation is another. Positive answers to the question of whether revegetation is attracting native vegetation dependent birds to farms are to be found in several sections of this report. Status 3 species are all dependent on native vegetation to varying degrees.

The analysis (section 3.4) on farm survey results showed only two species to be significantly more frequent in remnant sites, and two species were significantly more frequent in revegetation sites. The remaining sixty-five species of those with 18 or more 'presence' records were not significantly more likely in one or the other. That is they are using both of those tree history categories.

It takes a long time before nesting hollows can develop in trees and if for no other reason, old trees should be retained for this. There is no doubt that all remnant is valuable - from the solitary old eucalypt where the magpies nest to the half a dozen bushy shrubs near a gate which may be home-base for a pair of White-browed Scrubwrens. The young scrubwrens won't have a chance to disperse if there is no connecting vegetation. The value of revegetation is enhanced when it links or incorporates existing remnant patches.

### Verges

The majority of verge sites were revegetation.

The statistical analysis showed five species to favour revegetation sites. The remaining 39 species included in the analysis were as likely in remnant as revegetation sites.

The increase in different species in verges in different seasons gives a clear indication of the value of verges for birds both to live in and to move through the rural landscape. It is encouraging that narrower verges (at least to a low of ten metres) appear to be as occupied by birds as wider verges (Tables 5 - 7, Figure 3). Many bird species are very restricted in the distances they are prepared to attempt over open ground.

It is unlikely that birds, especially the more vulnerable status 3 species, breed in narrow verges as much as wider verges. Of the twenty-five status 3 breeding records in verges, only two were in verges 15 metres wide. The others were in verges from eighteen to over 300 metres wide. Luck *et al.* (1999) found that nest predation was relatively higher near habitat edges.

The Birds on Farms project did not specifically look at shire road verges though a few of the farm sites were along local roads. There is no doubt that local road reserves with their remnant vegetation play an important role in allowing birds to move through the landscape as well as providing a permanent home for some. Conservation is not yet a priority in management of these roads in some shires.

Some species were not recorded in verges at all. These included Malleefowl, Brush Bronzewing, Southern Scrub-robin, Hooded Robin and Shy Heathwren - all among the very vulnerable species that will be dependent on a reserve system for their survival in farming districts.

### Conservation and diversity

I believe that none of the bird species listed in Table 1 face total extinction in the foreseeable future. This is partly because all have part of their range in areas that are protected from clearing by lack of rainfall (goldfields and pastoral country) or in the south west forests and heathland. Fortunately the reserve system is gradually increasing in area but without conservation along road and in privately held land, the reserves would be simply a series of unconnected islands with ever-diminishing diversity of plants and animals.

Local extinction is becoming less likely now too, as revegetation and fencing programs take effect in the huge effort needed to combat degradation. Because there is a time lag between clearing and local extinction, many native vegetation dependent species have been able to hang on through the worst times. The statistical analyses (section 3.4) showed that most of the status 3 or vulnerable species preferred undisturbed types of habitat (e.g. not grazed, not isolated). Those recorded too infrequently to analyse (e.g. Malleefowl, Restless Flycatcher, Shy Heathwren) would in most cases be even more dependent on the reserve system.

Awareness of the need of some species for extra protection has been increasing in recent years. The **Malleefowl Preservation Group**, which was formed by a group of concerned farmers, has done a great deal in this regard by a vigorous public relations campaign that highlights the unusual life of the Malleefowl and also underlines its habitat requirements. In protecting habitat for the Malleefowl, other species needing similar vegetation and similar protection from foxes and cats also benefit. These include the Southern Scrub-robin, Blue-breasted Fairy-wren and Shy Heath-wren. Fox-baiting has become more widespread as it is undertaken by community landcare groups, with government agencies organizing large-scale baiting in reserves.

Awareness of the value of farms for wildlife conservation is promoted in other ways. The **Land for Wildlife** scheme, an initiative of the Department of Conservation and Land Management, is based on a successful Victorian model. It is helping farmers in a practical way to make the best use of their existing remnants and enhance the wildlife potential of their property without interfering negatively with production. Some local people including farmers are employed as Land for Wildlife officers to share hard-won knowledge, for example about revegetation projects.

The **Landcare** movement which has almost 100 Land Conservation District groups in southern Western Australia is doing an excellent job in looking at catchment systems to plan and implement land degradation control and associated conservation measures. Most of these measures should contribute to increased bird diversity in the district.

These are only some of the programs dedicated

to rehabilitation and protection of the rural environment.

Many farmers are aiming at diversification that includes tree or shrub crops. Even though these may be mono-cultural, they will be used by and ideally protected by birds especially if there is a diversity of local native plant species nearby as in case study 3. Most bush birds are not farm free-loaders as they feed on invertebrates (protecting plants) and /or nectar (pollinating).

This report does not offer an answer to the overload situation where one species in particular is extremely numerous and devastatingly destructive except to suggest that diversity of habitat in as many aspects as possible will encourage a diversity of species.

From Table 2 (Numerical summary) it can be seen that on farms the proportions of status 1, 2 and 3 species are very aptly 1:2:3. Figure 2 shows that status 1 species tend to be present regardless of the farm habitat characteristics. Diversity of birds is to be achieved by attracting species of status 2 and 3. It is well understood nowadays that understorey is an important component of revegetation for creating bio-diverse habitat. The results of the analyses (section 3.4) supported this.

All farmers can play a part in the conservation of bush birds. If a bird uses a site at all, even if not throughout the year, then that site is assisting in the conservation of that species. A consideration in revegetation is to include species which flower at differing times of the year.

All farms should in time be able to attract those of the indicator species that remain in their district. Learning to recognize local indicator birds by sight and sound would be well worthwhile. To have robins and fairy-wrens on the property is not only a delight but also something to take pride in. They can be very easily lost.

Changing attitudes are converting into changing practice. Before too long, a Grey Shrike-thrush, feasting on grubs with bouts of laid-back song between courses, could be part of any farmer's spring.

## 7.0 REFERENCES

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# Appendix 1

## RAOU BIRDS ON FARMS PROJECT SITE REGISTRATION FORM: THE 20 MINUTE SURVEY

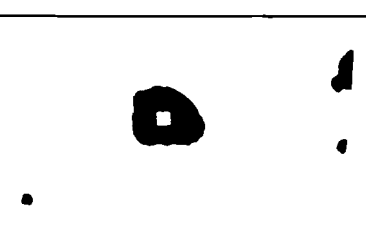
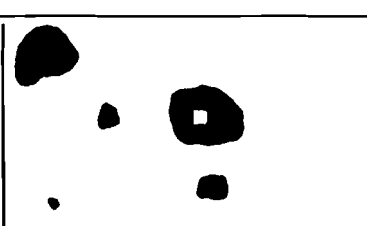
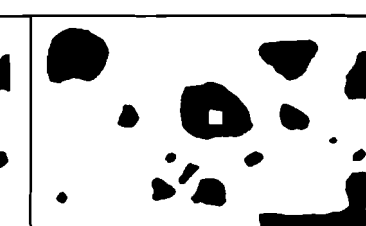
Please fill out this form once for each of the 20 minute survey areas (0.3 to 0.4 ha area).  
When estimating areas; 1 Hectare (ha)  $\approx$  2.5 Acres

Office Use Only: Codes

Your Name \_\_\_\_\_ Telephone No. \_\_\_\_\_

Observer Code (e.g. B20) \_\_\_\_\_ 20 Minute Site Code (e.g. T20) \_\_\_\_\_

Site Name (e.g. Pine Windbreak) \_\_\_\_\_

<p>Is the 20 minute survey area (0.3 - 0.5 ha area only, tick box) in:-</p> <p><input type="checkbox"/> planted trees / shrubs      <input type="checkbox"/> trees / shrubs that have regenerated naturally after clearing</p> <p><input type="checkbox"/> remnant trees / shrubs that have always been there</p> <p><input type="checkbox"/> native grassland    <input type="checkbox"/> non-native grassland    <input type="checkbox"/> improved or fertilised grassland</p> <p>Other:-</p>		
<p>What is the shape of the 20 minute survey site (0.3 to 0.5 ha search area, tick one)?</p> <p><input type="checkbox"/> circular    <input type="checkbox"/> square    <input type="checkbox"/> broad strip (rectangular)    <input type="checkbox"/> narrow strip    Other (Draw):</p>		
<p>If the 20 minute search area is within a patch of trees and or shrubs, what is the shape of this patch?</p> <p><input type="checkbox"/> circular    <input type="checkbox"/> square    <input type="checkbox"/> broad strip (rectangular)    <input type="checkbox"/> narrow strip    <input type="checkbox"/> undefined shape</p>		
<p>Estimate the area of the patch of vegetation (ha) which your 20 minute survey area is in:</p> <p><input type="checkbox"/> &lt; 2ha    <input type="checkbox"/> 2 - 3    <input type="checkbox"/> 4 - 5    <input type="checkbox"/> 6 - 10    <input type="checkbox"/> 11 - 20    <input type="checkbox"/> 21 - 50    <input type="checkbox"/> 51 - 100    <input type="checkbox"/> 100 - 400    <input type="checkbox"/> &gt; 400ha</p>		
<p>If the 20 minute survey area is in a strip of vegetation, is it (tick one):-</p> <p><input type="checkbox"/> roadside vegetation    <input type="checkbox"/> creekline strip,    <input type="checkbox"/> windbreak    Other:-</p>		
<p>Which of the following best describes the position of your 20 minute search area (<input type="checkbox"/>) relative to the surrounding vegetation (select A, B or C):-</p> <p style="text-align: center;">A - Isolated                      B - Semi Isolated                      C - Not Isolated</p>		
		
<p>If your survey area is in a patch of trees or shrubs, is this patch connected to other, <u>similar sized, or larger</u> patches of vegetation (y/n)?</p>		
<p>What is the main land use <u>within</u> the 20 minute survey area (e.g. apple orchard, erosion control, conservation area, sheep grazing etc.)? Specify land use:-</p>		
<p>What land use is immediately adjacent to, or <u>immediately surrounds</u> the 20 minute survey area?</p>		
<p>If trees and/or shrubs are present in the survey area, are the majority of them (tick one):-</p> <p><input type="checkbox"/> native and local species    <input type="checkbox"/> native, non-local species    <input type="checkbox"/> introduced species (pines, orchards etc.)</p> <p>Other:-</p>		
<p>Is the search area itself grazed by livestock (please tick one):-</p> <p><input type="checkbox"/> always    <input type="checkbox"/> most of the time    <input type="checkbox"/> seldom    <input type="checkbox"/> never    Other:-</p>		
<p>If seldom or never grazed, has this always been so (y/n)?</p> <p>If no, how many years is it since grazing stock were excluded?</p>		



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The Gordon Reid Foundation for Conservation was established in 1990 by the Lotteries Commission. The basic function of the Foundation is to stimulate and sustain community action to conserve indigenous plants, animals and micro-organisms, and their natural environments, in Western Australia.



## **Birds Australia**

CONSERVATION THROUGH KNOWLEDGE

### **BIRDS AUSTRALIA**

Birds Australia (formerly the Royal Australasian Ornithologists Union) was founded in 1901 and is Australia's national ornithological organisation. It aims to promote the preservation and knowledge of our Australian birds. Its members come from all ages and all walks of life, and include amateur birdwatchers and professional scientists.

Birds Australia is active in conservation realising that the preservation of native birds relies on the accumulation of knowledge and study of their status and needs.

Projects for the conservation of native birds involve the collection of field information by amateurs, and its assessment by professionals.

Birds Australia co-operates with other bodies such as the World Wide Fund for Nature. Its work is being increasingly recognised by governments and corporate bodies as the best source of authoritative advice.