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MURRUMBIDGEE RIVER CORRIDOR
BIRD SURVEY
FINAL REPORT – NOVEMBER 1986

Canberra Ornithologists Group

MURRUMBIDGEE
RIVER
CORRIDOR

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SUMMARY

The Murrumbidgee River Corridor supports a rich and varied avifauna of over 130 species.

The most common 20 species form a unique riverine avifauna. The Murrumbidgee River corridor is the main habitat for this avifauna in the ACT. The corridor is prime habitat for two uncommon species, the Rainbow Bee-Eater and the Yellow Thornbill.

The richest landbird habitats in the corridor are those in which the vegetation is varied in structure and composition. The richest waterbird habitats are areas where the river is slow-flowing and still pools and sand-bars are found.

The corridor is a major trunk route for autumn migration of honeyeaters.

A number of rare and highly sensitive species use the corridor. Planning and management policies must take these species into account.

A number of places along the river corridor have great potential as interpretational and educational sites.

Exclusion of grazing and revegetation with naturally occuring plant species will greatly improve the inner corridor as habitat for birds.

It is recommended that a Murrumbidgee Nature Park be established to facilitate the implementation of suitable management and conservation practices.

Where development is planned in areas not specifically surveyed in this report, brief ornithological surveys should be carried out.

The tentative ornithological value of corridor units, based on extrapolation of known areas, is shown in Map 1. Areas of high sensitivity and areas suitable for development as interpretation sites are also shown.

MAP 1. TENTATIVE ORNITHOLOGICAL VALUE OF INNER CORRIDOR UNITS

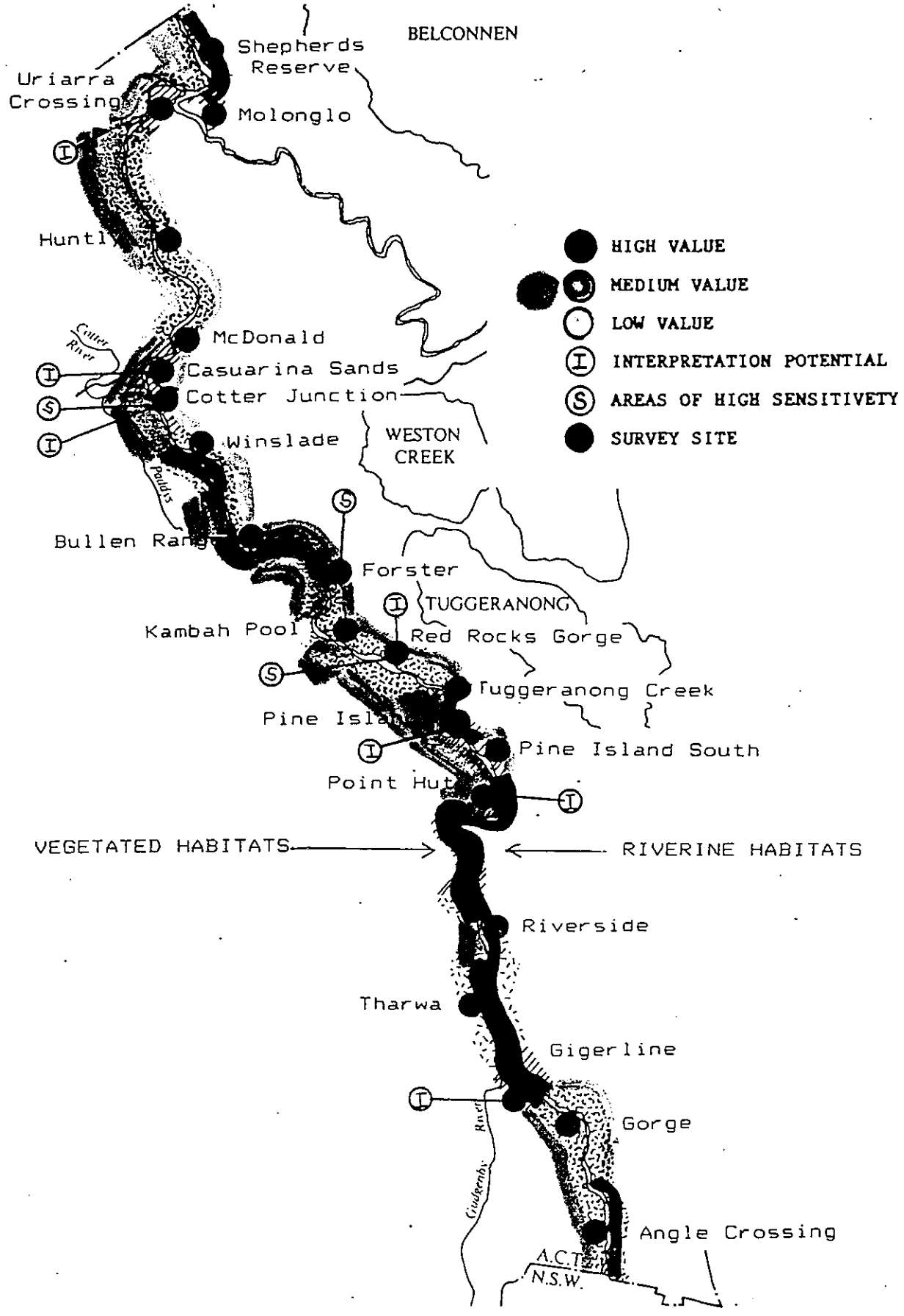


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1. INTRODUCTION

1 Purpose of this report.

The purpose of this report is as follows:

a. To provide a summary of previous ornithological surveys of the Murrumbidgee Corridor in the ACT.

b. To state the aims of the present survey and to outline the survey methods that were adopted.

c. To describe the species recorded in the river corridor, with density, ubiquity, requirements and status.

d. To provide a description of the avifauna of each survey site, with planning and management guidelines.

e. To provide a description of the habitat requirements of species in the corridor.

f. To describe the role of the river as a migration corridor.

g. To describe the seasonal variation in the composition of the river's avifauna.

This report supersedes the Initial and Interim Reports (COG 1985a, 1985b, 1986a, 1986b).

1.3 Previous ornithological studies of the corridor

The first and only major study of the avifauna of the Murrumbidgee River in the ACT took place between 1947 and 1949 (Lamm & White, 1950; Lamm & Calaby, 1950). This survey was the earliest attempt at conducting a census of birds anywhere in the ACT.

The eastern bank of the river between Uriarra Crossing and the Cotter was surveyed on 37 occasions between September 1947 and September 1949. The total number of birds of each species was recorded. Numbers of two abundant species, the Superb Fairy-wren and Red-browed Firetail were extrapolated from sample counts over short distances.

The relative frequency of each species was calculated as the proportion of surveys on which that species was recorded. In the case of migratory species, frequency was calculated as the proportion of surveys on which the species was recorded during the season in which the species was present in the district generally. The relative density of each species was calculated from the number of birds recorded in each survey.

A total of 83 species was recorded during the study. A number of records are of particular interest: an average per visit of 15 Painted Honeyeaters was recorded between mid-November 1948 and late February 1949, and evidence of breeding was noted (Lamm and White:1950); Yellow-faced Honeyeaters were observed on migration on two occasions in April 1949, passing at rates of 4000 and 10 000 per hour respectively; and Sulphur-crested Cockatoos were said to roost in the largest stand of casuarinas, presumably the one at Uriarra, where a large flock of cockatoos may still be found.

Lamm and White (1950) recorded Yellow-tailed Black-Cockatoos near the confluence of the Cotter and Murrumbidgee Rivers. This species was not recorded in Lamm and Calaby's (1950) survey.

McKelvie (1957) observed a Red-backed Kingfisher *Halcyon pyrrhopygia* at the Tharwa bridge in 1953 bringing the total number of species recorded in the corridor to 85. McKelvie also recorded the Black-faced Woodswallow *Artamus cinereus* for the ACT, but gives the precise location as Ginninderra Falls, which lies some kilometres outside the area covered by the present survey.

At Pine Island, Murn (1963) estimated that between 10 000 and 12 000 honeyeaters passed a point during a four-hour period one morning in April 1963. Ninety-five per cent were Yellow-faced, and the remainder were White-naped Honeyeaters. Wilson (1963) reported similar numbers at the same locality later that month.

1.4 Objectives of the study

The principal objective of the survey is to provide information on the relative ornithological value of the habitats within the inner corridor. This information may then be incorporated into planning proposals for the corridor.

The following information is required from the study:

a. Species list, including status, distribution and abundance.

b. The diversity and abundance of the avifauna and the level of breeding activity at each site, and identification of any special features of the avifauna at each site.

c. The diversity and abundance of the avifauna, analysed by habitat/river profile type, showing diversity, abundance and level of breeding activity for each habitat/river profile type, and the identification of the special features of the avifauna of each type.

d. The seasonal variations of the avifauna and breeding activity during the survey year.

e. Identification of the specific requirements and the sensitivity to disturbance of each species.

f. Planning and management guidelines for each site with an indication of the extent of the area for which such considerations are applicable.

For each site the following information is given:

- location;
- description of physical character and vegetation of the site, including photographic record;
- description of present land-use/state of development;
- frequency of replication along the river corridor, including identification of subsections of the corridor for which the site may be regarded as representative;
- short description of neighbouring bird habitats in the outer corridor, and a qualitative assessment of their importance on the basis of available information on the avifauna of similar habitats elsewhere.

For each survey site the following planning and management guidelines are given:

- sensitivity and vulnerability to damage
- type of protection needed

- level of usage considered acceptable

- ways of improving the habitat for birds by planting, landscaping, etc.

As far as possible, assessment of significance is determined using objective criteria, such as species diversity, population density, level of breeding activity, presence of rare or unusual species etc.

As a context for understanding the significance of particular areas within the Murrumbidgee River Corridor, a summary has been prepared outlining the area's general role and importance for birds.

1.5 Survey Methods.

In all, 21 sites were selected for study (Map 2) of which 18 were included in the regular survey program. The remaining three sites, the Gorge, Red Rocks Gorge and Forster were surveyed during the breeding season on one occasion only. Access to these three sites is difficult and regular surveys were not practical.

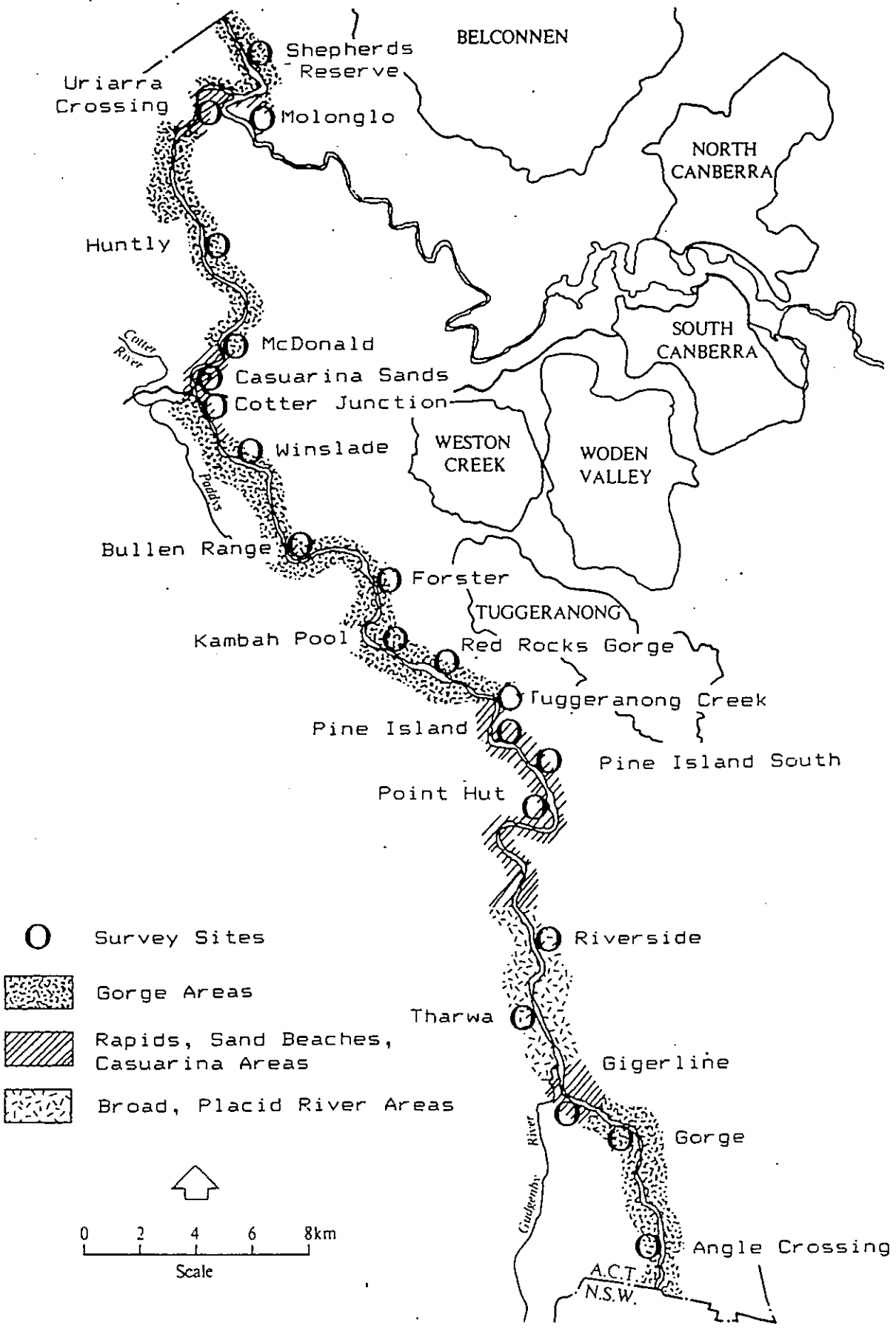
All survey sites were situated on or near the bank of the river. Each consisted of two components, one vegetated and one riverine. The vegetated component is a strip 250 m in length and 40 m wide (area 1 ha), measured from the lower limit of the vegetated parts of the river bank. The riverine area consisted of the adjoining 250 m stretch of the river itself and associated unvegetated areas, including beaches, sand-bars, snags, rocks, unvegetated parts of islets, etc. on both banks of the river below the vegetation line. The width of the non-vegetated component varied with the width of the river from site to site, but averaged about 50 m.

A total of 15 surveys were conducted at intervals over a twelve-month period to enable the seasonal variation of the avifauna to be studied. Surveys were conducted monthly with additional surveys in the spring and autumn to ensure that records of breeding and migration were as complete as possible. The surveys were carried out early in the morning when birds are most active, and therefore most readily detected. The dates and survey conditions of each survey are shown in Table 1.

On each visit, the site was surveyed for 30 mins. The observers moved slowly from one end of the site to the other recording the number of birds of each species found. Care was taken to avoid double-counting birds which move about the site during the survey.

The number of birds recorded in a site provided a measure of population density, while the total number of species over the twelve-month period and the average number of species per visit gave an indication of avifaunal diversity. The use of standardised survey procedures allowed direct comparisons of the results from different sites to be made.

MAP 2. LOCATION OF SURVEY SITES



Birds observed outside the survey site but within the river corridor, birds flying over the site but not hawking or hunting above it and birds seen within the site but not within the 30 min survey period were also recorded. These records were used in compiling the complete species list for the area.

TABLE 1. SURVEY CONDITIONS

Date	*Weather*	*Observation conditions*
7 July	Cool, partly overcast, light winds	Fair
4 August	Mild, partly overcast, generally calm	Good
1 September	Mild, overcast, some showers, calm	Poor
29 September	Warm, fine and sunny, generally calm	Good
20 October	Mild, partly overcast, light winds	Good
10 November	Warm, partly overcast, calm	Good
24 November	Warm, partly overcast, calm	Good
8 December	Warm, humid, overcast, light rain river in flood	Fair
12 January	Warm to hot, some cloud, calm	Good
2 February	Warm to hot, some cloud, mostly calm	Good
2 March	Warm, overcast - clearing, calm, river very low	Good
6 April	Cool, clear, windy	Good
20 April	Cool, clear, windy, some fog	Good
4 May	Cool to mild, overcast to clearing, calm	Good
1 June	Cool, overcast, calm	Fair

2. SPECIES LIST

2.1 Introduction

All species observed in the Murrumbidgee River Corridor between 7 July 1985 and 1 June 1986 are shown in Table 3. The common names, scientific names and the taxonomic order in which species are listed conform with the Royal Australasian Ornithologists Union's 'Recommended English Names for Australian Birds' (RAOU 1978).

A total of 139 species was recorded, 133 of these were recorded in one or more of the 15 scheduled surveys of the inner corridor. Six species, Lewin's Rail, Crested Pigeon, Tawny Frogmouth, Brown Treecreeper, Yellow-tufted Honeyeater and Satin Bowerbird were recorded in the inner corridor between July 1985 and June 1986, but not during scheduled surveys.

The aggregate number of species recorded in the inner corridor climbed very rapidly between July and November 1985. Although the number of new species recorded per survey declined to two or three thereafter, the aggregate continued to grow slowly as numbers of rare visitors appeared in the corridor. The fact that new species were recorded even after 14 surveys suggests that the aggregate will continue to rise slowly in the corridor as further rare visitors are observed.

A number of species which were not recorded during this study were found during previous studies of the Murrumbidgee. These include Darter, Grey Goshawk, Peaceful Dove, White-backed Swallow, White-bellied Cuckoo-shrike and Painted Honeyeater (NCDC 1981).

Additional species which could be expected in the corridor include Stubble Quail, Australian Owlet-nightjar, White's Thrush, Crested Shrike-tit, Pink Robin, Satin Flycatcher, Rufous Fantail and Brown Songlark and a small number of waders, lorikeets and owls.

With the exception of owls, which being nocturnal, are often overlooked in studies of this kind, many of these species are vagrants, or are at least rare in the Canberra area (COG 1985c). The fact that these species were not recorded during the present study suggests that they are not an integral part of the avifauna in the corridor.

Taking into account the number of species recorded during this study (139), the species recorded in previous studies but not in this one (6) and those which could occur in the area (about 14), the total number of species in the corridor will probably not exceed 160.

A total of 196 species of bird are recorded regularly in the Canberra area (COG 1985a). The number of species recorded in the Murrumbidgee Corridor represents a considerable proportion (71%) of all species recorded regularly in the area.

2.2 Abundance

The abundance of all species recorded within survey areas, expressed as the average number of birds per hectare, is shown in Table 3. Numbers of birds outside survey areas were not recorded, so it was not possible to calculate averages for these less common species. These are shown as a dash (--) in the table.

The most abundant species was the Yellow-faced Honeyeater (average = 10.98 birds/ha). This high figure was caused by several large flocks (up to 800 individuals) which were recorded during migration season.

The second most abundant species was the Superb Fairy-wren (average = 7.46 birds/ha). In spite of the fact that the Yellow-faced Honeyeater was the most abundant species overall, the Superb Fairy-wren may be considered to be the dominant species in the inner corridor as it was a very widespread breeding resident, while the bulk of the honeyeaters are merely passage migrants.

Other abundant species (average >=1 bird/ha) include Pacific Black Duck, Maned Duck, Crimson Rosella, Grey Fantail, White-browed Scrubwren, Brown Thornbill, Yellow-rumped Thornbill, Silvereye, European Goldfinch and Red-browed Firetail.

2.3 Core Species

Twenty species were recorded in all 18 sites. These may be considered the core species of the inner corridor and they reflect well the unique combination of geographical elements and vegetation communities along the river. These core species are listed with their preferred habitat type in Table 2.

Most of these species are relatively common in their respective habitats throughout the ACT, but the assemblage of bird species constitutes a distinctive riverine avifauna of which the Murrumbidgee is the main example in the ACT.

The species with the most restricted habitat requirements in this list is the Rainbow Bee-eater. This species requires deep sandy soil in which to excavate nest burrows, and large bodies of water to attract insects - its major food-source. With the exception of a number of rural streams, these conditions within the ACT are only met along the Murrumbidgee. It is likely that at least half the Rainbow Bee-eaters' nests in the ACT are located within the inner corridor.

One species not on this list which deserves special mention is the Yellow Thornbill. Before this survey was carried out, the species was thought to be rather rare in the ACT. It was found in many sites along the river where it shows a strong association with casuarinas. The inner corridor is prime habitat,

The significance of the core group can be illustrated by comparing it with core groups from other areas in the ACT (see

COG 1986c). Compared with Ainslie-Majura, Black Mountain, urban Canberra and the Museum of Australia site, the Murrumbidgee has a strong aquatic element (Great Cormorant, White-faced Heron and Pacific Black and Maned Duck). The Rainbow Bee-eater is only found in the core group of the Murrumbidgee. Overall, the Murrumbidgee group shows strongest similarities with the Museum site core species. Twelve species in the Murrumbidgee group are also core species at the Museum site. There are Crimson Rosella, Blackbird, Rufous Whistler, Grey Fantail, Superb Fairy-wren, Brown Thornbill, Yellow-faced Honeyeater, Silvereye, European Goldfinch, Red-browed Firetail, Australian Magpie and Australian Raven.

TABLE 2. CORE SPECIES IN THE INNER CORRIDOR

Species	*Habitat*
Great Cormorant	aquatic
White-faced Heron	aquatic
Pacific Black Duck	aquatic
Maned Duck	aquatic
Sulphur-crested Cockatoo	grassland/woodland
Crimson Rosella	woodland
Rainbow Bee-eater	riverine
Blackbird	shrub communities
Rufous Whistler	woodland
Grey Fantail	woodland
Superb Fairy-wren	shrub communities
White-browed Scrubwren	shrub communities
Brown Thornbill	shrub communities
Yellow-faced Honeyeater	woodland
Silvereye	woodland
European Goldfinch	woodland
Red-browed Firetail	shrub communities
Australian Magpie	grassland
Pied Currawong	woodland
Australian Raven	grassland

2.4 Habitat preference

The habitat preferences of each species is shown in the column labelled 'Habitat' in Table 3. Species are classified into those which use riverine habitats - R, vegetated habitats - V or both - V/R. For species which were not recorded within survey sites but which were still recorded within the inner corridor, their known habitat preferences are shown in parentheses.

The number of species with each habitat preference is shown below:

Habitat preference:	V	R	V/R	Total
No. of species:	93	17	28	138

It is apparent from this that the vegetated habitats are considerably richer in terms of species diversity than the riverine habitats. Note that the White-throated Needletail is aerial so no habitat is given.

2.5 Sensitivity

An indication of the sensitivity to disturbance of each species is given. For the sake of convenience and to assist with the formulation of conservation and planning strategies, four grades for sensitivity to human disturbance have been used: 0 - not sensitive, 1 - may be sensitive, 2 - sensitive and 3 - highly sensitive. These are outlined below.

0 -- Generally not sensitive to human disturbance.

This includes exotic species and species which commonly breed in the urban areas. In some cases, species in this category are dependent on human activity (House Sparrows breed in holes and crevices in buildings). Other species like the Australian Magpie and White-winged Chough benefit from food scraps left behind by picnickers, expanses of mown grass (at Uriarra Crossing for example) to forage on, etc. One species, the White-throated Needletail, is included in the category as it is almost entirely aerial. No special management is required for species in this category.

1 -- May be sensitive to human disturbance.

Birds in this category may become less frequent or may cease to breed in an area if it is disturbed. Many of the species in this category are rare visitors in the inner corridor, and these species are unlikely to be disturbed by localised development. The other species in this category are mostly species which breed in the inner corridor. They may retreat from areas which are disturbed but will continue to breed in nearby undisturbed areas. These species will continue to visit disturbed areas even if they no longer breed there.

Management considerations for species in this group centre around retaining breeding requirements in areas which are developed. For example, Pacific Black Ducks will continue to breed in an area if inaccessible islets are protected. Hole-nesting species like the Laughing Kookaburra, Galah and Red-rumped Parrot can be retained if dead limbs and spouts are not removed. Many of the species which nest in dense undergrowth, like the thornbills, fairy-wren and scrubwren can be encouraged by protecting and extending plantings of grevilleas and leptospermum.

2 -- Sensitive to human disturbance.

Species in this category are generally sensitive to human disturbance and retreat from developed areas. Most birds of prey, and many species of robin fall into this category. Several of these species such as the Hooded Robin and Jacky Winter were once common in the Canberra area, but have retreated in the face of urban development.

Management considerations for this group should centre around the need for conservation of habitat, and maintaining and upgrading existing habitat protection measures. This may entail reducing or restricting access to particular areas, controlling types of activity taking place in that area, screen plantings to protect habitats, habitat improvement through forward plantings, etc. Species in this group and Group 3 below are the ones most likey to suffer as development in the inner corridor accelerates.

3 -- Highly sensitive to human disturbance.

Breeding in the corridor of two species in this category, the Peregrine Falcon and Wedge-tailed Eagle, could be disrupted irrevocably by human disturbance. Development could at worst cause these two species to cease breeding in the river corridor and especially in the case of the falcon, may result in the species deserting the area entirely.

Neither of these species will tolerate humans near their nests. Every care should be taken to ensure that development does not increase pressure on areas where these species breed. A single visitor to a falcon eyrie in early spring may cause desertion of the nest and abandonment of the site altogether.

The third species is the Yellow-tailed Black-Cockatoo. Numbers of this species are already low and appear to be declining. The casuarinas at the confluence of the Cotter and Murrumbidgee Rivers appear to be a traditional winter roost. Public access should be restricted to minimise disturbance of these birds.

2.6 Special requirements

A very brief outline of special habitat requirements is shown for each species. In general these are particular environmental features on which a species is dependent, or with which it is usually associated. These requirements are expanded upon in Section 4 below.

2.7 Status summary

The following elements have been used to summarise the status of each species recorded in the inner corridor:

-- Distribution

Rare	recorded at fewer than 4 sites
Uncommon	recorded at 5-9 sites
Common	recorded at 10-13 sites
Very Common	recorded at 14-18 sites

-- Breeding status

Non-breeding	does not breed in inner corridor
(Breeding)	assumed breeding - constantly present during breeding season
Breeding*	probably breeding - birds recorded carrying nesting material, giving territorial song, defending territory, etc.
Breeding	Confirmed breeding - nests with eggs or young, dependent fledglings, etc.

-- Occurrence

Visitor	Only visits the river corridor sporadically. Occurrence in the corridor is largely accidental.
Resident	Inhabits the river corridor year-round. Most are sedentary species.
Summer migrant	Spends the warmer part of the year (generally from August-September to March-April) in the river corridor, but winters in the warmer parts of Australia and South-east Asia.
Winter migrant	Spends the winter in the river corridor, but moves to the higher country in spring. These species return to the corridor in autumn.
Spring passage migrant	Passes along the river corridor in the spring. These are mostly breeding summer migrants in areas adjacent to the corridor. The return autumn passage of these species was not recorded.
Autumn passage migrant	Passes along the river corridor in autumn. These species are mainly breeding summer migrants in areas adjacent to the river. Inward spring passage not recorded.

SPECIES		HAB-ITAT	BIRDS /ha	TOTAL SITES	SENSI-TIVITY	REQUIREMENTS	BREEDING AND STATUS
Hoary-headed Grebe	*Poliocephalus poliocephalus*	R	0.01	3	1	still pools	rare visitor
Australasian Grebe	*Tachybaptus novaehollandiae*	R	0.08	9	1	still pools	uncommon visitor
Australian Pelican	*Pelecanus conspicillatus*	R	0.01	1	1	still pools	rare visitor
Great Cormorant	*Phalacrocorax carbo*	V/R	0.19	18	2	still pools, casuarinas	very common non-breeding resident /visitor
Little Pied Cormorant	*Phalacrocorax melanoleucos*	V/R	0.19	17	2	still pools	very common non-breeding resident /visitor
Little Black Cormorant	*Phalacrocorax sulcirostris*	R	0.03	6	2	still pools	uncommon non-breeding resident
Pacific Heron	*Ardea pacifica*	(R)	0.00	3	2	muddy banks	rare visitor
White-faced Heron	*Ardea novaehollandiae*	V/R	0.18	18	1	still pools	very common breeding* resident /visitor
Great Egret	*Egretta alba*	(R)	0.00	1	2	-	rare visitor
Rufous Night Heron	*Nycticorax caledonicus*	V	0.00	3	2	roosts in willows	rare non-breeding summer migrant
Sacred Ibis	*Threskiornis aethiopica*	R	0.01	4	1	-	rare visitor
Black Swan	*Cygnus atratus*	R	0.01	1	1	still pools	rare visitor
Muscovy	*Cairina moschata*	R	0.00	2	0	-	rare non-breeding resident (escapee)
Pacific Black Duck	*Anas superciliosa*	V/R	1.55	18	1	breeds on islets	very common breeding resident
Mallard	*Anas sp.*	R	0.01	2	0	-	rare non-breeding resident (escapee)
Grey Teal	*Anas gibberifrons*	R	0.01	2	1	still pools	rare visitor
Maned Duck	*Chenonetta jubata*	V/R	1.25	18	1	-	very common breeding resident
Black-shouldered Kite	*Elanus notatus*	(V)	0.00	1	1	hunts over open ground	rare visitor
Whistling Kite	*Haliastur sphenurus*	(V)/R	0.01	5	2	hunts along river	uncommon breeding* resident
Brown Goshawk	*Accipiter fasciatus*	V/R	0.06	13	2	often hunts over scrub	common breeding resident
Collared Sparrowhawk	*Accipiter cirrhocephalus*	R	0.00	1	1	-	rare visitor
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	(V/R)	0.00	1	1	hunts along river	rare visitor
Wedge-tailed Eagle	*Aquila audax*	(V)	0.00	14	3	will desert if disturbed	very common breeding resident
Little Eagle	*Hieraaetus morphnoides*	(V)	0.00	11	2	-	common (breeding) resident
Spotted Harrier	*Circus assimilis*	(V)	0.00	1	1	hunts along river	rare visitor
Swamp Harrier	*Circus aeruginosus*	(V/R)	0.00	2	1	hunts along river	rare visitor
Peregrine Falcon	*Falco peregrinus*	(V)/R	0.00	4	3	will desert if disturbed	rare breeding resident
Australian Hobby	*Falco longipennis*	(V)	0.00	2	1	-	rare visitor

SPECIES		HAB-ITAT	BIRDS /ha	TOTAL SITES	SENSI-TIVITY	REQUIREMENTS	BREEDING AND STATUS
Brown Falcon	*Falco berigora*	V	0.01	12	2	-	common (breeding) resident
Australian Kestrel	*Falco cenchroides*	V	0.01	13	2	hunts over open ground	common breeding* resident
Brown Quail	*Coturnix australis*	V	0.04	1	1	coarse, dense grass	rare visitor
Lewin's Rail	*Rallus pectoralis*	(V/R)	--	-	2	reed-beds	rare visitor
Dusky Moorhen	*Gallinula tenebrosa*	R	0.06	5	1	still pools	uncommon non-breeding visitor /resident
Eurasian Coot	*Fulica atra*	R	0.06	6	1	still pools	uncommon non-breeding visitor
Masked Lapwing	*Vanellus miles*	V/R	0.06	6	2	sand-bars, muddy banks	uncommon non-breeding visitor /resident
Red-capped Plover	*Charadrius ruficapillus*	R	0.01	1	1	sand-bars	rare visitor
Black-fronted Plover	*Charadrius melanops*	R	0.27	9	2	sand-bars	uncommon (breeding) resident
Common Sandpiper	*Tringa hypoleucos*	R	0.00	1	1	sand-bars	rare visitor
Feral Pigeon	*Columba livia*	(V)	0.00	1	0	-	rare visitor - introduced
Common Bronzewing	*Phaps chalcoptera*	V	0.01	2	1	often found with acacias	rare visitor
Crested Pigeon	*Ocyphaps lophotes*	(V)	--	-	1	irruptive	probably rare non-breeding resident
Wonga Pigeon	*Leucosarcia melanoleuca*	(V)	0.00	1	1	usually in wet forest	rare visitor
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	V	0.18	13	3	feeds on casuarina nuts	common non-breeding visitor /resident
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	0.04	8	1	only found in Cotter area	uncommon non-breeding visitor /resident
Galah	*Cacatua roseicapilla*	V/R	0.26	17	0	feeds on open ground	very common breeding resident
Sulphur-crested Cockatoo	*Cacatua galerita*	V/R	0.34	18	0	roosts by water	very common breeding* resident
Australian King-Parrot	*Alisterus scapularis*	V	0.04	5	0	generally restricted to Cotter area	uncommon non-breeding resident /visitor
Crimson Rosella	*Platycercus elegans*	V	1.11	18	0	found in all habitats	very common breeding* resident
Eastern Rosella	*Platycercus eximius*	V/R	0.34	16	0	prefers more open areas	very common breeding* resident
Red-rumped Parrot	*Psephotus haematonotus*	V	0.14	10	1	prefers more open areas	common breeding resident
Pallid Cuckoo	*Cuculus pallidus*	V	0.04	12	1	-	common spring passage migrant /(breeding) summer migrant
Fan-tailed Cuckoo	*Cuculus pyrrhophanus*	V	0.04	12	1	common in casuarinas	common breeding summer migrant
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	V	0.04	13	1	-	common breeding summer migrant

TABLE 3. CONTINUED

SPECIES		HAB-ITAT	BIRDS /ha	TOTAL SITES	SENSI-TIVITY	REQUIREMENTS	BREEDING AND STATUS
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	V	0.04	12	1	-	common breeding summer migrant
Southern Boobook	*Ninox novaeseelandiae*	V	0.01	2	1	-	rare visitor
Tawny Frogmouth	*Podargus strigoides*	(V)	--	-	1	-	rare breeding resident
White-throated Needletail	*Hirundapus caudacutus*	(V/R)	0.00	2	0	aerial feeder	rare non-breeding summer migrant
Laughing Kookaburra	*Dacelo novaeguineae*	V	0.13	16	1	breeds in hollow limbs	very common breeding* resident
Sacred Kingfisher	*Halcyon sancta*	V	0.00	6	1	breeds in hollow limbs	uncommon breeding* summer migrant
Rainbow Bee-eater	*Merops ornatus*	V	0.68	18	1	digs nests in sandy soil	very common breeding summer migrant
Dollarbird	*Eurystomus orientalis*	V	0.06	11	1	breeds in hollow limbs	common breeding summer migrant
Skylark	*Alauda arvensis*	V	0.00	6	1	inhabits open paddocks	uncommon (breeding) resident (introduced)
Welcome Swallow	*Hirundo neoxena*	V/R	0.77	17	0	feeds over water	very common breeding summer migrant /resident
Tree Martin	*Cecropis nigricans*	V/R	0.33	7	1	feeds over water	uncommon breeding summer migrant
Fairy Martin	*Cecropis ariel*	V/R	0.14	3	1	feeds over water	rare spring passage migrant
Richard's Pipit	*Anthus novaeseelandiae*	V	0.02	8	1	inhabits open paddocks	uncommon (breeding) resident
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	V	0.01	15	1	-	very common (breeding) summer migrant
Cicadabird	*Coracina tenuirostris*	V	0.00	1	1	breeds in ranges	rare spring passage migrant
White-winged Triller	*Lalage sueurii*	V	0.01	4	1	-	rare (breeding) summer migrant
Blackbird	*Turdus merula*	V	0.35	18	0	needs some dense cover	very common breeding resident (introduced)
Rose Robin	*Petroica rosea*	V	0.01	4	1	breeds in ranges	rare non-breeding winter migrant
Flame Robin	*Petroica phoenicea*	V/R	0.14	15	2	-	very common breeding winter migrant
Scarlet Robin	*Petroica multicolor*	V	0.20	16	1	prefers more open areas	very common non-breeding winter migrant
Red-capped Robin	*Petroica goodenovii*	V	0.00	1	2	-	rare breeding* resident
Hooded Robin	*Melanodryas cucullata*	V	0.01	2	2	usually in euc.woodland	rare visitor
Eastern Yellow Robin	*Eopsaltria australis*	V	0.24	15	2	needs dense cover	very common breeding resident
Jacky Winter	*Microeca leucophaea*	V	0.01	3	2	-	rare visitor
Golden Whistler	*Pachycephala pectoralis*	V	0.06	13	1	spends summer in ranges	common non-breeding winter migrant
Rufous Whistler	*Pachycephala rufiventris*	V	0.91	18	1	-	very common breeding summer migrant

TABLE 3. CONTINUED

SPECIES		HAB-ITAT	BIRDS /ha	TOTAL SITES	SENSI-TIVITY	REQUIREMENTS	BREEDING AND STATUS
Grey Shrike-thrush	*Colluricincla harmonica*	V	0.15	17	1	needs some cover	very common breeding* resident /winter migrant
Leaden Flycatcher	*Myiagra rubecula*	V	0.07	7	2	usually in euc. woodland	uncommon breeding summer migrant
Restless Flycatcher	*Myiagra inquieta*	(V)	0.00	6	2	-	uncommon breeding resident
Grey Fantail	*Rhipidura fuliginosa*	V	1.39	18	1	needs some cover	very common breeding summer migrant /resident
Willie Wagtail	*Rhipidura leucophrys*	V/R	0.17	16	0	feeds in open areas	very common breeding summer migrant /resident
Eastern Whipbird	*Psophodes olivaceus*	V	0.01	2	1	usually in wet forest	rare visitor
Clamorous Reed-Warbler	*Acrocephalus stentoreus*	V/R	0.11	7	1	breeds in large reedbeds	uncommon breeding* summer migrant
Golden-headed Cisticola	*Cisticola exilis*	(V)	0.00	1	1	rank grass by water	rare visitor
Rufous Songlark	*Cinclorhaphus mathewsi*	V	0.01	4	2	breeds in open woodland	rare (breeding) summer migrant
Superb Fairy-wren	*Malurus cyaneus*	V/R	7.46	18	1	dense cover/open ground	very common breeding resident
White-browed Scrubwren	*Sericornis frontalis*	V/R	1.52	18	1	needs dense cover	very common breeding resident
Speckled Warbler	*Sericornis sagittatus*	V	0.01	1	2	usually in dry woodland	rare (breeding) visitor/resident
Weebill	*Smicrornis brevirostris*	V	0.02	8	1	feeds in euc. canopy	uncommon breeding* resident /visitor
Western Gerygone	*Gerygone fusca*	V	0.01	4	1	euc.woodland	rare (breeding) summer migrant
White-throated Gerygone	*Gerygone olivacea*	V	0.00	7	1	euc. woodland	uncommon (breeding) summer migrant
Brown Thornbill	*Acanthiza pusilla*	V/R	1.63	18	1	needs dense cover	very common breeding resident
Buff-rumped Thornbill	*Acanthiza reguloides*	V	0.45	16	1	needs some cover	very common breeding resident
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	V	1.67	17	1	often in open areas	very common breeding resident
Yellow Thornbill	*Acanthiza nana*	V	0.44	12	1	only in casuarinas	common breeding resident
Striated Thornbill	*Acanthiza lineata*	V	0.29	10	1	often in euc. canopy	common (breeding) resident
Southern Whiteface	*Aphelocephala leucopsos*	(V)	0.00	2	1	open land with dead trees	rare breeding resident
Varied Sittella	*Daphenositta chrysoptera*	V	0.04	6	1	forest - trunk-feeder	uncommon breeding* resident
White-throated Treecreeper	*Climacteris leucophaea*	V	0.27	17	1	forest - trunk-feeder	very common (breeding) resident

TABLE 3. CONTINUED

SPECIES		HAB-ITAT	BIRDS /ha	TOTAL SITES	SENSI-TIVITY	REQUIREMENTS	BREEDING AND STATUS
Red-browed Treecreeper	*Climacteris erythrops*	(V)	0.00	1	1	forest - trunk-feeder	rare visitor
Brown Treecreeper	*Climacteris picumnus*	(V)	--	-	2	woodland, fallen timber	rare visitor
Red Wattlebird	*Anthochaera carunculata*	V	0.03	12	0	-	common (breeding) resident/autumn passage migrant
Noisy Friarbird	*Philemon corniculatus*	V	0.15	17	1	usually feeds in eucs	very common breeding* summer migrant
Noisy Miner	*Manorina melanocephala*	(V)	0.00	3	1	-	rare visitor
Yellow-faced Honeyeater	*Lichenostomus chrysops*	V	10.98	18	1	migrates along river, breeds in corridor	very common breeding summer migrant/autumn passage migrant
White-eared Honeyeater	*Lichenostomus leucotis*	V	0.05	17	1	migrates along river	very common winter/autumn passage migrant
Yellow-tufted Honeyeater	*Lichenostomus melanops*	(V)	--	-	1	migrates along river	rare autumn passage migrant
Fuscous Honeyeater	*Lichenostomus fuscus*	(V)	0.00	1	1	migrates along river	rare passage migrant
White-plumed Honeyeater	*Lichenostomus penicillatus*	V	0.14	9	1	needs permanent water	uncommon breeding resident
Brown-headed Honeyeater	*Melithreptus brevirostris*	(V)	0.00	1	1	-	rare passage migrant
White-naped Honeyeater	*Melithreptus lunatus*	V	0.36	14	1	breeds in corridor	migrant/passage migrant.
Crescent Honeyeater	*Phylidonyris pyrrhoptera*	V	0.04	6	1	migrates along river, often with grevilleas	very common breeding* summer uncommon (breeding) resident
New Holland Honeyeater	*Phylidonyris novaehollandiae*	V/R	0.12	10	1	often with grevilleas	common (breeding) resident
Eastern Spinebill	*Acanthorhynchus tenuirostris*	V	0.52	17	1	often with grevilleas	very common breeding* resident /winter migrant
White-fronted Chat	*Ephthianura albifrons*	V	0.01	2	2	sand-bars	rare breeding summer migrant
Mistletoebird	*Dicaeum hirundinaceum*	V	0.76	14	1	requires casuarinas	very common breeding summer migrant
Spotted Pardalote	*Pardalotus punctatus*	V	0.03	13	1	-	common (breeding) resident
Striated Pardalote	*Pardalotus striatus*	V	0.12	17	1	-	very common (breeding) resident
Silvereye	*Zosterops lateralis*	V	4.15	18	0	-	very common breeding summer migrant
European Goldfinch	*Carduelis carduelis*	V	1.43	18	0	often with thistles	very common breeding summer migrant /resident - introduced
House Sparrow	*Passer domesticus*	V	0.01	5	0	only nests in buildings	uncommon breeding resident
Red-browed Firetail	*Emblema temporalis*	V/R	3.27	18	1	-	very common breeding resident

TABLE 3. CONTINUED

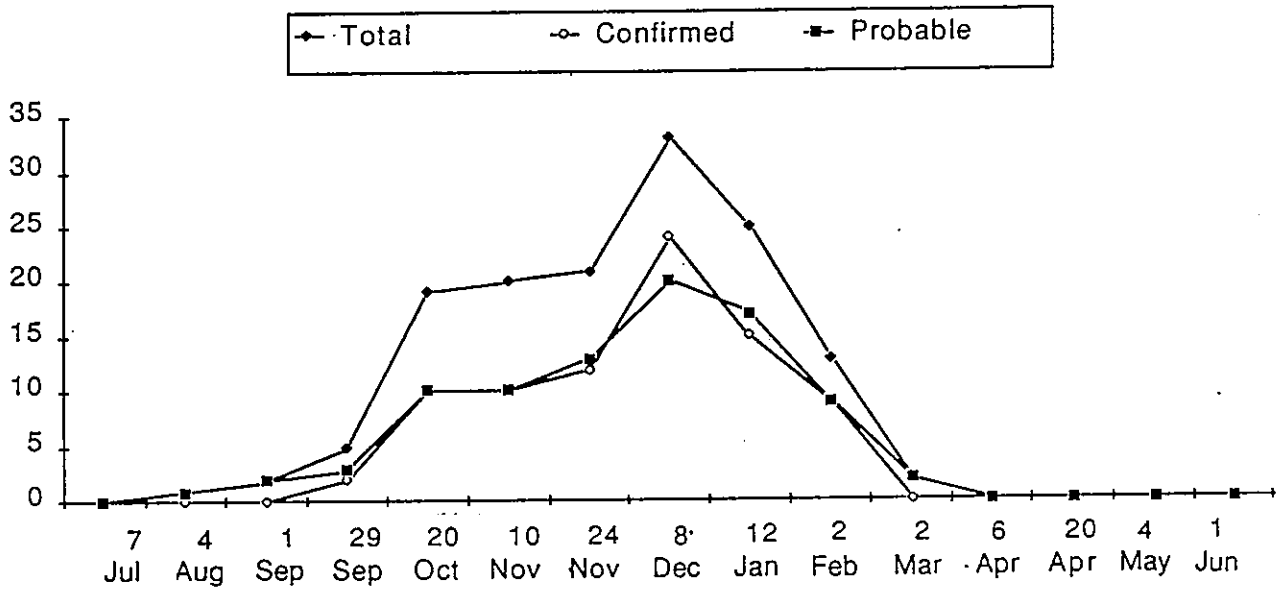
SPECIES		HAB-ITAT	BIRDS /ha	TOTAL SITES	SENSI-TIVITY	REQUIREMENTS	BREEDING AND STATUS
Diamond Firetail	*Emblema guttata*	(V)	0.00	1	1	-	rare visitor
Double-barred Finch	*Peophila bichenovii*	V	0.07	4	1	open areas	rare (breeding) resident
Common Starling	*Sturnus vulgaris*	V	0.13	14	0	-	very common breeding resident
Olive-backed Oriole	*Oriolus sagittatus*	(V)	0.00	2	1	feeds in open paddocks	rare visitor
Satin Bowerbird	*Ptilonorhynchus violaceus*	(V)	--	-	1	-	rare visitor
White-winged Chough	*Corcorax melanorhamphos*	V	0.10	7	0	feeds on open ground	uncommon breeding resident
Australian Magpie-lark	*Grallina cyanoleuca*	V/R	0.21	14	1	feeds on open ground	very common breeding resident
*Dusky Woodswallow	*Artamus cyanopterus*	V	0.11	13	1	often near water	common breeding summer migrant
Grey Butcherbird	*Cracticus torquatus*	(V)	0.00	2	1	prefers woodland/forest	rare visitor
Australian Magpie	*Gymnorhina tibicen*	V	0.57	18	0	feeds on open ground	very common breeding resident
Pied Currawong	*Strepera graculina*	V	0.16	18	0	-	very common breeding resident
Grey Currawong	*Strepera versicolor*	(V)	0.00	4	1	-	rare visitor
Australian Raven	*Corvus coronoides*	V	0.22	18	0	prefers open paddocks	very common breeding* resident
Little Raven	*Corvus mellori*	(V)	0.00	4	1	prefers open paddocks	rare visitor

2.8 Breeding

This section relates only to confirmed and probable breeding records. Those species for which breeding was assumed in Table 3 are not included as no data are available for them. For definitions of 'confirmed', 'probable' and 'assumed', see Section 2.7 above.

The total number of species breeding on each survey is shown in Fig. 1.

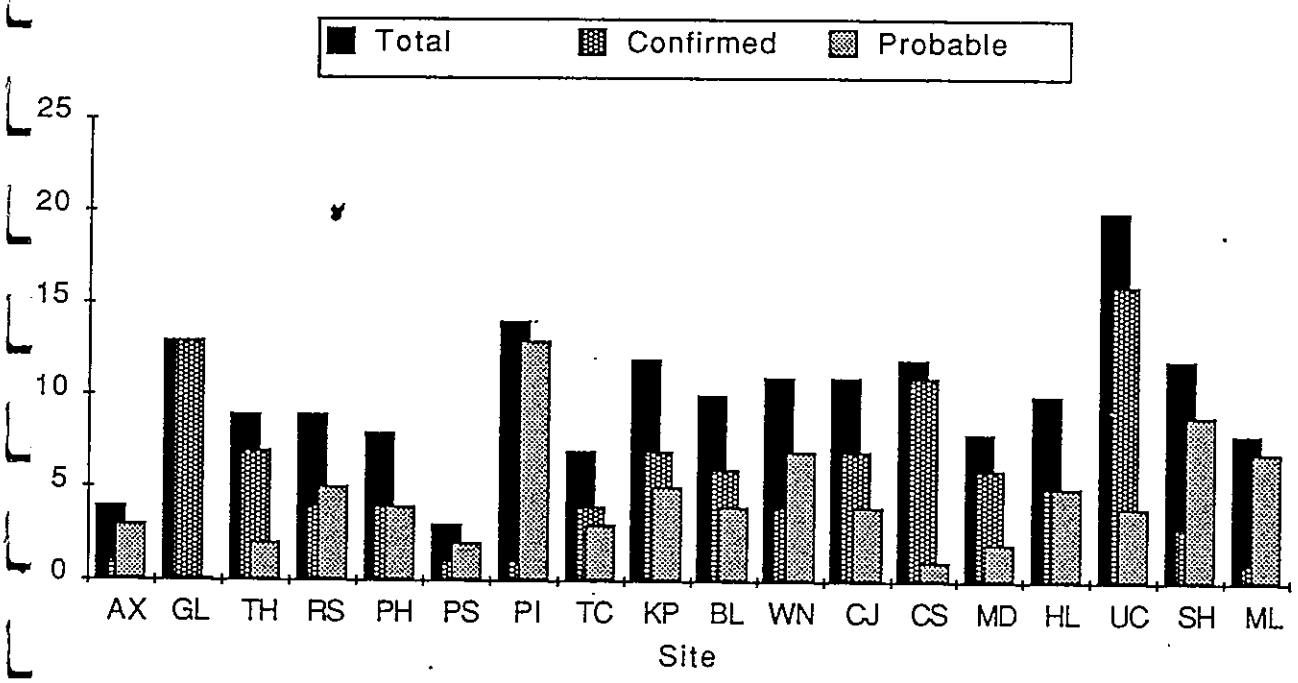
FIG. 1. NUMBER OF SPECIES BREEDING PER SURVEY



Breeding activity was recorded as early as August - a pair of Australian Ravens was seen at a nest. A further two species, the Brown Thornbill and Red-browed Firetail were displaying and nest-building respectively. The first nests with eggs were recorded in late September. Many species were breeding by the end of October and breeding activity reached a peak in December when 33 species were breeding - 24 confirmed and 9 probable. Breeding activity declined after December. The last signs of breeding were recorded in March when dependent young of both the Sulphur-crested Cockatoo and Rufous Whistler were still present.

The number of species breeding at each survey site is shown in Fig. 2.

FIG. 2 NUMBER OF SPECIES BREEDING AT EACH SITE



3. SITES

3.1 Introduction

This section contains a brief physical description for each survey site with a summary of the avifauna and planning and management guidelines. The various headings under which physical and ornithological information is presented are described below.

SITE NUMBER:	Sites are numbered sequentially from 1 to 21.
SITE NAME:	The name of the site which was adopted for the purposes of this report.
OTHER NAMES:	Alternative names of the survey site used in other publications.
CORRIDOR UNIT:	The corridor unit in which the site is located. A corridor unit is defined as a unit with relatively homogeneous environmental characteristics distinguishing it from others and influencing its land-use potential (NCDC 1981).
CHANNEL SUBSECTION:	The channel subsection in which the survey site is located. A channel subsection is defined by changes in the nature of the river bed and banks (NCDC 1981).
LOCATION:	The precise location of the survey site.
1:2500 MAP:	The relevant 1:2500 map of the Murrumbidgee River Corridor (NCDC 1977).
1:10 000 MAP:	The relevant map in the Australian Capital Territory 1:10 000 Planning Series. Commonwealth of Australia 1984.
ACCESS:	Access to the survey site for the purposes of this project.
TRANSECT PROFILE:	A description of the topography of the vegetated component of the survey site.
RIVER BED:	A description of the topography of the riverine component of the survey site.
VEGETATION:	A brief description of the vegetation in and around the survey site.
OUTER CORRIDOR FEATURES:	General features of the outer corridor adjacent to the site which may have a bearing on the avifauna of the site.

SIMILAR AREAS: Other channel subsections which are similar to the one in which the site is located.

PROPOSED DEVELOPMENTS: Developments which have been proposed for the site and adjacent areas in NCDC 1981 and 1983.

OVERALL RATING: A rating out of a maximum of 36 has been given to each site. The rating has been calculated by assigning values to the 12 attributes given for each site using the following values : H = 3, M = 2, L = 1. The rating is then the sum of these 12 values. See 'Summary of Attributes' below.

RANK: The 18 major sites were ranked according to their overall rating. Sites with equal overall ratings (e.g. Bullen Range and Shepherd's Reserve) were ranked together. There are 13 ranks, 1 for the richest site and 13 for the poorest, and these are shown below the overall rating for each site.

VEGETATED AND RIVERINE HABITATS:

Using the system of weighting H,M and L outlined above, a summary rating for vegetated and riverine habitats is given for each site. These are calculated by adding the values of ABV, TSV and ASV for vegetated habitats; and ABR, TSR and ASR for riverine habitats. The following divisions were adopted: H=9-7, M=6-5, L=4-3.

For the three sites which were only surveyed on one occasion, and for which no attributes are available, assessment of vegetated and riverine habitats is based on a qualitative comparison of these sites with the 18 regularly surveyed sites.

SUMMARY OF ATTRIBUTES: Various attributes for each of the 18 sites which were surveyed regularly are given for each site to allow objective comparisons to be made. These attributes were not calculated for the three sites which were only visited during the breeding season. In these cases, the

words 'not applicable' have been inserted. The attributes are based on the following parameters:

- Average number of birds. This is the average number of birds recorded at each site per visit.

- Total number of species. This is the aggregate number of species recorded at each site during all 15 visits.

- Average number of species. This is the average number of species recorded at each site per visit.

- Vegetated habitats. This is the vegetated part of the survey site, measuring 1 ha in area.

- Riverine habitats. This is the unvegetated part of the survey site.

- Inner corridor. This includes the entire survey site and an area reaching 200m from the river on either side.

- Breeding level. This is the number of species which breed or probably breed in the inner corridor at each site.

The following abbreviations are used for each site:

ABV	Average number of birds in vegetated habitats
TSV	Total number of species in vegetated habitats
ASV	Average number of species in vegetated habitats
ABR	Average number of birds in riverine habitats
TSR	Total number of species in riverine habitats
ASR	Average number of species in riverine habitats
ABVR	Average number of birds in vegetated and riverine habitats combined
TSVR	Total number of species in vegetated and riverine habitats combined
ASVR	Average number of species in vegetated and riverine habitats combined
TSI	Total number of species in the inner corridor
ASI	Average number of species in the inner corridor
B	Breeding level L= 3-7, M=8-10, H=11-20 (no. of breeding species)

High, medium and low were calculated for each attribute by examining the full

range of 18 values for each attribute, discounting the highest and lowest value, taking the difference between the second highest and lowest value and dividing it by three. These three divisions formed the basis for the categories used above. See Appendix III.

SPECIAL FEATURES: The special ornithological features are described briefly.

SENSITIVITY: Each site has been described using one of three levels of sensitivity: high, medium and low. A highly sensitive site should not be disturbed as it might lead to a serious impact on the avifauna. Moderately sensitive sites will withstand small amount of disturbance without major impact to the avifauna. Sites with low sensitivity have generally already been disturbed, or are considered to be able to withstand increased use without detrimental effects on the avifauna.

PROTECTION: Measures required to protect the intrinsic value of special features of each site are proposed.

RECOMMENDED LEVEL OF USAGE:

This is closely tied to the sensitivity of each site. As a rule, only low levels of usage are acceptable in highly sensitive sites and sites with low sensitivity will tolerate heavier use. High levels of use include large numbers of visitors and vehicles, camping areas, swimming, kiosks, toilets, barbeques, high numbers of bushwalkers and canoeists. Moderate use includes smaller picnic areas, with moderate numbers of bushwalkers and canoeists. Low levels of use infer very few visitors. Development should be restricted to walking trails.

IMPROVEMENTS: Ways of improving each site as a habitat for birds are suggested.

SITE NUMBER:	1
SITE NAME:	Angle Crossing
OTHER NAMES:	Nil
CORRIDOR UNIT:	1.1
CHANNEL SUBSECTION:	1A
LOCATION:	West bank, transect commences 400 m downstream of the crossing.
1:2 500 MAP:	N.A.
1:10 000 MAP:	208-570
ACCESS:	The site may be reached on foot from Angle Crossing Road.
TRANSECT PROFILE:	Steep, cleared hills border the site to the west. The site itself lies on an extensive gently sloping terrace, with some bare rocky flood channels.
RIVER BED:	Broad and flat, with occasional sand bars and beaches, and marshy banks.
VEGETATION:	The terrace supports dense leptospermum thickets and the occasional willow. The area is rather open and exposed. There is some timber on the eastern bank with more leptospermum thickets at the river's edge.
OUTER CORRIDOR FEATURES:	West side: steep rolling hills, cleared pasture with some scattered timber. East side: steep, more heavily timbered forest; pasture at higher levels.
SIMILAR AREAS:	Remainder of subsection 1A and subsection 1B.
PROPOSED DEVELOPMENTS:	Walking trail, recreation area improvements, vegetation restoration.



Fig. 1. Angle Crossing Survey Site.

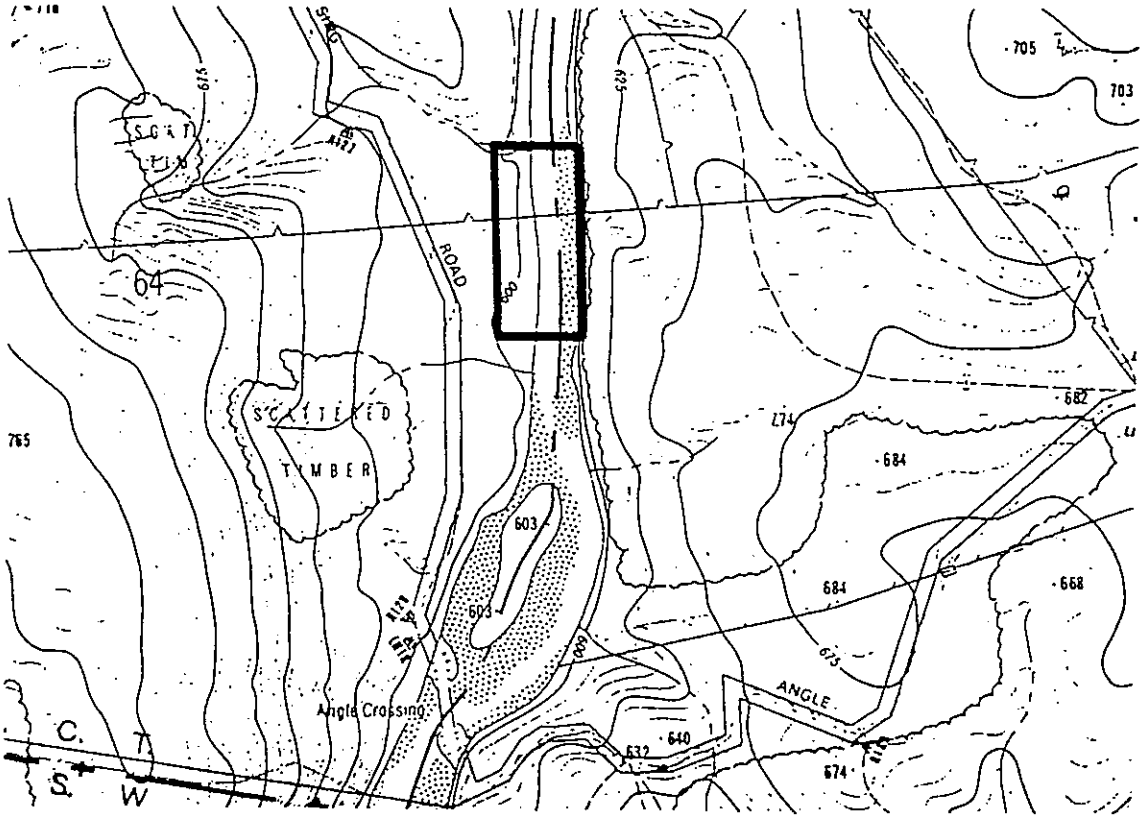


Fig. 2. Location of Angle Crossing Survey Site.

OVERALL RATING: 25

RANK: 6

VEGETATED HABITATS: M

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
H	L	M	M	M	H	H	L	H	M	M	L

SPECIAL FEATURES: Angle Crossing supported more Rainbow Bee-eaters than any other site. This is principally because the extensive sandy terrace where the site was located provided perfect breeding conditions for the bee-eaters, which need soft soil in which to dig nest burrows. Extensive leptospermum thickets account for the presence of unusually high numbers of Superb Fairy-wrens and Brown Thornbills. The combination of thickets and open ground accounts for the large numbers of Yellow-rumped Thornbills, higher than at any other site. Crimson and Eastern Rosellas and Rufous Whistlers were all present in higher numbers than elsewhere, possibly reflecting the influence of the adjacent woodland on the composition of the avifauna at the site.

Blackbirds were recorded regularly at Angle Crossing. These constitute the southernmost records of this species in the ACT.

Generally good riverine habitat attracts above-average numbers of Pacific Black Duck, Maned Duck and Red-capped Plover.

SENSITIVITY: Moderate

PROTECTION: Leptospermum scrub should be retained wherever possible. Sandy banks used by Rainbow Bee-eaters should be protected.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: Re-afforestation and vegetation restoration in inner corridor. Vehicle access on to the flood terrace should be restricted. Formal parking and picnic areas should be considered as a way of reducing erosion etc. Development should be designed to protect the flood terrace.

SITE NUMBER:	2
SITE NAME:	Gorge
OTHER NAMES:	Nil
CORRIDOR UNIT:	1.3
CHANNEL SUBSECTION:	1C
LOCATION:	An area in the gorge 2km upstream from the Gigerline site (see below) will be surveyed.
1:2 500 MAP:	Not available.
1:10 000 MAP:	208-570
ACCESS:	The area is reached on foot from Gigerline.
TRANSECT PROFILE:	Extensive rocky outcrops and terraces.
RIVER BED:	Narrow, shallow, many rapids, many backwaters and small pools.
VEGETATION:	Leptospermum thickets, some callitris.
OUTER CORRIDOR FEATURES:	Steep slopes with supporting open forest, some areas of regrowth.
SIMILAR AREAS:	1C

PROPOSED DEVELOPMENT: Nature conservation.

OVERALL RATING:	Not applicable
RANK:	Not applicable
VEGETATED HABITATS:	M
RIVERINE HABITATS:	L
SUMMARY OF ATTRIBUTES:	Not applicable
SPECIAL FEATURES:	The rocky inner corridor with its poor vegetation and fast flowing water only provides fair habitat for birds. The lightly timbered grazing land on the southern and western side of the river supports a good range of woodland species.
SENSITIVITY:	Moderate
PROTECTION:	Maintain protection at current level. At present, access is restricted to small numbers of bushwalkers and canoeists as access is very difficult and is only possible on foot.
LEVEL OF USAGE:	Low
IMPROVEMENTS:	Nil

SITE NUMBER:	3
SITE NAME:	Gigerline
OTHER NAMES:	Smiths Road
CORRIDOR UNIT:	1.4
CHANNEL SUBSECTION:	1D
LOCATION:	The transect is located at the site of a disused sand extraction works below Smiths Road approximately 1000m upstream of the Gudgenby confluence.
1:2 500 MAP:	M20
1:10 000 MAP:	200-576
ACCESS:	A track leaves Smiths Road immediately east of the bridge across the Gudgenby River. The track leads directly to the site.
TRANSECT PROFILE:	Bare, cleared slopes let on to a wide, flat, elevated, sandy terrace. As a result of mining operations, there are a number of steep sandy banks.
RIVER BED:	Broad, shallow, slow flowing, sand bars.
VEGETATION:	Dominated by acacias with a number of larger eucalypts, and some leptospermum. The steep banks down to the river are covered with dense weeds and are fringed with reeds at water level. On the terrace itself are considerable areas of open ground.
OUTER CORRIDOR FEATURES:	Bare cleared slopes to the south, cleared pasture to the north with some scattered timber.
SIMILAR AREAS:	Remainder of Subsection 1D.
PROPOSED DEVELOPMENTS:	Picnic sites, parking areas, vegetation rehabilitation.



Fig. 3. Gigerline Survey Site.

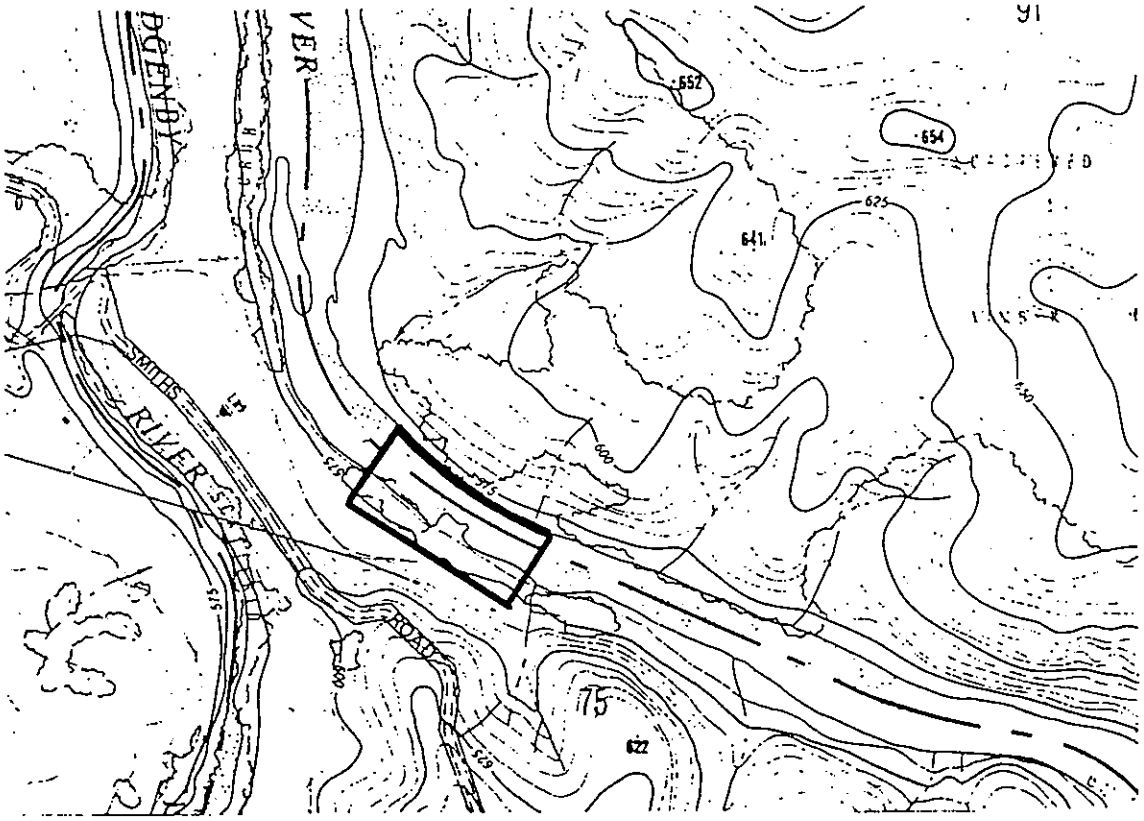


Fig. 4. Location of Gigerline Survey Site.

OVERALL RATING: 36

RANK: 1

VEGETATED HABITATS: H

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
H	H	H	H	H	H	H	H	H	H	H	H

SPECIAL FEATURES:

The most highly rated site. Gigerline was the richest area surveyed. It is in the highest classification for all attributes. The avifaunal diversity and abundance reflects the diversity of habitat types in the survey area - open ground, small and medium shrubs, mature trees, and broad still pools.

Broad, still pools provide good habitat for waterbirds and even the limited reedbeds held small numbers of Clamorous Reed-Warblers.

Red-rumped Parrots which are not widely distributed in the inner corridor were recorded regularly here. This species is closely tied to senescent eucalypts as it nests in hollow limbs and spouts and requires open ground to forage over. It is likely that it breeds in the old Manna Gums near Gigerline.

Large numbers of Rainbow Bee-eaters were recorded here, they nest in the walls of disused sandpits and in other sandy embankments. Other birds of predominantly woodland habitats which were present in numbers above the average for the corridor as a whole included Striated Thornbill, Striated Pardalote, Dusky Woodswallow and White-plumed Honeyeater. Gigerline was the only site that supported a breeding colony of this latter species. All these species benefitted from the stands of eucalypt in the vicinity.

Tree Martins were recorded more frequently here than anywhere else. Like the Red-rumped Parrot mentioned above, they breed in hollow limbs of dead eucalypts. Gigerline was the only site on the river where breeding for this species was confirmed.

SENSITIVITY: Moderate

PROTECTION: At present, no limit is placed on vehicle access to the site; indeed it is possible to drive right down to the water. There are no clearly defined parking areas or picnic/barbeque areas with the result that the area is covered with vehicular tracks, remains of fires and litter. Such unstructured and uncontrolled use has an adverse effect on the birds through erosion and destruction of vegetation. It is recommended that access be controlled.

Any development of picnic areas, parking areas would be inappropriate as this is the richest site on the river.

The walls of the old sand pits are favoured nesting sites for the Rainbow Bee-eater which is particularly common in the area. Steps should be taken to preserve the walls as they are.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: There is considerable scope for general landscape planting of this area. Vehicular tracks could be re-grassed, block plantings of shrubs could be carried out, and forward plantings of eucalypts will help to ensure the future diversity of this site.

The richness and diversity of this site, its relative stability and good access make it suitable for development as a low-intensity interpretational site. Permanent outdoor display boards describing the avifauna of the site and the relationships between birds and their habitats would be appropriate as long as these did not conflict with the goals of conserving the area.

SITE NUMBER:	4
SITE NAME:	Tharwa
OTHER NAMES:	Nil
CORRIDOR UNIT:	2.3
CHANNEL SUBSECTION:	2B
LOCATION:	The transect commences approximately 300m north of the Tharwa Bridge on the west bank of the river.
1:2 500 MAP:	M19
1:10 000 MAP:	200-576
ACCESS:	A track branches off the Tharwa Road to the north at the western end of the bridge.
TRANSECT PROFILE:	Broad, high sandy terrace with narrow sub-terrace almost at water level. On the east, very extensive open river flats.
RIVER BED:	Broad, shallow, many sand bars.
VEGETATION:	The upper levels of the terrace are dominated by acacia scrub and rank weeds including aniseed. the lower terrace supports dense stands of willows at water level. The are a number of remaining Manna Gums on the eastern bank.
OUTER CORRIDOR FEATURES:	West side: gently rolling hills, improved pasture with scattered eucalypts. East bank: cleared river flats.
SIMILAR AREAS:	Subsections 2A, 2B
PROPOSED DEVELOPMENTS:	Picnic areas, recreation trails, reveg-etation.

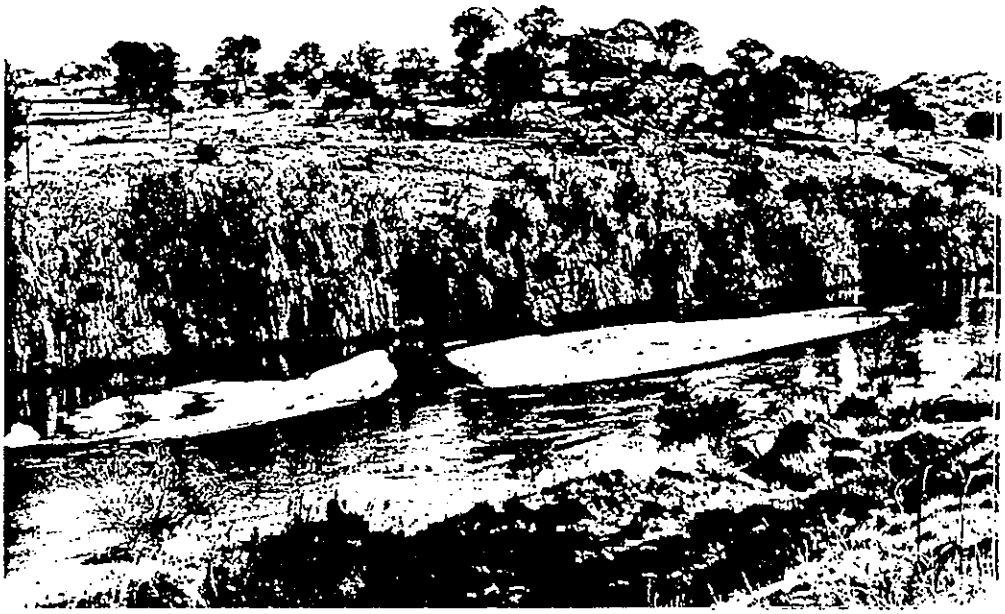


Fig. 5. Tharwa Survey Site.

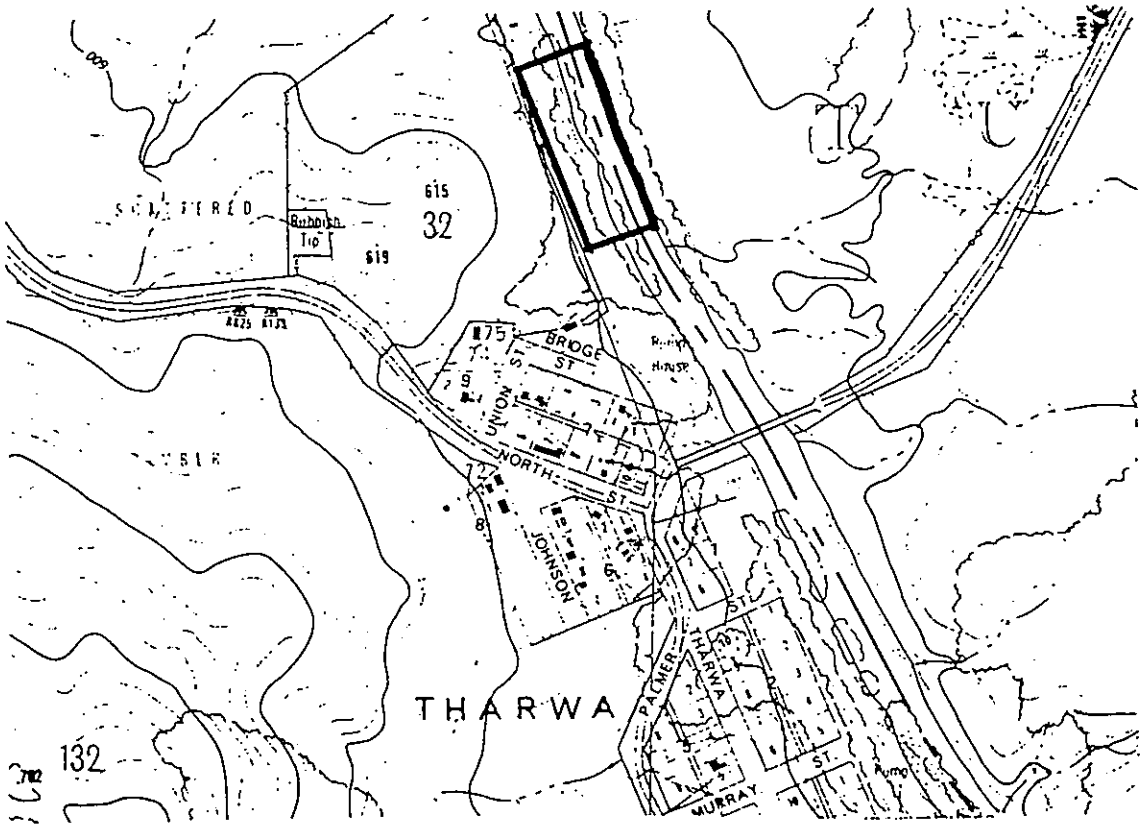


Fig. 6. Location of Tharwa Survey Site.

OVERALL RATING: 34

RANK: 2

VEGETATED HABITATS: H

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
H	H	H	M	H	H	H	H	H	H	H	M

SPECIAL FEATURES: A very good area. The remarks on varied habitat structure at Gigerline above, apply equally as well to Tharwa. Extensive pools and sand-bars provide excellent conditions for ducks, coots, lapwings and plovers. High numbers of Eastern Rosellas, Galahs, Scarlet Robins, Common Starlings and Australian Magpies reflect the adjacent open woodland and grassland habitats. Common Bronzewings which generally feed on fallen acacia seeds were found here. The proximity of houses in the village account for records of two exotic species, the House Sparrow and the Feral Pigeon at this site. Both species are dependent on manmade structures for nest-sites. Rank grass beside the river provides habitat for the Golden-headed Cisticola. Tharwa was the only place on the river in which this species was recorded.

This was also only site at which the Red-capped Plover was recorded. This species is usually found at Lakes Bathurst and George, and occasionally at Lake Burley Griffin. This is the first record for the Murrumbidgee.

SENSITIVITY: Moderate

PROTECTION: As this site is so rich, some blanket protection is warranted. The few remaining Manna Gums on the eastern bank require protection.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: Plantings of shrubs and eucalypts would enhance the area. Formalisation of the walking trail on the western bank would be appropriate. Picnic areas and low-moderate intensity recreation areas may be appropriate.

SITE NUMBER:	5
SITE NAME:	Riverside
OTHER NAMES:	Lanyon Woolshed
CORRIDOR UNIT:	2.4
CHANNEL SUBSECTION:	2C
LOCATION:	The transect lies on the east bank of the river immediately below the woolshed itself.
1:2 500 MAP:	M17
1:10 000 MAP:	200-576
ACCESS:	An unsealed road leaves the main Lanyon Homestead public access road shortly after the Nolan Gallery and leads directly to the woolshed and out-buildings. The survey area may be reached on foot from there.
TRANSECT PROFILE:	The site is situated on a broad gently undulating sandy bank. There is little clear distinction between the river channel and the surrounding country.
RIVER BED:	The river at this point is very wide and slow, there are some sand bars and mud flats along the shore.
VEGETATION:	Severely modified habitat. The banks have been cleared right to the water's edge, and support lush exotic grasses. The river is lined with dense stands of willows. Only the occasional Manna Gum remains on the opposite bank, which is otherwise devoid of vegetation.
OUTER CORRIDOR FEATURES:	Open grazing country on both sides. Some scattered timber.
SIMILAR AREAS:	2C, 2D, 2E.

PROPOSED DEVELOPMENTS: Intensive water-based recreation area.



Fig. 7. Riverside Survey Site.

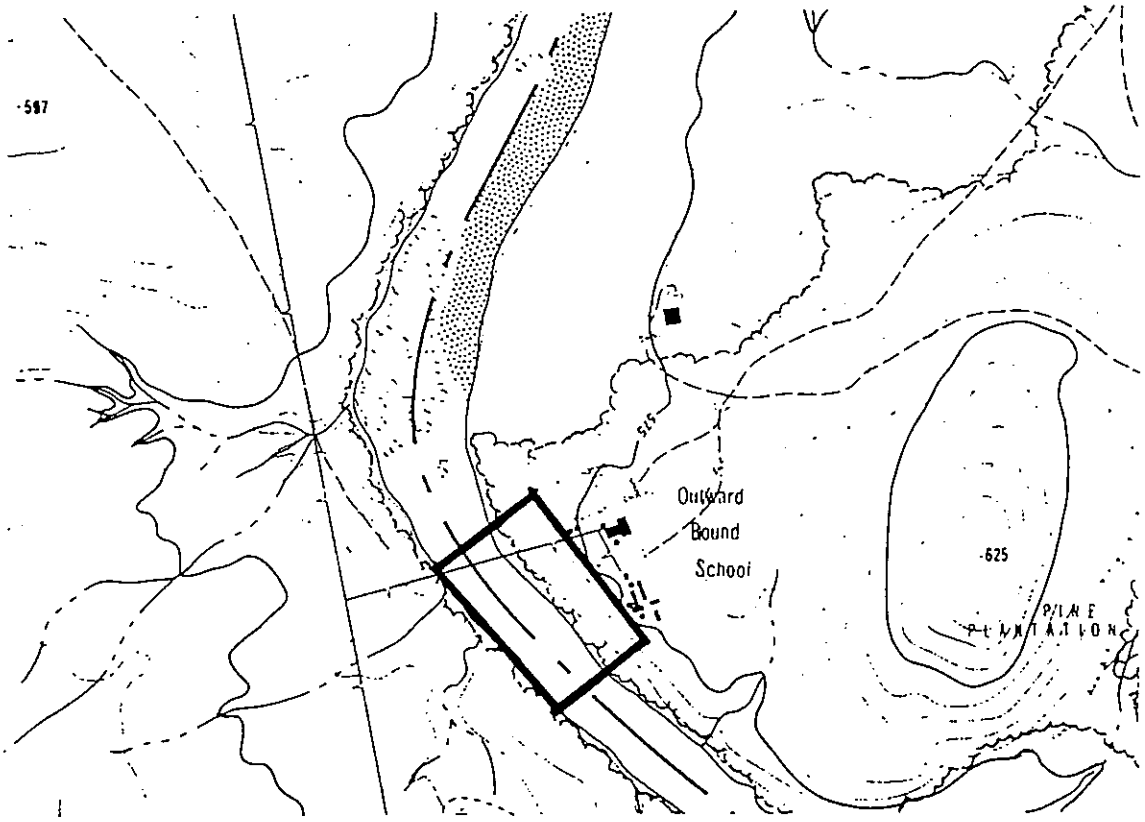


Fig. 8. Location of Riverside Survey Site.

OVERALL RATING: 29

RANK: 3

VEGETATED HABITATS: H

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
M	H	M	H	H	H	M	H	H	L	M	M

SPECIAL FEATURES: A site with very rich riverine habitats. In terms of average number of birds (12.7), average number of species (4.1) and total number of species (17) in riverine habitats, this site was richer than any other. The river is particularly attractive to birds because there are large, still pools where grebes, ducks, moorhens and coots are able to feed. These species feed and seek shelter on the surface of the water - which is only possible if it is flowing very slowly. Still pools are also attractive to insects, hence the numbers of aerial feeders, including swallows and martins. The area has muddy shorelines and extensive sandbars and shallows. These areas are favoured by lapwings, herons and dotterels. The river is lined with willows which provide shelter for the Rufous Night Heron.

In many areas, the vegetated habitats are badly degraded - stock are permitted to graze right down to the water. There is considerable scope for revegetation.

Old eucalypts in the corridor provide nest hollows for parrots and kookaburras.

Pacific Black Duck breed on islets in the river here. This is one of the few areas where this species was recorded breeding.

SENSITIVITY: High (riverine), low (vegetated)

PROTECTION: Proposals for intensive water-based recreations are incompatible with the value of this area and others like it as waterbird habitat. High numbers of waterbirds will only continue to shelter in these parts of the river if they can do so undisturbed.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: At present, stock are permitted to graze right down to the water in most parts of this area. The result is that there is little vegetative cover along the river, and there are very few landbirds. Exclusion of grazing and extensive revegetation along the inner corridor would greatly improve the habitat for landbirds. If the area is to be developed in any way, it will be essential to leave refuge areas in riverine habitats where waterbirds can rest and feed undisturbed, and to protect these refuges with screen plantings. This means that land-based developments should be kept away from the river at selected points to minimise human disturbance.

SITE NUMBER:	6
SITE NAME:	Point Hut
OTHER NAMES:	Below Point Hut
CORRIDOR UNIT:	3.1
CHANNEL SUBSECTION:	3A
LOCATION:	The site is situated on the west bank of the river, about 400 m downstream of the crossing.
1:2 500 MAP:	M15
1:10 000 MAP:	200-576
ACCESS:	A track leaves the sealed road to north on the west side of the crossing. The site may be reached on foot a short distance past the end of the track.
TRANSECT PROFILE:	A moderately wide terrace, partly sand and partly rocky flood channels.
RIVER BED:	Broad and rocky, with many small, shallow pools separated by rocky outcrops and islets.
VEGETATION:	The southern end of the site consists of scattered clumps of leptospermum interspersed by rank weeds. The northern end includes a stand of large casuarinas with some leptospermum understorey and stacks of flood-washed dead timber.
OUTER CORRIDOR FEATURES:	Undulating slopes cleared for grazing, some scattered timber on western side.
SIMILAR AREAS:	3A
PROPOSED DEVELOPMENTS:	This area will come under considerable pressure as Tuggeranong Town Centre is developed. Extension of recreation area to the north, revegetation, and a recreation trail have been proposed.



Fig. 9. Point Hut Survey Site: rocky pools, medium to large casuarinas, leptospermum understorey.

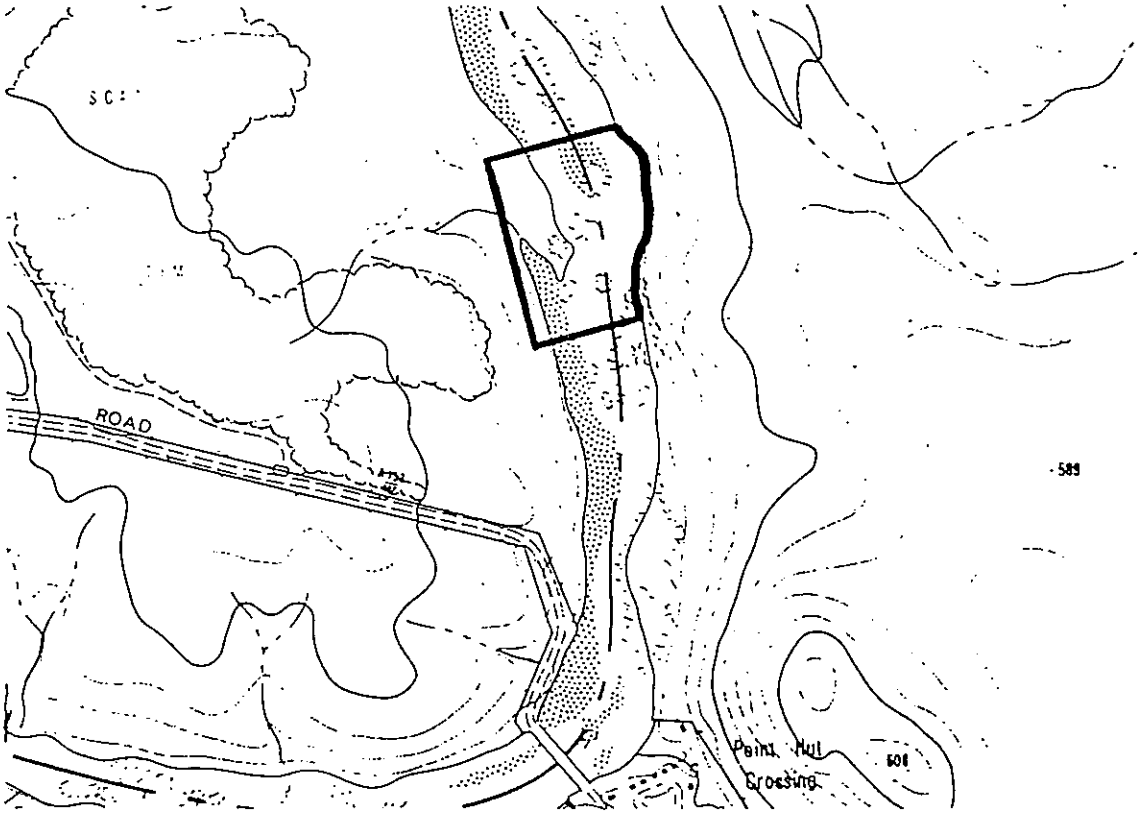


Fig. 10. Location of Point Hut Survey Site.

OVERALL RATING: 27

RANK: 4

VEGETATED HABITATS: H

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
H	M	M	M	M	H	H	H	M	M	L	M

SPECIAL FEATURES: The White-faced Heron appears to breed on this part of the river - it was recorded here more regularly than elsewhere and immature birds were reported here. Both Pacific Black Duck and Clamorous Reed-Warblers took advantage of the relatively good riverine habitats. White-fronted Chats were recorded here regularly during the breeding season along the water's edge and probably bred in the area. This was the only site which appeared to have a resident population of Willie Wagtails. Being at the southern limit of the casuarinas in the ACT, this site was the southernmost at which Mistletoebirds were recorded.

This is the point at which the southernmost branch of the northern honeyeater migration route leaves the river. It is currently an ideal place to observe the migration and has good potential for development as an interpretational site. In recent years, public expeditions have been conducted to Point Hut to observe the honeyeater migration.

SENSITIVITY: Moderate

PROTECTION: This is a rich area that will come under increasing pressure as Tuggeranong develops. Steps should be take to protect the river from the effects of urban development. A buffer zone should be created between the river and any developments to minimise impacts. As development proceeds between the river and Mt Rob Roy, the significance of Point Hut as a place to watch the honeyeater migration may decrease. It is likely that the honeyeaters will leave the river closer to Pine Island and take advantage of the cover afforded by trees in newly

established urban areas. They only follow the river to Point Hut because the land to the east is devoid of trees.

Developments should be sited well back from the river.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: Grazing should be excluded from this part of the river, as stock reduce the amount of vegetation and destroy potential habitat for birds. There is plenty of scope for revegetation, particularly on the eastern bank. Walking trails may be appropriate, but major developments should be kept well back from the river.

Erection of permanent outdoor display signs describing the honeyeater migration would be a most valuable improvement.

SITE NUMBER:	7
SITE NAME:	Pine Island South
OTHER NAMES:	Nil
CORRIDOR UNIT:	3.1
CHANNEL SUBSECTION:	3B
LOCATION:	The site is located several hundred metres southeast of the southernmost parking area at Pine Island on the east bank of the river.
1:2 500 MAP:	M14
1:10 000 MAP:	200-582
ACCESS:	A number of ephemeral foot tracks lead upstream along the east bank of the river from the parking area to the site.
TRANSECT PROFILE:	Moderately steep, narrow sandy terrace, rocky in places.
RIVER BED:	Broad, with large still pools separated by rocky rapids. Snags, some sandy spits and beaches.
VEGETATION:	Narrow band of mature casuarinas with some leptospermum undergrowth, tangles, flood-washed timber.
OUTER CORRIDOR FEATURES:	Undulating grazing land with scattered timber to the west, with higher bare hills in the east.
SIMILAR AREAS:	3B
PROPOSED DEVELOPMENTS:	This area is already under considerable pressure from traffic at Pine Island. Like Site 5, pressure will be greatly increased with the development of the Tuggeranong Town Centre.

OVERALL RATING: 27

RANK: 4

VEGETATED HABITATS: H

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
H	M	M	M	M	H	H	H	M	M	L	M

SPECIAL FEATURES:

The White-faced Heron appears to breed on this part of the river - it was recorded here more regularly than elsewhere and immature birds were reported here. Both Pacific Black Duck and Clamorous Reed-Warblers took advantage of the relatively good riverine habitats. White-fronted Chats were recorded here regularly during the breeding season along the water's edge and probably bred in the area. This was the only site which appeared to have a resident population of Willie Wagtails. Being at the southern limit of the casuarinas in the ACT, this site was the southernmost at which Mistletoebirds were recorded.

This is the point at which the southernmost branch of the northern honeyeater migration route leaves the river. It is currently an ideal place to observe the migration and has good potential for development as an interpretational site. In recent years, public expeditions have been conducted to Point Hut to observe the honeyeater migration.

SENSITIVITY: Moderate

PROTECTION:

This is a rich area that will come under increasing pressure as Tuggeranong develops. Steps should be take to protect the river from the effects of urban development. A buffer zone should be created between the river and any developments to minimise impacts. As development proceeds between the river and Mt Rob Roy, the significance of Point Hut as a place to watch the honeyeater migration may decrease. It is likely that the honeyeaters will leave the river closer to Pine Island and take advantage of the cover afforded by trees in newly



Fig. 11. Pine Island South Survey Site: still pools and large rapids, mature casuarinas and leptospermum understorey.

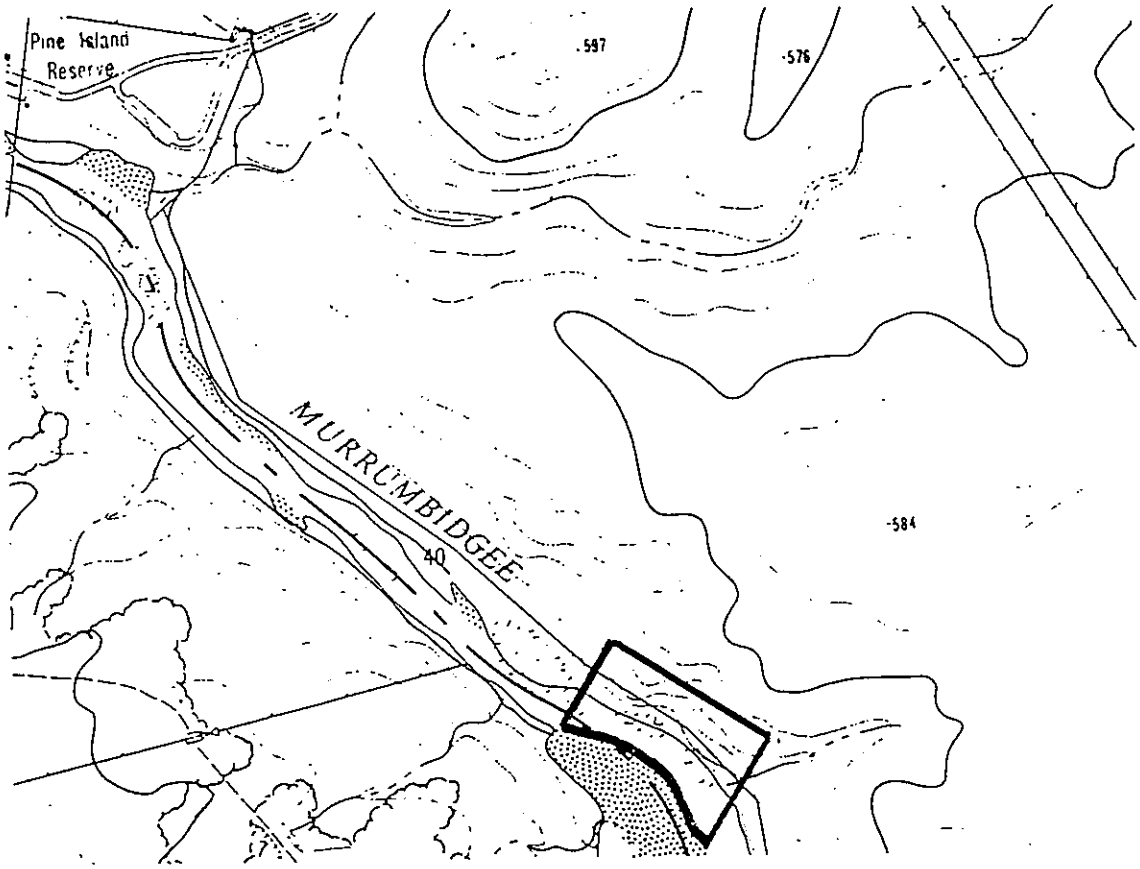


Fig. 12. Location of Pine Island South Survey Site.

OVERALL RATING: 19

RANK: 10

VEGETATED HABITATS: M

RIVERINE HABITATS: L

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
H	M	L	L	L	L	M	H	L	M	L	L

SPECIAL FEATURES: The Australasian Grebe and the three species of cormorant were recorded here more frequently than elsewhere, possibly on account of the area's relative seclusion. Overall, however, riverine habitats were poor.

Vegetated habitats were little better. The band of vegetation along the river is very narrow and this, coupled with the fast-flowing river, accounts for the general impoverishment of the avifauna here. Note that the average number of birds in vegetated habitats (ABV) is artificially high as a large flock of migrating honeyeaters was recorded in the site. In fact the site warrants a rating even lower than 19. Nevertheless two features are worthy of mention: this is the only site where the Weebill appeared to breed, and a rare vagrant in the inner corridor, the Red-browed Treecreeper, was recorded here.

One species has benefitted from the replacement of bushland with grazing land in this area: the Skylark. It is a bird of open grassland and was recorded more frequently here than anywhere else.

SENSITIVITY: Moderate

PROTECTION: Like Point Hut above, this site will come under increasing pressure at the development of Tuggeranong proceeds. Although the avifauna of the area is relatively impoverished, efforts should be made to ensure that it does not suffer any further disturbance. A buffer zone should be established between the river and any developments to preserve the peaceful nature of the river landscape and minimise the effects of development.

LEVEL OF USAGE: Moderate

IMPROVEMENTS:

There is great scope for revegetation on both sides of the river. Grevilleas and leptospermum would attract the smaller birds back into the area. Forward plantings of casuarinas should be carried out and the outer parts of the corridor would benefit from plantings of eucalypts. A walking trail may be appropriate.

SITE NUMBER:	8
SITE NAME:	Pine Island
OTHER NAMES:	Nil
CORRIDOR UNIT:	3.2
CHANNEL SUBSECTION:	3C
LOCATION:	The site is located at the western end of the 'island' itself and follows the southern bank of the major arm of the river.
1:2 500 MAP:	M14
1:10 000 MAP:	200-582
ACCESS:	The western end of the transect may be reached down a steep track from the carpark located at the southern edge of the pine plantation.
TRANSECT PROFILE:	The transect is located on the elevated islet, steep rocky banks fall sharply to the river. The site flattens out to the west and includes a beach area.
RIVER BED:	The river is narrow and deep, but relatively slow. The are some rocky outcrops and an extensive beach on the opposite bank.
VEGETATION:	Open callitris scrub, with scattered leptospermum thickets and rank weeds. The lower part of the site incorporates some moderately large casuarinas and the occasional willow.
OUTER CORRIDOR FEATURES:	To the south are lightly timbered undulating grazing country, to the east the land has been cleared, but also supports a pine plantation.
SIMILAR AREAS:	3C, 3D

PROPOSED DEVELOPMENTS: Pine Island North recreation site.



Fig. 13. Pine Island Survey Site: deep, rocky channel, elevated site with scattered callitris and leptospermum.

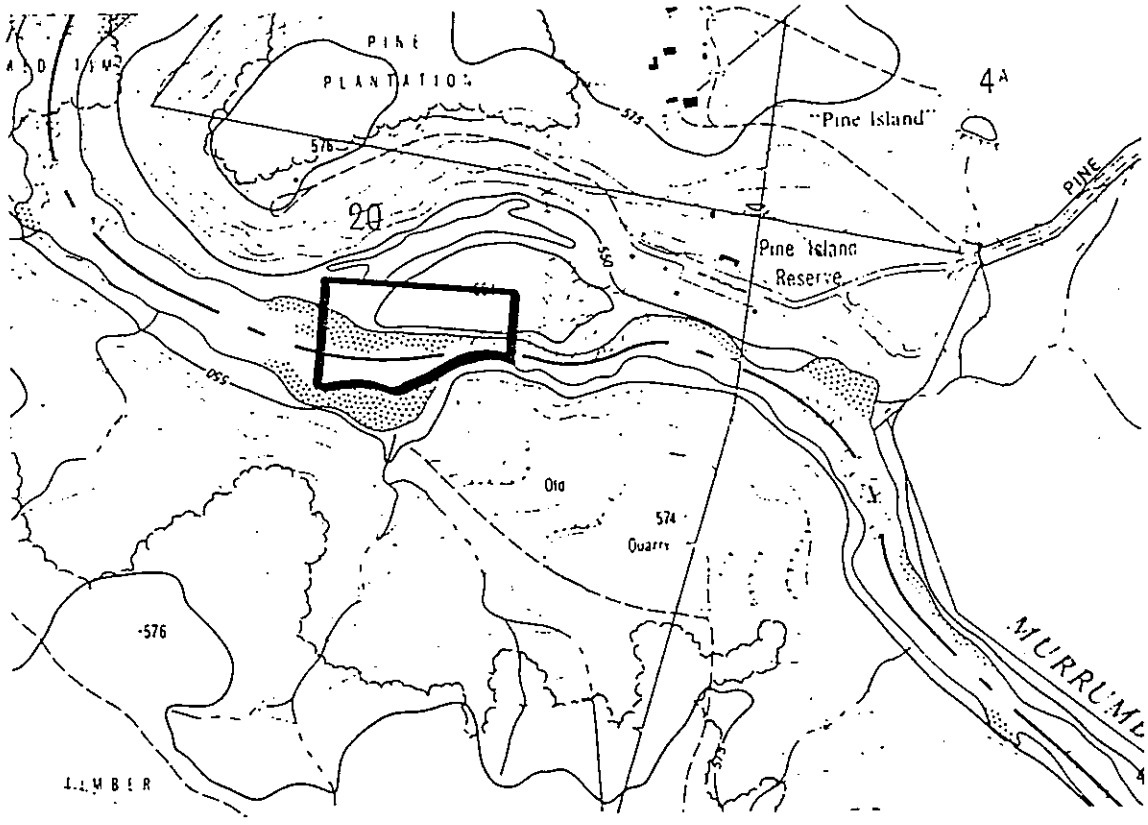


Fig. 14. Location of Pine Island Survey Site.

OVERALL RATING: 26

RANK: 5

VEGETATED HABITATS: M

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
L	H	M	L	H	H	L	H	M	M	M	H

SPECIAL FEATURES: Considering the restricted area of riverine habitats, the number of waterbird species was surprisingly high. Many species took advantage of the large sandy beach on the southern side of the river. One species, the Common Sandpiper, is uncommon in the ACT and this constituted the first record of the species on the Murrumbidgee.

The large reed-bed in the anabranch north of the 'island' supported a population of Clamorous Reed-Warblers which probably bred there.

Grey Shrike-thrushes were regularly present and probably bred in the area and a party of White-winged Choughs appeared occasionally.

SENSITIVITY: Moderate

PROTECTION: Steps should be taken to ensure that the condition of the 'island' itself does not deteriorate further. Total exclusion of visitors from the island while the area revegetates should be considered.

LEVEL OF USAGE: High

IMPROVEMENTS: Much of the area could be revegetated. Public access to the 'island' should be controlled to reduce erosion.

With a rich and accessible avifauna and large numbers of visitors, Pine Island has excellent potential for interpretation. Permanent out-door display boards would be appropriate.

A recreation area at Pine Island North would be appropriate, especially if it were sited in the pine forest which has relatively low ornithological value.

SITE NUMBER:	9
SITE NAME:	Tuggeranong Creek
OTHER NAMES:	Nil
CORRIDOR UNIT:	3.2
CHANNEL SUBSECTION:	3E
LOCATION:	The transect lies on the eastern bank of the river immediately upstream from the Tuggeranong Creek confluence.
1:2 500 MAP:	M13
1:10 000 MAP:	200-588
ACCESS:	The site lie a fifteen-minute walk from the lower Pine Island carpark, along ephemeral foot-tracks that follow the river.
TRANSECT PROFILE:	Rolling slopes abut steep sandy banks that drop almost vertically to the river. Some eroded sandy embankments.
RIVER BED:	Very broad and shallow, many small rocky outcrops, slow flowing, large flat stretches of water.
VEGETATION:	Little vegetation. The site is covered with long grass with the occasional casuarina and willow, but is generally open and exposed.
OUTER CORRIDOR FEATURES:	Gently sloping hills on both sides, cleared on the east, but some areas of scattered timber remain on the west.
SIMILAR AREAS:	3E
PROPOSED DEVELOPMENTS:	Low intensity recreation site on opposite bank, recreation trails, erosion control and rehabilitation.



Fig. 15. Tuggeranong Creek Survey Site: broad, shallow channel, with some weeds and sedge. Little other vegetation.

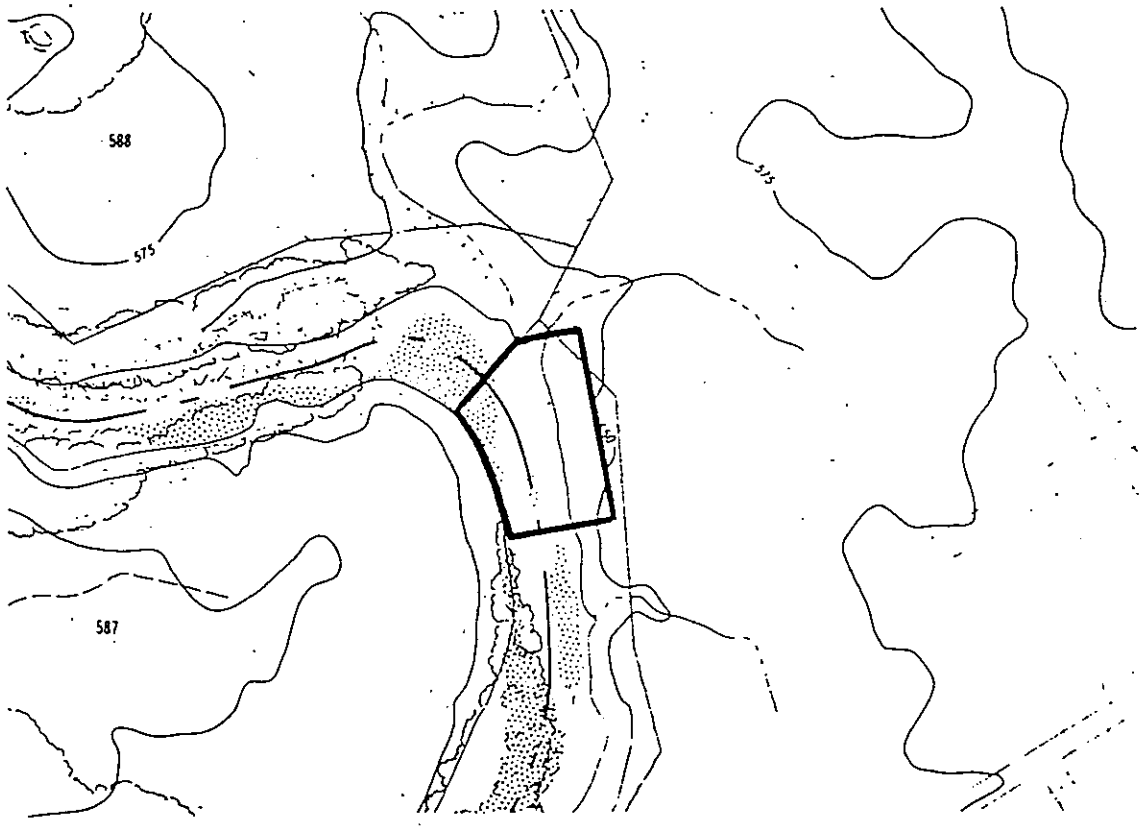


Fig. 16. Location of Tuggeranong Creek Survey Site.

OVERALL RATING: 22

RANK: 9

VEGETATED HABITATS: L

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
M	L	L	H	H	H	M	M	M	L	L	L

SPECIAL FEATURES: The generally impoverished vegetated habitats contrast with very rich riverine habitats. The vegetation is badly degraded as the result of grazing and clearing, only a narrow band of vegetation remains along the banks of the river. There are few trees. On the other hand, the broad still pools, fringing reed-beds and extensive sandbars are excellent habitat for waterbirds.

Steps should be taken to revegetate the inner corridor, further plantings of casuarinas would be particularly appropriate. At the same time, any developments in the area, such as walking trails should be set back behind banks of vegetation to preserve the riverine habitats' role as a place of refuge for waterbirds.

SENSITIVITY: High (riverine), low (vegetated)

PROTECTION: Screen planting along the eastern bank to isolate riverine habitats from visitors using the walking trail. This area's role as a refuge for waterbirds should be preserved.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: Revegetation should be carried out, with emphasis on screen plantings to protect the riverine habitats (see above).

Even a low-intensity recreation site in this area will reduce the value of this site as a waterbird refuge area.

SITE NUMBER:	10
SITE NAME:	Red Rocks Gorge
OTHER NAMES:	Nil
CORRIDOR UNIT:	4.1
CHANNEL SUBSECTION:	4A
LOCATION:	An area above the gorge itself will be surveyed.
1:2 500 MAP:	M12
1:10 000 MAP:	200-588
ACCESS:	The area can be reached on foot along ephemeral tracks from either Pine Island or Kambah Pool.
TRANSECT PROFILE:	High rocky cliffs.
RIVER BED:	Narrow with deep pools and many rapids
VEGETATION:	Little vegetation in steeper areas, but some casuarinas at water level, with leptospermum scrub and callitris where there is sufficient topsoil.
OUTER CORRIDOR FEATURES:	Undulating slopes, cleared pasture with some scattered timber.
SIMILAR AREAS:	4A

PROPOSED DEVELOPMENTS: Walking track

OVERALL RATING:	Not applicable
RANK:	Not applicable
VEGETATED HABITATS:	M
RIVERINE HABITATS:	L
SUMMARY OF ATTRIBUTES:	Not applicable
SPECIAL FEATURES:	The gorge itself supports little vegetation and there are few areas of still water. For this reason, few birds find it attractive. For further details contact the Principal Environmental Officer, Environment Section, NCDC.
SENSITIVITY:	High
PROTECTION:	Human disturbance should be kept at an absolute minimum in the gorge itself. No formal access paths should be built into the gorge. It is known that rock-climbers use the area. Such usage, particularly during the breeding season, needs careful assessment. Any walking trails on the western bank would be inappropriate.
LEVEL OF USAGE:	Low
IMPROVEMENTS:	Notices warning visitors against disturbing birds or approaching nests should be erected at either end of the walking trail. Closing the trail for up to a month every year should be considered.

SITE NUMBER:	11
SITE NAME:	Kambah Pool
OTHER NAMES:	Below Gorge
CORRIDOR UNIT:	4.1-4.2
CHANNEL SUBSECTION:	4B, 4C
LOCATION:	The site is located on the eastern bank immediately upstream of the large sandy beach.
1:2 500 MAP:	M11
1:10 000 MAP:	200-588
ACCESS:	A path leads from the southern carpark to the beach and changing facilities. The are ephemeral foot-tracks along the eastern bank to the site.
TRANSECT PROFILE:	Narrow sloping terrace at the foot of steep slopes. Rocky flood channels and exposed areas of sand.
RIVER BED:	Broad rocky shores with some rapids in the upper part of the site where the river flows moderately swiftly. These give way to a broad still pool with some snags and rocky outcrops.
VEGETATION:	The river is edged with medium to large casuarinas, with a leptospermum understorey. The upper slopes support numbers of eucalypts and clumps of leptospermum. There are a number of extensive reed-beds within the site and some scattered willows.
OUTER CORRIDOR FEATURES:	Open grazing land on the east and the steep, forested escarpment of the Bullen range on the west.
SIMILAR AREAS:	4B, 4C
PROPOSED DEVELOPMENTS:	



Fig. 17. Kambah Pool Survey Site: broad, still pool with mature casuarinas, dense leptospermum scrub and eucalypts on slopes.

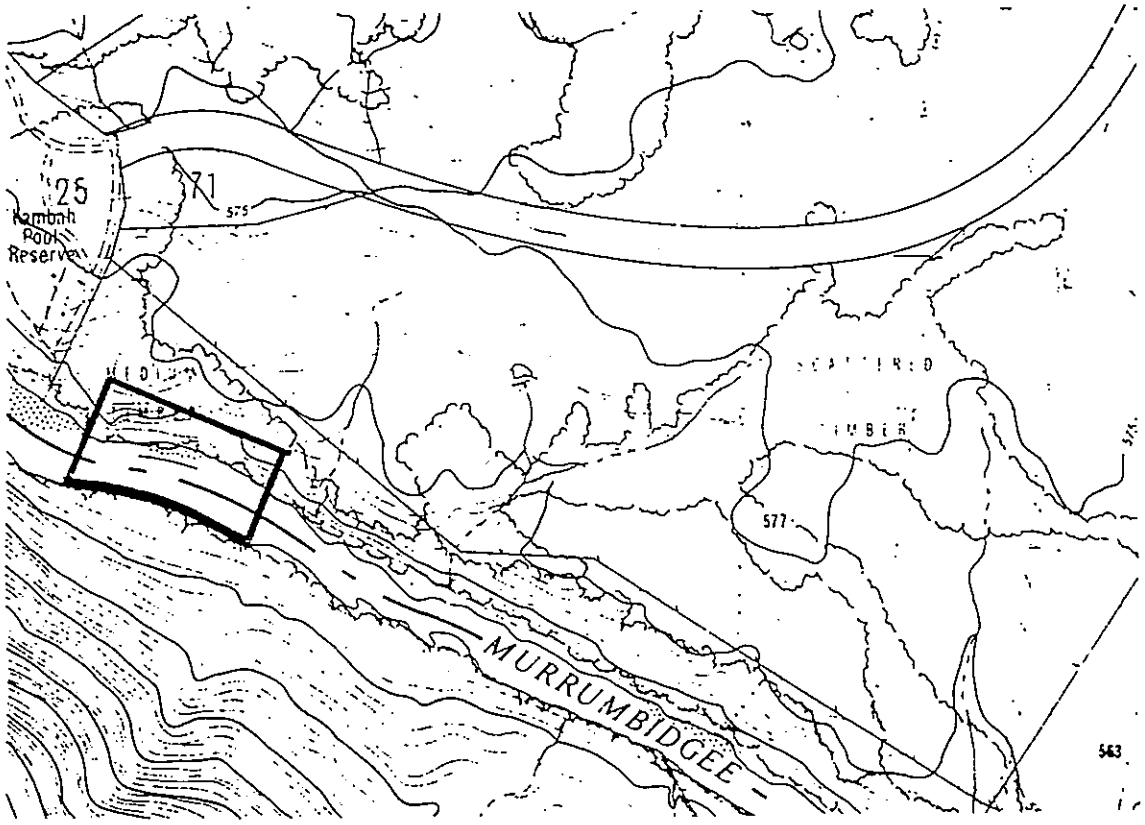


Fig. 18. Location of Kambah Pool Survey Site.

OVERALL RATING: 17

RANK: 12

VEGETATED HABITATS: L

RIVERINE HABITATS: L

SUMMARY OF ATTRIUBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
L	L	L	L	M	L	L	M	L	L	M	H

SPECIAL FEATURES: Overall, a rather impoverished site. Some waterbirds were usually present on the pool itself, but riverine habitats were rather poor. Steep ground and rocky soil account for the low rating of the vegetated habitats. One feature worthy of mention is that the Horsfields Bronze-Cuckoo bred here. Breeding for this species was not confirmed at any other site.

Kambah Pool marks the point at which the main southerly honeyeater migration route from the Cotter divides into two - many birds leave the river and head eastwards across the suburb of Kambah, while the remainder continue to follow the river to Point Hut.

For a site with such poor birdlife, a surprising level of breeding activity was recorded.

SENSITIVITY: Moderate

PROTECTION: The area around the car-parks should be protected against further erosion.

LEVEL OF USAGE: High

IMPROVEMENTS: The poverty of the avifauna is largely a function of the topography of the site. For this reason there is little scope for improvement, although further revegetation and erosion control should be considered.

SITE NUMBER:	12
SITE NAME:	Forster
OTHER NAMES:	Below Forster Trig.
CORRIDOR UNIT:	5.1
CHANNEL SUBSECTION:	5B
LOCATION:	A site 2 km downstream from Kambah Pool will be surveyed.
1:2 500 MAP:	M5
1:10 000 MAP:	192-600
ACCESS:	The site can be reached from farm tracks on the eastern side or on foot from the northern Kambah Pool carpark.
TRANSECT PROFILE:	Moderately steep rocky slopes.
RIVER BED:	Mostly straight channel with large pools and occasional rapids.
VEGETATION:	Leptospermum thickets and casuarinas.
OUTER CORRIDOR FEATURES:	Moderate to steep slopes on both sides, cleared pasture with occasional stands of timber.
SIMILAR AREAS:	5A, 5B, 5C
PROPOSED DEVELOPMENT:	Nature conservation.

OVERALL RATING:	Not applicable
RANK:	Not applicable
VEGETATED HABITATS:	M
RIVERINE HABITATS:	M
SUMMARY OF ATTRIBUTES:	Not applicable
SPECIAL FEATURES:	A special feature of this area is the large expanses of grevillea which grow on the eastern bank downstream from Kambah Pool. These appear to be some of the best areas for grevillea on the river and support large populations of Crescent and New Holland Honeyeaters. These are two of the less common species of honeyeater and may breed in the area. An active Wedge-tailed Eagle's eyrie is located in this section. There are probably no more than 10 pairs of this species in the ACT. It will not tolerate the presence of humans near its nest, and will desert. For further details see species sensitivity section above.
SENSITIVITY:	High (riverine), Low (vegetated)
PROTECTION:	Exclusion of all visitors from the western side of the river. This is an isolated stretch of the river with an appealing wilderness character which should be preserved as far as possible.
LEVEL OF USAGE:	Low
IMPROVEMENTS:	These is some scope for revegetation on the eastern side.

SITE NUMBER:	13
SITE NAME:	Bullen Range
OTHER NAMES:	Jew's Corner
CORRIDOR UNIT:	5.2
CHANNEL SUBSECTION:	5D
LOCATION:	The transect is located on the eastern bank of the river approximately 3km north-west of Kambah Pool.
1:2 500 MAP:	M9
1:10 000 MAP:	192-588
ACCESS:	Farm tracks through the Fairvale property.
TRANSECT PROFILE:	Moderately broad, elevated sandy terrace, backing on to steep slopes.
RIVER BED:	Very wide, still deep pool, with occasional rocky outcrop.
VEGETATION:	Medium to large casuarinas with a very dense leptospermum understorey on the terrace. Upper slopes support leptospermum thickets up to 3 m high, with the occasional callitris and *Pinus radiata*. There are some small areas of reeds and sedge along the river bed.
OUTER CORRIDOR FEATURES:	Western side: very steep slopes rising directly from the river carry extensive open forest areas of Scribbly Gum, Red Stringybark and shrubs, with callitris on lower slopes. Eastern side: improved pasture with scattered eucalypts.
SIMILAR AREAS:	5D, 5E

PROPOSED DEVELOPMENTS: Nature conservation, possible low intensity picnic site, with access track.



Fig. 19. Bullen Range Survey Site: very broad, still pool with mature casuarinas, dense leptospermum scrub. Note extensive stands of Callitris on opposite bank.

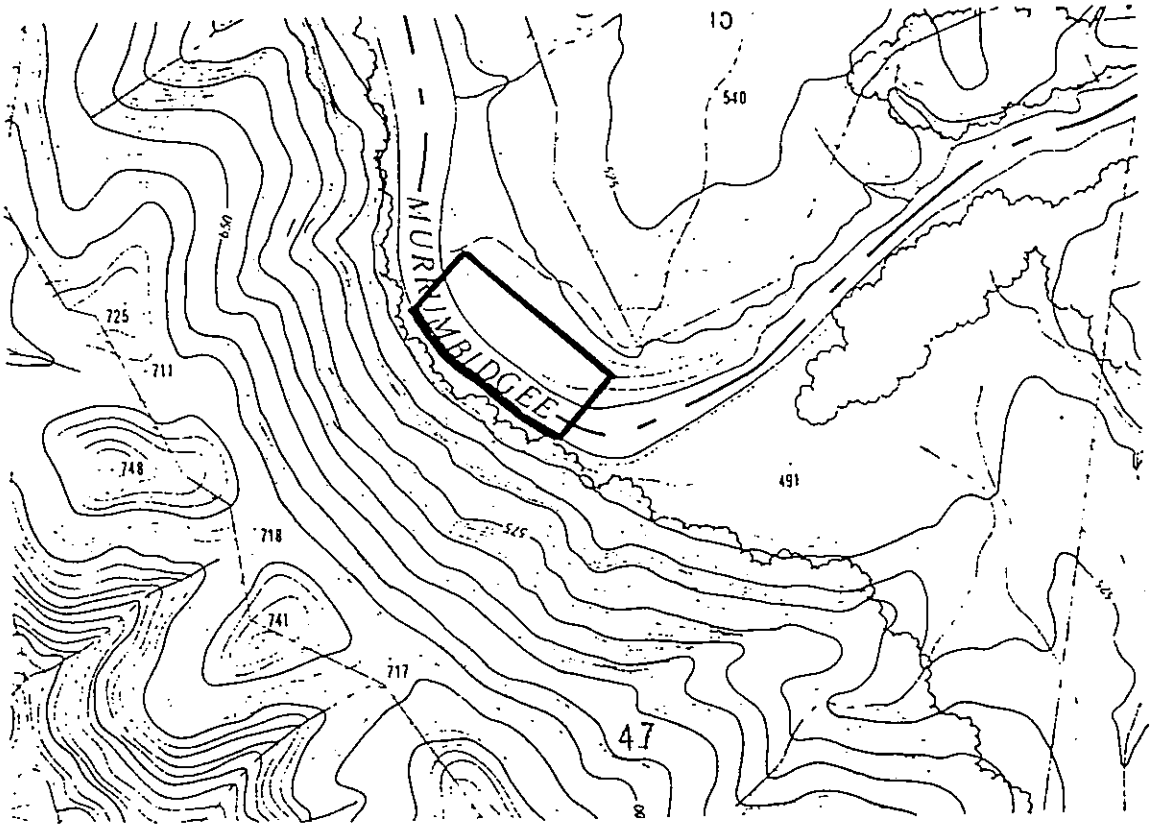


Fig. 20. Location of Bullen Range Survey Site.

OVERALL RATING: 24

RANK: 7

VEGETATED HABITATS: H

RIVERINE HABITATS: L

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
H	L	H	L	L	L	H	M	H	L	H	M

SPECIAL FEATURES: Due to access difficulties, this site was only covered on 12 of the 15 surveys. Half the site was burnt out in a summer bushfire. For these reasons, the attributes relating to the total numbers of species are lower than they should be and the site is ranked rather lower than it should be.

The most notable feature of the site is the extensive leptospermum thickets which dominate the shrub layer. These thickets proved ideal habitat for such birds as the Eastern Yellow Robin, Grey Fantail, Superb Fairy-wren, White-browed Scrubwren, Brown Thornbill, Buff-rumped Thornbill and Red-browed Firetail, all of which were recorded in very high numbers here.

Another feature is the significant montane element in the avifauna. This includes the Wonga Pigeon, Yellow-tailed Black-Cockatoo, Gang-gang Cockatoo and Cicadabird. The record of the Wonga Pigeon was in fact the first outside the Brindabella Ranges for the ACT.

The riverine habitats were surprisingly impoverished.

SENSITIVITY: Moderate

PROTECTION: Extensive leptospermum thickets and fine casuarinas which characterise the site should receive suitable protection.

LEVEL OF USAGE: Low

IMPROVEMENTS: The relative isolation of this site means that it has remained comparatively undisturbed. Any development in the site will entail reduction in the extent of the leptospermum thickets. This will reduce

the number of birds on the shrub-layer which are a feature of the area. It is felt that development of this site is inappropriate.

SITE NUMBER:	14
SITE NAME:	Winslade
OTHER NAMES:	Nil
CORRIDOR UNIT:	5.5
CHANNEL SUBSECTION:	5G
LOCATION:	The transect is located on the east bank 3 km upstream from the Cotter confluence.
1:2 500 MAP:	M7
1:10 000 MAP:	192-594
ACCESS:	The site may be reached from farm tracks leading from the Cotter Road through the Riverview property.
TRANSECT PROFILE:	Moderately broad, elevated sandy terrace deeply scoured with many flood channels. Some exposed areas of sand.
RIVER BED:	Broad, deep, still reaches are separated by minor rocky rapids. Some rocky outcrops.
VEGETATION:	Small to large casuarinas dominate the area. Grassy cover below with substantial leptospermum thickets and weeds. Some dead trees still standing.
OUTER CORRIDOR FEATURES:	West side: the precipitous rocky face of the Bullen range, carrying a few eucalypts and low scrub. East side: rolling hill, cleared for grazing, but with many substantial tracts of open woodland at lower levels.
SIMILAR AREAS:	5F, 5G
PROPOSED DEVELOPMENTS:	Potential moderate-capacity recreation site.



Fig. 21. Winslade Survey Site: broad, still pool with rocky rapids; mature casuarinas, generally open below, with sparse leptospermum understorey.

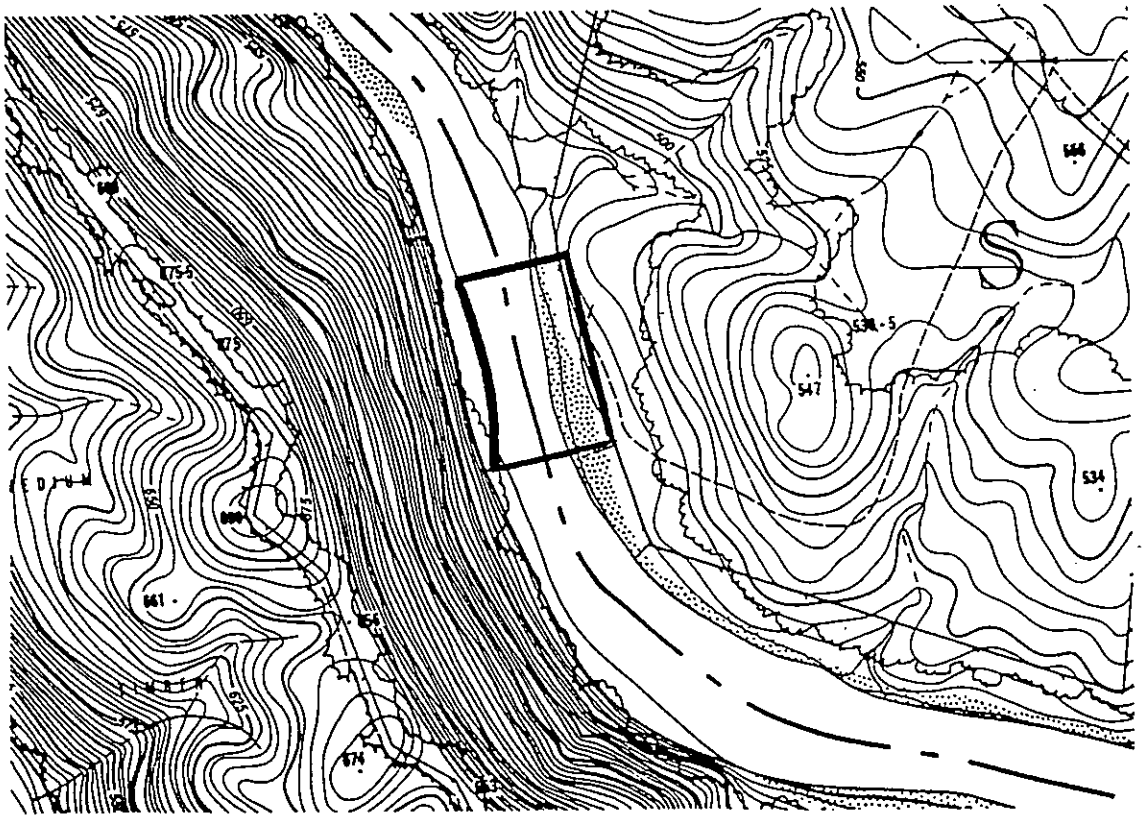


Fig. 22. Location of Winslade Survey Site.

OVERALL RATING: 23

RANK: 8

VEGETATED HABITATS: H

RIVERINE HABITATS: L

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
H	L	H	L	L	L	H	L	H	L	M	H

SPECIAL FEATURES: In contrast with the poor riverine habitats at this site, the vegetated habitats were above average. Like Bullen Range, Winslade supported good leptospermum thickets which in turn provided habitat for Superb Fairy-wrens, White-browed Scrubwrens, Brown Thornbills and Red-browed Firetails. Eastern Spinebills appeared to be winter visitors to most parts of the Murrumbidgee, but were recorded on every visit to this site, suggesting that they may be a breeding resident here.

SENSITIVITY: Moderate

PROTECTION: Any future development should take into account the good balance of habitat types in this area: eucalypt woodland on the boundaries of the inner corridor, mature casuarinas, shrub-layer and grasses. Much of the terrace will become eroded under heavy traffic. This will result in a reduction in the vegetation cover and a commensurate reduction in the diversity and abundance of birds. Development is inadvisable on the terrace itself.

There is a particularly good anabranch on the eastern bank upstream from the survey site. This is a long still pool which provides a refuge for a large number of waterbirds. This area should be left undisturbed.

LEVEL OF USAGE: Low

IMPROVEMENTS: A walking trail above the sandy terraces would be acceptable. Low-intensity recreation areas may be considered if they are located well back from the river itself.

SITE NUMBER:	15
SITE NAME:	Cotter Junction
OTHER NAMES:	-
CORRIDOR UNIT:	5.5
CHANNEL SUBSECTION:	5H
1:2 500 MAP:	M6
1:10 000 MAP:	192-594
LOCATION:	East bank of the river. Transect begins about 250 m upstream of the bridge across the Murrumbidgee at the Pumping Station.
ACCESS:	A number of foot tracks lead from the sealed road at the bridge along the river bank and through the transect area.
TRANSECT PROFILE:	Steep slopes rise rapidly from narrow margin on the eastern bank. Some areas of sandy terrace, mainly rocky flood channel. Extensive sandy areas on the flatter western bank.
RIVER BED:	Narrow and fast flowing with many rocky rapids.
VEGETATION:	The northern end of the terrace has been cleared and consists of open grassy areas with occasional clumps of blackberry, leading down to band of moderately large casuarinas along the river itself. The rocky channel areas are dominated by dense thickets of leptospermum and are fringed on the river side by smaller casuarinas.
OUTER CORRIDOR FEATURES:	Steep slopes on either side of the river support sparse eucalypt woodland.
SIMILAR AREAS:	5H and all but southernmost section of 5G.
PROPOSED DEVELOPMENTS:	Vegetation restoration of steep slopes above terrace and recreation trail.

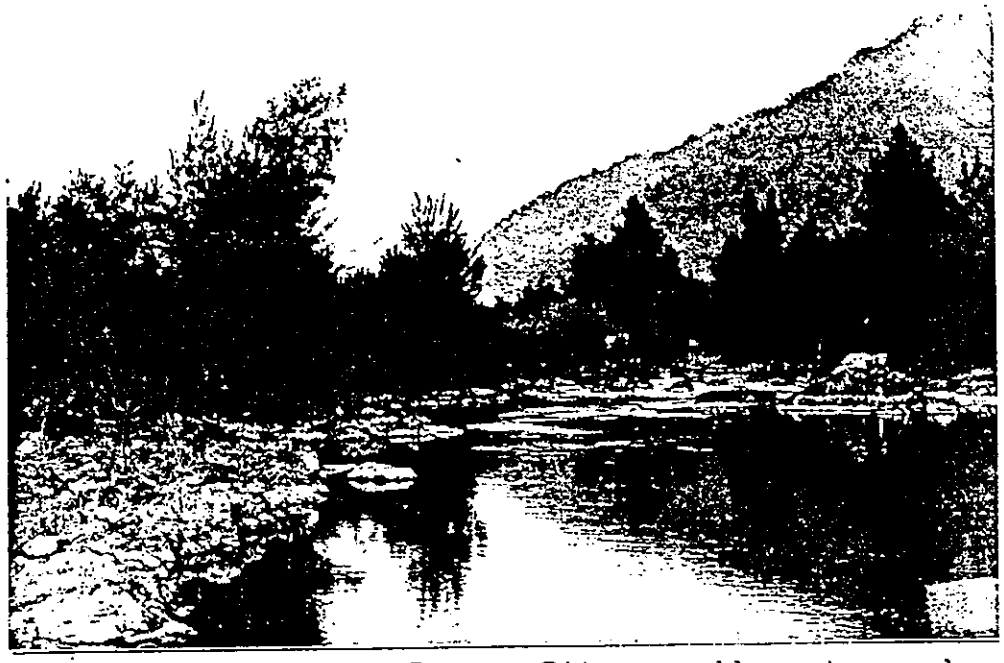


Fig. 23. Cotter Junction Survey Site: small rocky pools with many rapids, some casuarinas and dense leptospernum thickets.

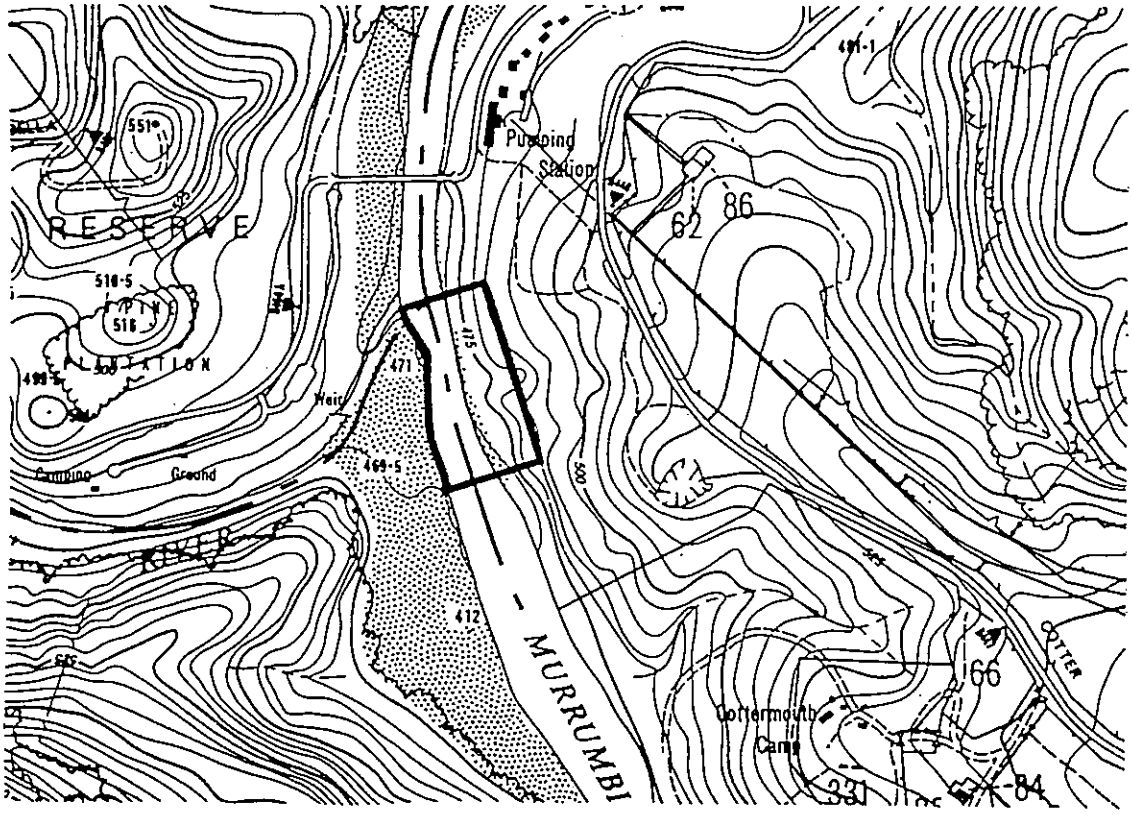


Fig. 24. Location of Cotter Junction Survey Site.

IMPROVEMENTS:

There is considerable scope for reafforestation of the upper slopes on the eastern side of the river and the lower flood terrace on the west side below the bridge.

The entire area from the Cotter Reserve to Casuarina Sands has excellent potential for interpretation: it is accessible, it is visited by large numbers of people, the birds are relatively tame and easy to see. The significance of the area as a hub for altitudinal migration from the ranges to the lowland should be stressed. Permanent display boards in the picnic areas would be most appropriate.

A walking trail would be appropriate.

SITE NUMBER: 16

SITE NAME: Casuarina Sands

OTHER NAMES: Nil

CORRIDOR UNIT: 6.1

CHANNEL SUBSECTION: 6A

LOCATION: The transect lies on the southern bank of the river, immediately downstream from the first weir.

1:2 500 MAP: M6

1:10 000 MAP: 192-594

ACCESS: The site can be reached on foot from the main carpark at Casuarina Sands.

TRANSECT PROFILE: Very broad, relatively flat sandy terrace, many flood channels, some rocky.

RIVER BED: The level of the river has been raised artificially by a second weir downstream from the site. The result is a wide still pool with the occasional rocky outcrop in the upper stretches. Some small sand or silt beaches.

VEGETATION: Disturbed habitat. Sparse stands of casuarinas, mainly mature trees, open below except for occasional leptospermum thicket, some blackberries, weeds at water's edge.

OUTER CORRIDOR FEATURES: Northern side: dense scrub and callitris forest; southern side: savannah woodland.

SIMILAR AREAS: Remainder of Subsection 6A

PROPOSED DEVELOPMENTS: Unspecified improvements.

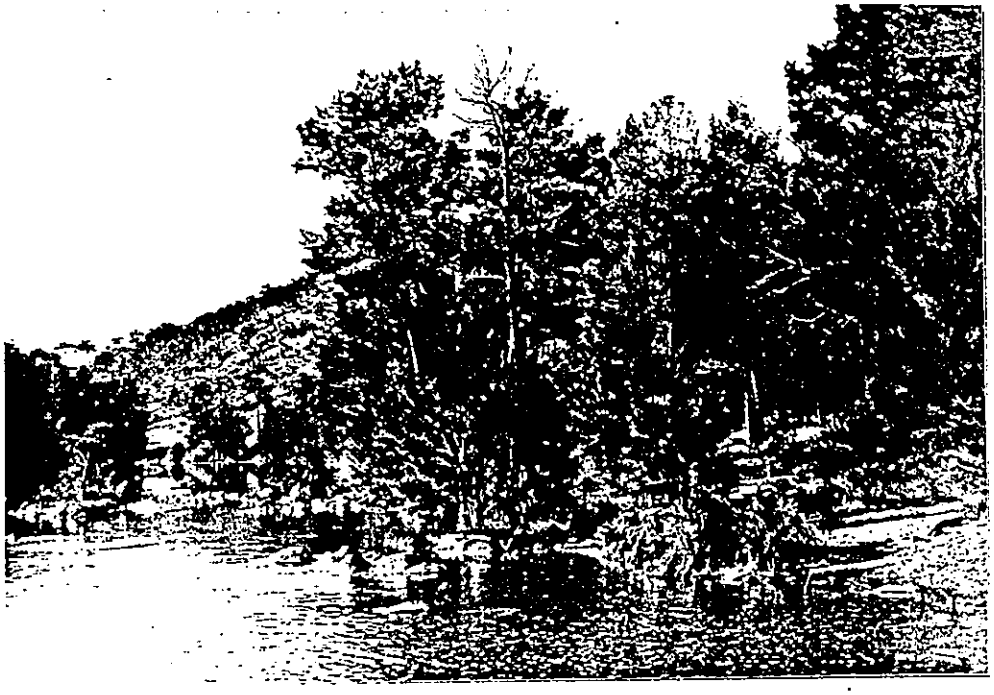


Fig. 24. Casuarina Sands Survey Site: extensive broad channel, many mature casuarinas, little undergrowth.

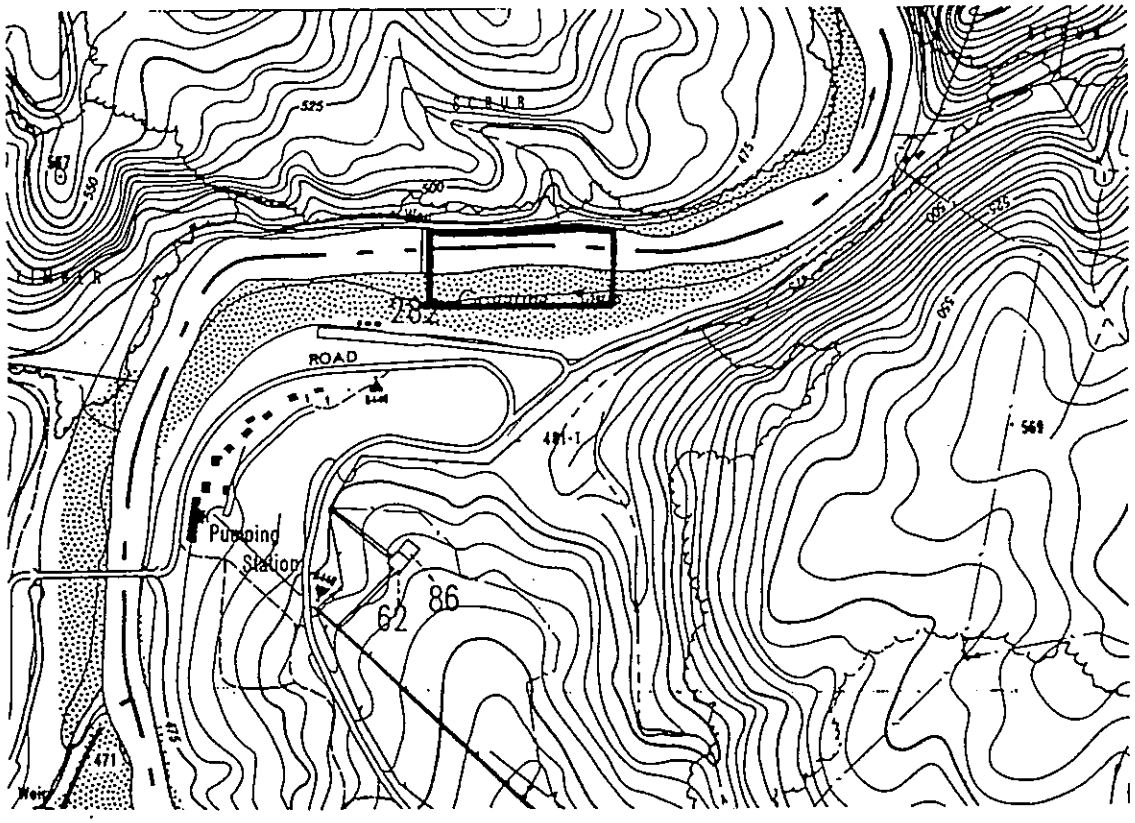


Fig. 25. Location of Casuarina Sands Survey Site.

OVERALL RATING: 18

RANK: 11

VEGETATED HABITATS: L

RIVERINE HABITATS: L

Summary of attributes

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
L	M	L	L	L	L	L	L	L	M	H	H

SPECIAL FEATURES: In overall terms, the site was only fair: both vegetated and riverine habitats were rather impoverished. Note, however, that the inner corridor as a whole was rather better than average and that a high level of breeding activity was recorded. Great Cormorants were recorded here more often than elsewhere. They were frequently seen perching in the tall casuarinas which dominate the banks. Above average numbers of Yellow Thornbill and Crescent Honeyeater were also recorded in the casuarinas. The weir supported a permanent population of Maned Duck which bred in the area.

Elements of montane avifauna were recorded here. These include Yellow-tailed Black-Cockatoo, Gang-gang Cockatoo, Australian King-Parrot and Pied and Grey Currawong. A number of species with restricted breeding ranges along the river bred at Casuarina Sands. These include Leaden Flycatcher, Yellow Thornbill and White-winged Chough.

SENSITIVITY: Low

PROTECTION: The fine stand of mature casuarinas on the terrace should be preserved at all cost.

LEVEL OF USAGE: High

IMPROVEMENTS: At present there are few controls on access to this site. The result is that the area has little undergrowth. Block plantings of grevillea and leptospermum, the establishment of defined walking tracks and forward plantings of casuarinas would all make the area more attractive to birds and people. Picnic areas under the casuarinas may be considered.

SITE NUMBER:	17
SITE NAME:	McDonald
OTHER NAMES:	Below Casuarina, Stony Creek
CORRIDOR UNIT:	6.2
CHANNEL SUBSECTION:	6B
LOCATION:	East bank, approximately 450 m downstream from the easternmost carpark at Casuarina Sands.
1:2 500 MAP:	M6
1:10 000 MAP:	192-594
ACCESS:	Cars may be parked at Casuarina Sands, a vehicular track leads to a water tank. A foot track continues along the bank of the river to the site.
TRANSECT PROFILE:	A narrow boulder-strewn terrace with steeply sloping rock faces behind it. Many exposed areas of rock.
RIVER BED:	Wide, shallow and moderately swift, many rocky outcrops and islets.
VEGETATION:	Rather narrow band of casuarinas with some leptospermum undergrowth, substantial stand of callitris on slopes, occasional reeds and willows on river's edge.
OUTER CORRIDOR FEATURES:	Rolling hills with callitris forest and some eucalypts in the west; similar in the east, but steeper and cleared at higher levels.
SIMILAR AREAS:	6B
PROPOSED DEVELOPMENTS:	Walking trail.



Fig. 26. McDonald Survey Site: narrow, rocky terrace, rather scrubby with callitris and eucalypts on higher slopes.

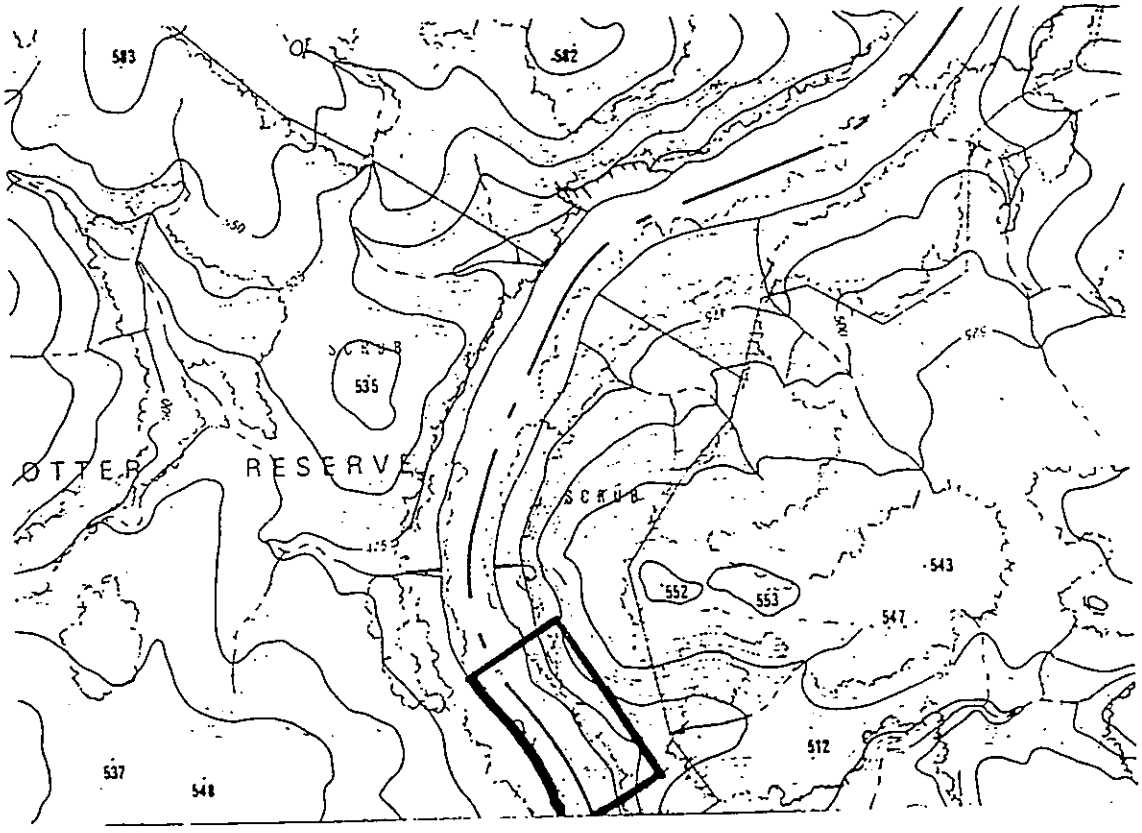


Fig. 27. Location of McDonald Survey Site.

OVERALL RATING: 14

RANK: 13

VEGETATED HABITATS: L

RIVERINE HABITATS: L

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
L	L	M	L	L	L	L	L	L	L	L	M

SPECIAL FEATURES: A poor site. Steep rocky gound with poor vegetation cover, only a very narrow band of fringing vegetation and a fast-flowing rocky river profile attracted few birds to the area.

However, two notable species, the Rose Robin and Yellow-tailed Black-Cockatoo were recorded, and the site had higher numbers of White-browed Scrubwrens than average.

SENSITIVITY: Low

PROTECTION: The river itself is scenically attractive in this area, and the combination of steep slopes and callitris woodland, while poor for birds, is aesthetically excellent. Any future development should take these landscape qualities into consideration.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: This would be a good site for a walking trail.

SITE NUMBER:	13
SITE NAME:	Huntly
OTHER NAMES:	Nil
CORRIDOR UNIT:	6.3
CHANNEL SUBSECTION:	6D
LOCATION:	East bank, below Huntly homestead, immediately upstream from the pumping station.
1:2 500 MAP:	M4
1:10 000 MAP:	192-600
ACCESS:	The site may be reached on a farm track from the Huntly homestead which leads to within 100 m of the start of the transect.
TRANSECT PROFILE:	Moderately broad terrace, rocky flood channels, some open sandy beaches, backing on to steep slopes.
RIVER BED:	Upper part: long still deep pools and sandy beach; lower part: fast flowing and very rocky with many short rapids and small vegetated islets, some quiet anabranches.
VEGETATION:	Large, medium and small casuarinas, with grass and leptospermum understorey, dense leptospermum thickets on the upper slopes. Some reeds on the margins of still water. Occasional willows.
OUTER CORRIDOR	West side: extensive areas of pine plantation; east side: cleared, improved pasture with scattered eucalypts.
SIMILAR AREAS:	6C, 6D
PROPOSED DEVELOPMENTS:	Vegetation restoration, potential picnic site.

OVERALL RATING: 18

RANK: 11

VEGETATED HABITATS: M

RIVERINE HABITATS: L

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
M	L	M	L	L	L	M	L	M	L	M	M

SPECIAL FEATURES: The scrub layer is thicker and wetter here than at most sites, and yielded above-average numbers of Blackbirds, Eastern Yellow Robins, Grey Shrike-thrushes, Brown Thornbills, New Holland Honeyeaters, Eastern Spinebills and Red-browed Firetails. All these species prefer dense cover. This was the only site at which the New Holland Honeyeater was present all year round. It is likely that it bred here.

Double-barred Finches, which have a very restricted distribution along the river, were recorded here on a number of occasions. Another rare visitor, the Eastern Whipbird, was also recorded at Huntly.

SENSITIVITY: Moderate

PROTECTION: As there is no public access to the area, no specific protection requirements are necessary. However, the excellent stands of casuarinas found along the river should be protected, and the leptospermum thickets which are excellent bird habitats should be conserved. The general aesthetics of the river corridor deserve consideration here.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: Reafforestation of the grazing land on the upper slopes of the inner corridor on the eastern side would improve the area as habitat for birds. Any picnic area in the site should take into account the bird habitat on the river, and should be established high on the bank away from the flood channels.

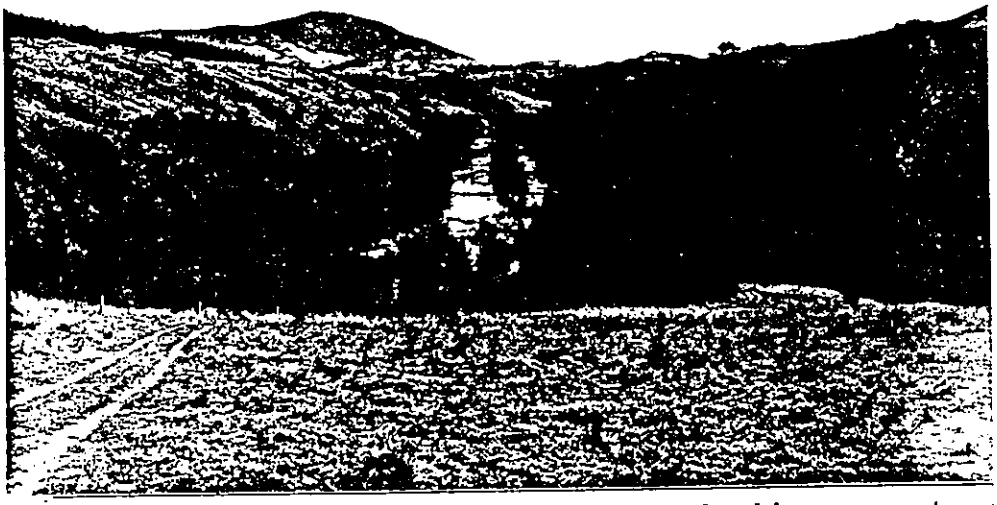


Fig. 28. Huntly Survey Site: casuarinas of all ages, dense leptospermum regrowth on slopes.

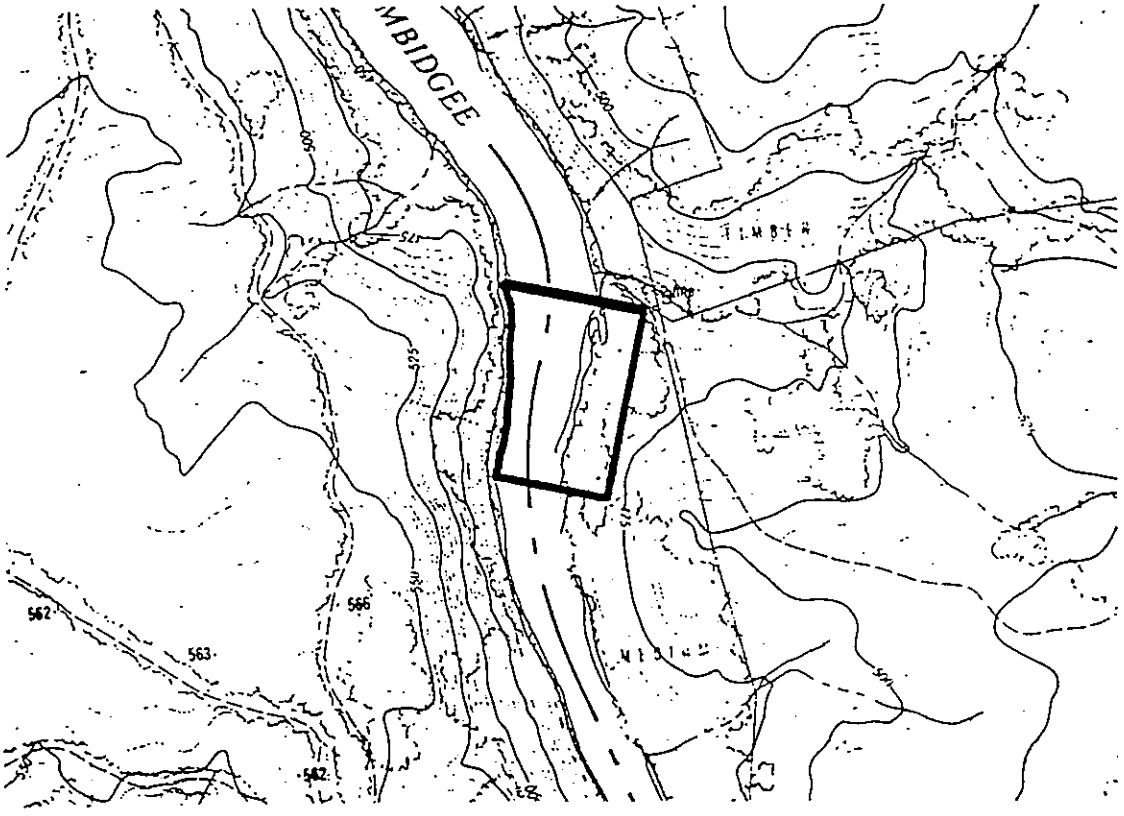


Fig. 29. Location of Huntly Survey Site.

SITE NUMBER:	19
SITE NAME:	Uriarra Crossing
OTHER NAMES:	Nil
CORRIDOR UNIT:	6F
CHANNEL SUBSECTION:	6.4
LOCATION:	East bank, immediately upstream of the picnic reserve.
1:2 500 MAP:	M2
1:10 000 MAP:	??
ACCESS:	Many ephemeral foot tracks lead along the river bank from the picnic area, where there is a carpark.
TRANSECT PROFILE:	Broad, flat terrace, exposed pebbly flood channels with sandy stretches.
RIVER BED:	Rather broad and generally slow-flowing with some fast rapids, many rocky outcrops, some sandy beaches and spits.
VEGETATION:	Casuarinas of varying ages, little ground cover except for occasional weeds and leptospermum thickets. Much dead timber.
OUTER CORRIDOR FEATURES:	Both sides: cleared rolling hills - grazing country.
SIMILAR AREAS:	6F, 6G.

PROPOSED DEVELOPMENTS: Further development of picnic area.



Fig. 30. Uriarra Crossing Survey Site: rocky outcrops, sandy beaches, casuarinas of all ages, but little undergrowth.

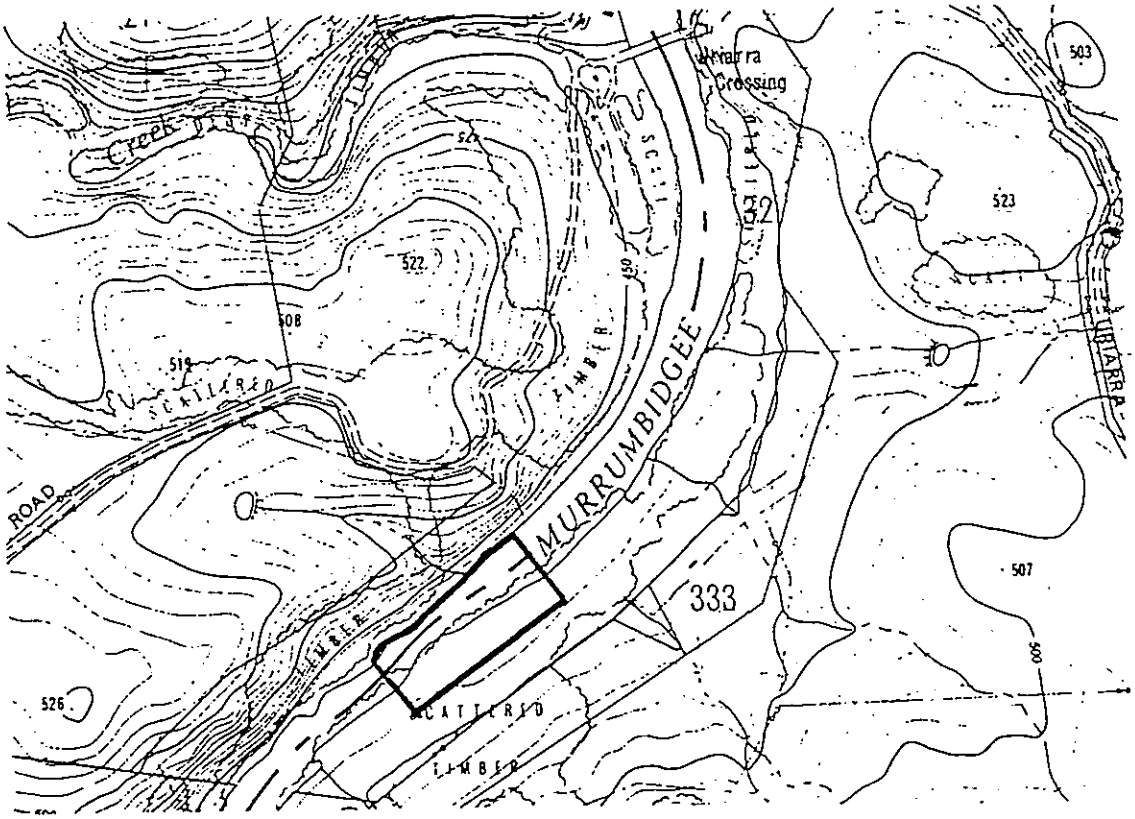


Fig. 31. Location of Uriarra Crossing Survey Site.

OVERALL RATING: 18

RANK: 11

VEGETATED HABITATS: L

RIVERINE HABITATS: L

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
L	L	L	L	L	L	L	L	L	H	H	H

SPECIAL FEATURES: The survey site itself was rather impoverished. This was chiefly because the still pools and muddy banks favoured by waterbirds and the variety of vegetation layers required by landbirds were absent. The river is swift-flowing and the land site consists of rocky or sandy flood channels with few shrubs or grasses. While there are a number of eucalypts in areas adjacent to the site, there are no eucalypts in the site itself, another factor contributing to the general poverty of the avifauna. The large number of Yellow Thornbills and Mistletoebirds recorded in the site reflect the quality of casuarina habitat.

A large flock of up to 200 Sulphur-crested Cockatoos roosts in the Casuarinas on the east side of the river. The number fluctuates seasonally, with maximum numbers present in winter. Evidence suggests that this roost has been used for at least 40 years (see Lamm and Calaby 1950), in spite of the large number of people who use the area.

Note, however, that the picnic area on the east side of the river at Uriarra Crossing adjacent to the survey site was very rich. The bulk of the breeding records for this section were made in the picnic area. A number of species recorded in the picnic area probably benefit from the presence of people. These include Australian Magpie, Australian Magpie-lark and White-winged Chough. Species such as the Willie Wagtail feed on insects on the ground and prefer mown lawns to longer untended native grassland.

SENSITIVITY: Low

PROTECTION:

Extension of the picnic area to the south is feasible but removal of any casuarinas would be detrimental to the avifauna of the area. The excellent ambiance of this general area must be preserved if any future developments are to take place.

A number of very large casuarinas were recently felled in the existing picnic area.

LEVEL OF USAGE:

High

IMPROVEMENTS:

Plantings of grevilleas attract fairy-wrens, scrubwrens and firetails, and the forward plantings of casuarinas ensure future continuity of habitat.

The naturalistic development of the picnic area should serve as a model for future intensive recreation sites in the inner corridor. It demonstrates that many bird species and people can co-exist if development is undertaken with the birds' requirements in mind.

The Uriarra Crossing picnic area provides an excellent opportunity for development as an interpretation site. There is a wide range of species, many of which are relatively tame, approachable ground-feeding birds. The site provides an excellent context for the interpretation of seasonal changes in avifauna. This could be illustrated by the changes in the cockatoo roost, by the arrival and departure of prominent summer migrants like the Dollarbird and Rainbow Bee-eater, and by the passage migration of honeyeaters which use the western bank of the river at Uriarra Crossing.

SITE NUMBER:	20
SITE NAME:	Shepherds Reserve
OTHER NAMES:	Nil
CORRIDOR UNIT:	6.5
CHANNEL SUBSECTION:	6H
LOCATION:	East bank, 2 km below the Molonglo confluence.
1:2 500 MAP:	M1
1:10 000 MAP:	xx
ACCESS:	The site lies 400 m beyond the termination of a farm track leading west from the Strathnairn Homestead.
TRANSECT PROFILE:	Broad, sandy, slightly elevated terrace, deeply scoured by rocky flood channels, backing on to steeply sloping banks.
RIVER BED:	Very wide, shallow and swift. many flat rocky outcrops and wide sandy beaches.
VEGETATION:	Medium to small casuarinas on lower areas, dense leptospermum thickets and occasional callitris on upper slopes.
OUTER CORRIDOR FEATURES:	East side: cleared grazing land with very little cover; west side: precipitous banks supporting leptospermum scrub with eucalypts in the gullies. Open grazing land above.
SIMILAR AREAS:	6H, 6I.

PROPOSED DEVELOPMENTS: Recreation area.



Fig. 32. Shepherds Reserve Survey Site: sandy terrace with medium to small casuarinas, many beaches and rocky outcrops.

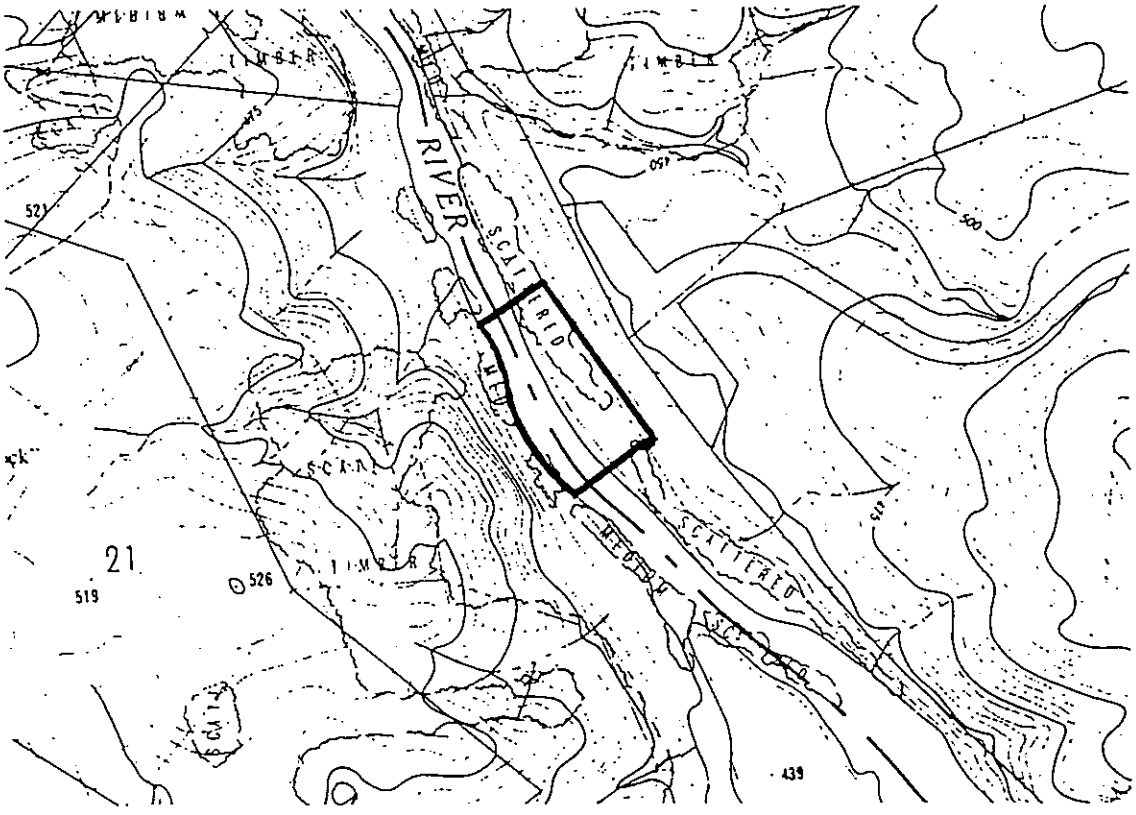


Fig. 33. Location of Shepherds Reserve Survey Site.

OVERALL RATING: 24

RANK: 7

VEGETATED HABITATS: L

RIVERINE HABITATS: H

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
L	L	L	M	H	M	M	M	M	M	H	H

SPECIAL FEATURES: A mixed showing in vegetated habitats was offset by good riverine diversity and excellent diversity in the inner corridor with high levels of breeding.

Australian Pelican, Black Swan and White-bellied Sea-Eagle were all unique to this site, and the presence of Galahs, Sulphur-crested Cockatoos, Richard's Pipits, Southern Whiteface and Common Starlings in high numbers reflects the influence of the open grazing land in the outer corridor on this site.

Whistling Kites appear to have bred close by, and Shining Bronze-Cuckoos parasitised Yellow Thornbills. Shepherds Reserve was the only site at which four species of Cuckoo were recorded in vegetated habitats.

SENSITIVITY: Moderate

PROTECTION: Any recreation areas in this site should be situated away from the river in order to minimise their impact.

Exclusion of grazing from the inner corridor would permit revegetation and promote species diversity and abundance.

LEVEL OF USAGE: Moderate

IMPROVEMENTS: A low intensity picnic area may be considered as long as it is sited appropriately.

For further details contact Dr G.Scott, Environment Section, NCDC.

SITE NUMBER:	21
SITE NAME:	Molonglo
OTHER NAMES:	Holt
CORRIDOR UNIT:	Not applicable.
CHANNEL SUBSECTION:	Not applicable.
LOCATION:	The site is situated on the north bank of the Molonglo River, approximately 1.5 km above its confluence with the Murrumbidgee.
1:2 500 MAP:	Not available.
1:10000 MAP:	xx
ACCESS:	The site may be reached on foot from Stockdill Drive.
TRANSECT PROFILE:	Broad, rocky, level to gently sloping, many boulders, relatively open.
RIVER BED:	Broad placid pools separated by small rapids.
VEGETATION:	Rather bare and open, scattered callitris and occasional medium and large casuarinas. The areas has been burnt out recently and it grazed regularly. Is relatively degraded.
OUTER CORRIDOR FEATURES:	Cleared grazing country on both sides. Occasional callitris and eucalypts remain.
SIMILAR AREAS:	Molonglo corridor.

PROPOSED DEVELOPMENTS: Nil.

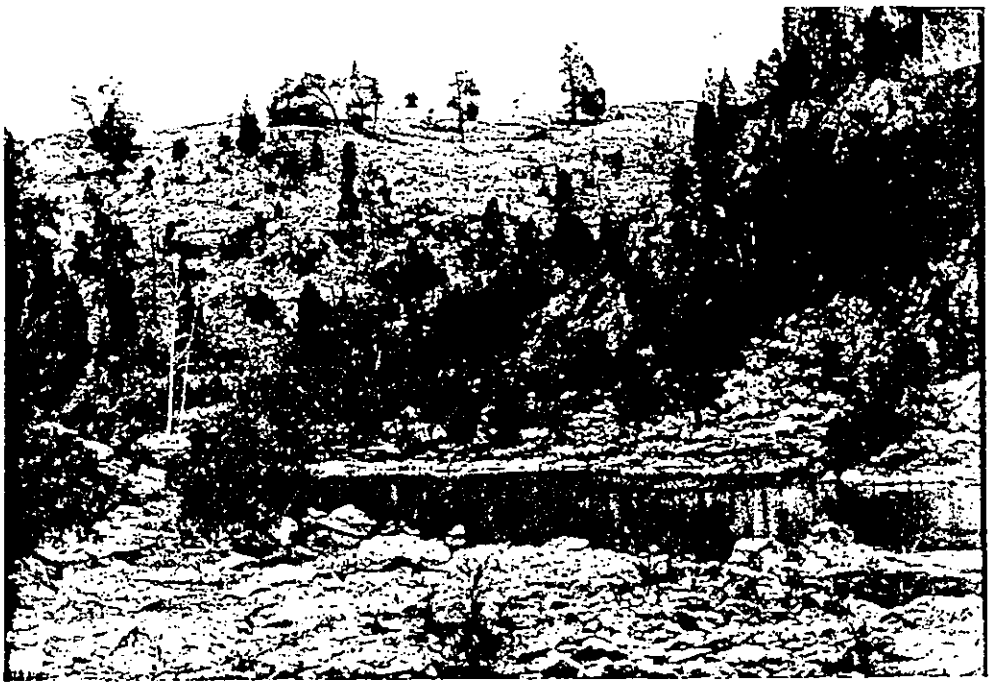


Fig. 34. Molonglo Survey Site: rocky terrace, callitris and casuarinas, cleared slopes above.

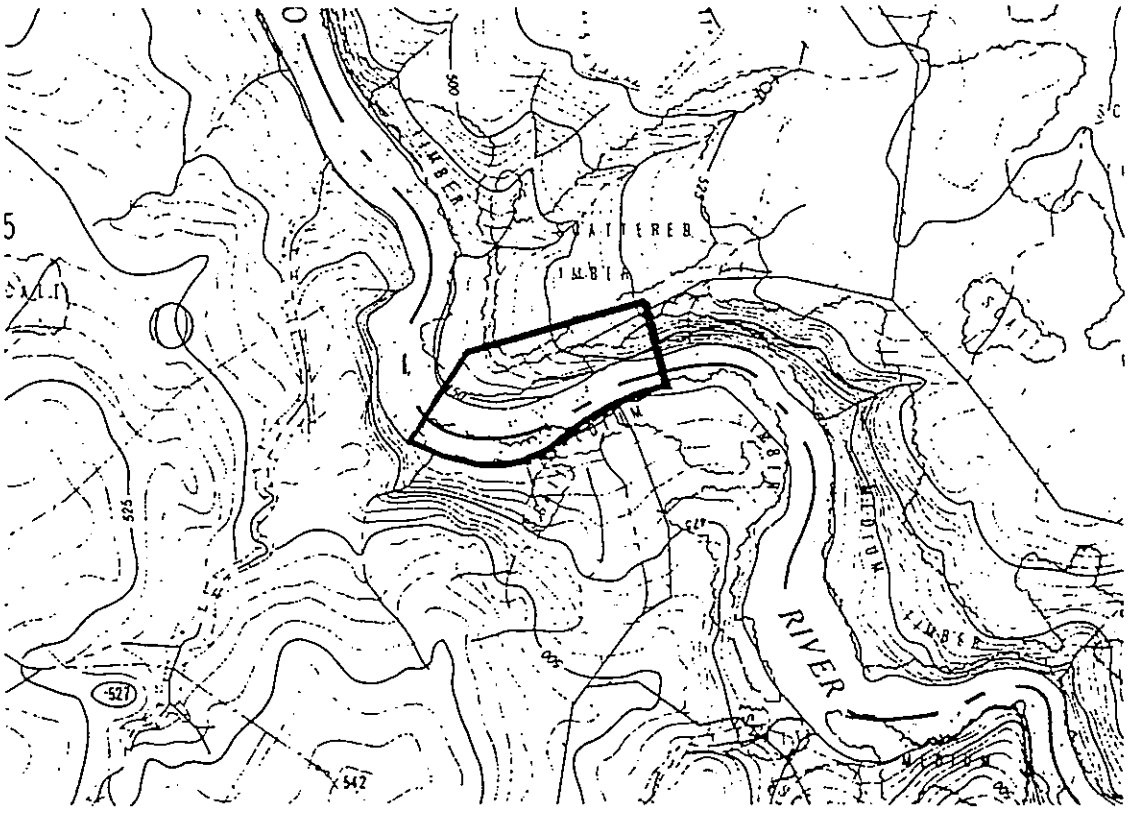


Fig. 34. Location of Molonglo Site.

OVERALL RATING: 18

RANK: 11

VEGETATED HABITATS: M

RIVERINE HABITATS: L

SUMMARY OF ATTRIBUTES:

ABV	TSV	ASV	ABR	TSR	ASR	ABVR	TSVR	ASVR	TSI	ASI	B
M	M	M	L	L	L	L	M	M	L	L	M

SPECIAL FEATURES: In spite of the fact that the area had been burnt out shortly before this project commenced, the vegetated habitats proved to be fairly good. Two species, the Red-capped Robin and Speckled Warbler, were recorded nowhere else in the inner corridor. Of particular interest was the fact that the Red-capped Robin appeared to have bred in the area. Very few records of breeding in the ACT exist for this species. Double-barred Finches, a species with limited distribution in the Murrumbidgee Corridor, were recorded frequently at this site. All three are species of dry, open forest or woodland, and are an element of the ACT's avifauna which is poorly represented along the Murrumbidgee.

For further details contact the Principal Environmental Officer, Environment Section, NCDC.

SENSITIVITY: Moderate

PROTECTION: The area is severely degraded as the result of uncontrolled use. The inner corridor is littered with the remains of camps and fire-places. Trees have been cut down. Stock are permitted to graze right down to the river. What little vegetation remains is under considerable pressure.

LEVEL OF USAGE: Low

IMPROVEMENTS: Access should be restricted. Camping and grazing should be excluded. The upper slopes should be revegetated and block plantings of shrubs should be carried out at lower levels.

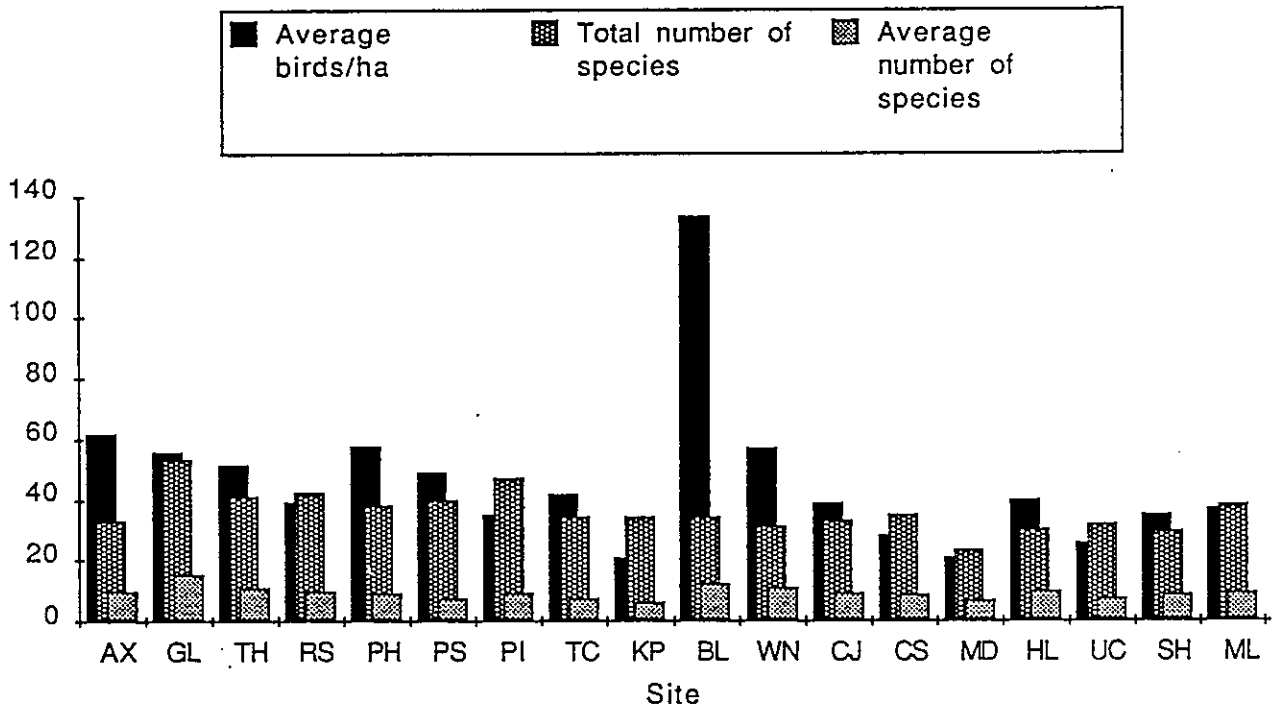
3.3 SUMMARY

3.31 Vegetated habitats

The average number of birds, the total number of species and the average number of species in vegetated habitats at each site are shown in Fig. 4. The average number of birds is probably the least reliable of these three measures as the presence of a single large flock can severely bias the results for a particular site. For example, the high average number of birds at Bullen Range (133) is largely the result of the presence of a flock of 800 migrating Yellow-faced Honeyeaters during one survey.

The other two variables are much more valuable indicators of diveristy. The total number of species varied from 53 at Gigerline to 23 at McDonald, with an average of 35.9. Gigerline also had the highest average number of species (15.1), while the lowest was at Kambah Pool with 6.3. The overall average number of species per site per visit was 9.2.

FIG. 4. COMPARISON OF SITES: VEGETATED HABITATS

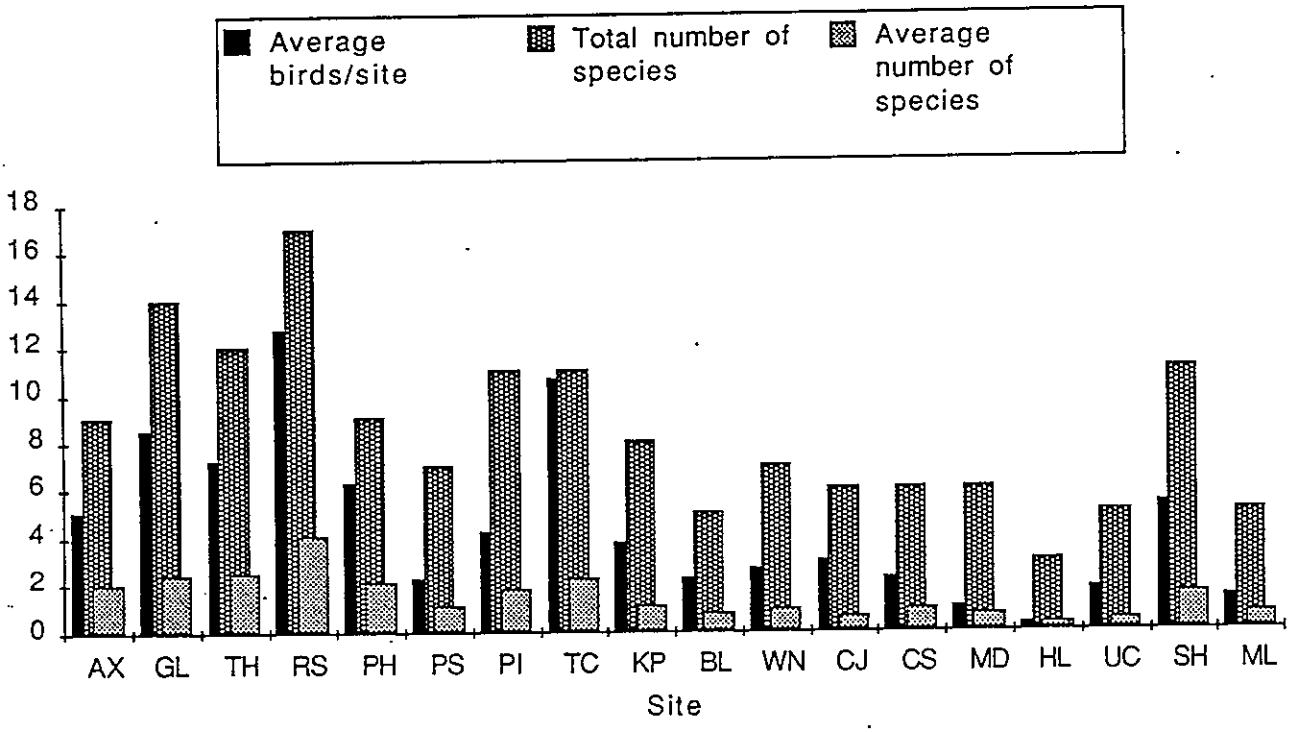


3.32 Riverine Habitats

The average number of birds, total number of species and the average number of species in riverine habitats at each site are shown in Fig. 5. The average number of birds in riverine habitats at each site is more useful as an indicator of abundance than the average number of birds in vegetated habitats because riverine habitats are not subject to large influxes of migratory species.

The highest average number of birds was recorded at Riverside (12.7) and the lowest was at Huntly (0.3). The overall average was 4.5. Riverside and Huntly also had the highest and lowest total numbers of species: 17 and 3 respectively. The overall average was 8.4. This pattern was repeated for the average number of species: Riverside topped the list with 4.1 and Huntly was the lowest with 0.3. The overall average number of species in riverine habitats was 1.5.

FIG.5 COMPARISON OF SITES: RIVERINE HABITATS



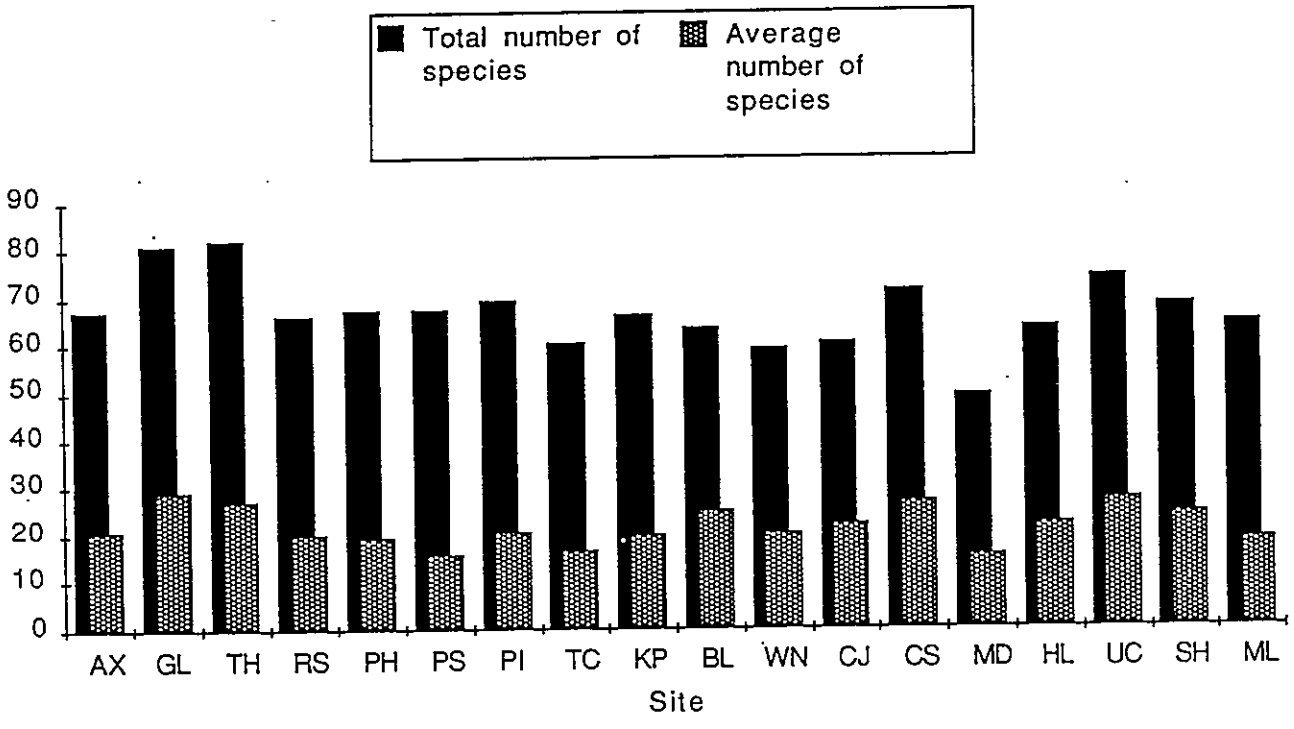
3.33 Inner Corridor

The total number of species recorded in the inner corridor and the average number per visit are shown in Fig.6. Eighty-two species were recorded in the inner corridor at Tharwa and 81 were recorded at Gigerline, making these two sites the richest of the 18 surveyed on a regular basis. The average aggregate number of species was 66.4.

Factors contributing to the diversity at these sites include the presence of still, slow flowing pools with sand bars, good vegetation cover with a variety of vegetation layers - grasses, shrub layer and trees, and relatively good outer corridor conditions. All of these factors make a site attractive to birds.

Gigerline had the highest average number of species (28.9) while the lowest was 15.5 at McDonald. The overall average was 21.6 species per site.

FIG. 6 COMPARISON OF SITES: INNER CORRIDOR



4. HABITAT ANALYSIS

4.1 Introduction

The characteristics for each of the 18 sites surveyed regularly are summarised in Table 4. A 'Y' indicates that a particular characteristic applies to a site. If the characteristic does not apply, an 'N' is shown. A more thorough description each site is given in the section dealing with sites above.

TABLE 4. CHARACTERISTICS OF EACH SURVEY SITE

('Y'= characteristic applies; 'N'= characteristic does not apply)

	Survey Site																
Characteristic	A x	G l	T h	R s	P h	P s	P i	T c	K p	B l	W n	C j	C s	M d	H l	U c	S h	M l
Dominated by Casuarina	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Buildings within 200m	N	N	Y	Y	N	N	Y	N	N	N	N	Y	Y	N	N	Y	N	N
Large still pools	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	N	N	Y	N
Extensive sand bars	Y	Y	Y	Y	N	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	N
Grazing in adjacent areas	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	Y	Y	Y	Y
Dense undergrowth	Y	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
Substantial reed-beds	N	Y	N	Y	N	N	Y	Y	Y	N	N	N	Y	N	N	N	N	N
Open canopy	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	Y	N
Sandy soil, sparse cover	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	N	N	Y	Y
Eucalypts present or nearby	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	N
Leptospremum thickets	Y	N	N	N	N	N	N	N	Y	Y	Y	Y	N	Y	Y	N	Y	N
Grevillea thickets	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N
Willows present	Y	N	Y	Y	N	N	Y	Y	Y	N	N	N	N	Y	Y	N	N	N

4.2 Species-habitat correlations

There is a strong correlation between many species of waterbird and the presence of large still pools. Grebes, ducks, coots, waterhens and moorhens spend much of their time feeding or resting on open water. This is only possible if the water is not flowing rapidly. The three species of cormorant also show a strong correlation with sites with pools.

Large, still bodies of water attract air-borne insects. Insectivorous species such as the Rainbow Bee-eater, Dollarbird, Welcome Swallow and both the Tree and Fairy Martin show a strong preference for sites with still pools for this reason.

TABLE 5. HONEYEATER MIGRATION IN THE RIVER CORRIDOR

Location	*6 April*		*20 April*		*4 May*	
	No.	*Direct-ion*	*No.*	*Direct-ion*	*No.*	*Direct-ion*
Angle Crossing	7445	E	780	E	3375	E
Gigerline	995	E	43	E	65	?
Tharwa	2120	S	-	-	653	S
Castle Hill	-	-	283	E	2621	E
Riverside	333	S	-	-	-	-
Point Hut	-	-	260	E	100	E
Pine Island South	938	S	180	S	-	-
Pine Island	556	S	-	-	-	-
Tuggeranong Creek	3406	S	751	E	410	S
Kambah Pool	-	-	616	N	1385	S
McQuoids Creek	-	-	201	E	412	E
Bullen Range	2700	S	7	S	2565	S
Winslade	150	S	263	S	88	S
Cotter Junction	100	S	200	S	269	S
Casuarina Sands	973	E	1000	E	-	-
McDonald	1704	E	111	E	693	E
Huntly	-	-	100	S	-	-
Urarra Crossing	14	?	4540	N	2500	E
Pine Ridge	-	-	-	-	730	E
Shepherd Reserve	-	-	629	E	97	S
Molonglo	-	-	-	-	-	-
Total counted	21434		9964		15963	
Minimum	15865		7926		11754	
Approximate composition:						
Yellow-faced	100%		99%		50%	
White-naped	0%		1%		50%	

The second count was made on 20 April. Conditions were less favourable. Cold, gusty winds were reported at most sites. Conditions like these are known to reduce numbers and the direction of migration is less pronounced than during fine weather. Reconnaissance conducted after the first count revealed further key migration routes and these were all monitored. A total of 7926 honeyeaters, mainly Yellow-faced with some White-naped, were recorded. Much of the movement was confused, with migrating flocks flying both up and down river at some sites.

The final count was made on 4 May in good conditions. All major points were covered and a minimum of 11 754 honeyeaters was recorded, Yellow-faced and White-naped being present in approximately equal numbers. The migration commenced rather later than usual (1100 a.m. in some places), with the result that some

birds which may have migrated in the early afternoon may have been overlooked. It is felt that if counts had continued past 12.00 a.m. total numbers may have been closer to 15 000.

5.2 Migration routes

Using the above data, it is possible to sketch out the major routes along the corridor (see Map 3), but not all routes may be used on a particular day. The choice of routes appears to be influenced by weather conditions, such as wind direction, etc.

1. The Northern Route.

A broad stream of honeyeaters follows the Cotter River downstream from the Brindabella Ranges to the area of its confluence with the Murrumbidgee. This divides in three:

i. A route follows the western bank of the Murrumbidgee in a generally northerly direction, past Uriarra Crossing, at least as far as Shepherds Reserve. At this point, some leave the river and fly east across Holt, Hawker, Aranda, Lyneham, and Ainslie. This is possibly the same stream that follows the western shore of Lake George and the escarpment to Goulburn.

ii. A second branch crosses the Murrumbidgee and continues east through the Stromlo forest in the direction of Central Canberra.

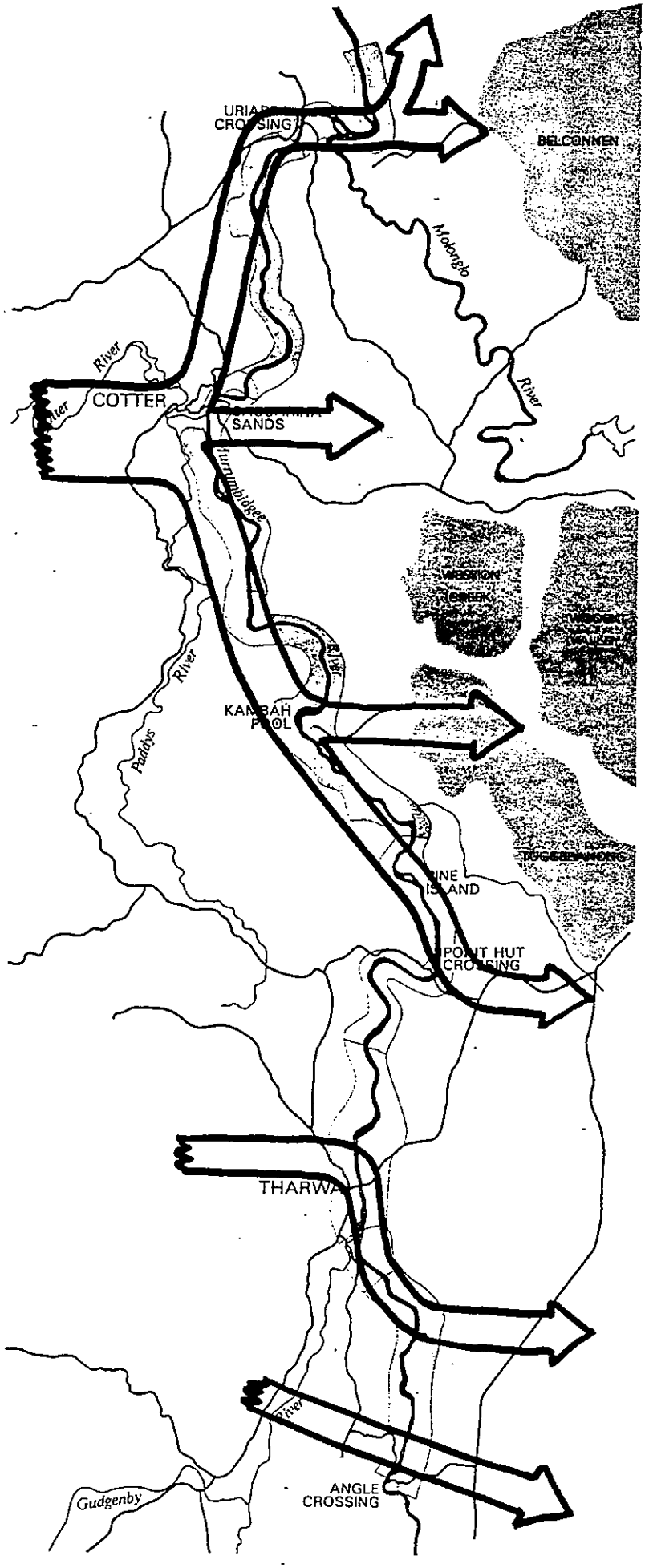
iii. A third branch follows the river upstream past Winslade and Bullen Range to Kambah Pool. Birds tended to fly along the top of Bullen Range, hence the low counts at Winslade, even when several thousand were recorded at the Bullen Range survey site. At Kambah Pool many leave the river and fly east across the suburbs of Kambah and Wanniassa and cross the Monaro Highway near Rose Cottage. The remainder continue along the river to Tuggeranong Creek, Pine Island and finally leave the river at Point Hut, where they fly east in the direction of Mt Rob Roy.

2. The Central Route

Birds flying east along Paddys River from the direction of the Tidbinbilla Range leave the river and skirt around the southern side of Castle Hill and join the Murrumbidgee between Lanyon and Tharwa. They follow the river upstream past Gigerline and leave the corridor at the eastern end of the gorge where the river turns south.

3. The Southern Route

Large numbers of honeyeaters fly east from the Naas River, over the Gudgenby River and the pine plantation west of Angle Crossing. They descend into the corridor 2 km downstream from the crossing, then fly up the eastern bank.



MAP 3.

HONEYEATER MIGRATION ROUTES IN THE MURRUMBIDGEE CORRIDOR

0 2 4 6 8 10 km

5.3 Species composition.

The results above bear out what has been traditionally held about honeyeater migration: early in the migration season, the flocks are predominantly composed of Yellow-faced Honeyeaters. As the season progresses, numbers of White-naped increase, and by the end of the migration period, White-napes dominate.

Other species of honeyeater recorded migrating with the main flocks were Eastern Spinebill, Noisy Friarbird, Red Wattlebird, White-plumed Honeyeater, Brown-headed Honeyeater and Crescent Honeyeater. Small numbers of White-eared Honeyeaters were reported from most sites, but at Angle Crossing, about 700 were recorded on one day. This figure represented 10% of the total number of honeyeaters recorded at Angle Crossing and is the largest number of White-eared Honeyeaters ever recorded on migration in the Canberra area.

A number of points deserve mention:

i. The pivotal role of the Cotter River valley. As mentioned in the discussion of the Cotter Junction survey site, the Cotter serves as a direct link between the low, dry river corridor and the high wet forests of the western ACT. All four major migration routes that cross Canberra are branches of the Northern Route and they all appear to stem from the Cotter.

ii. The Central and Southern Routes. These two very important routes had not been recorded previously. A significant percentage of the total number of honeyeaters using the corridor migrate along these two routes.

iii. The ubiquity of migration. Before this survey was conducted, migration was known to take place at three or four points along the river. It is now clear that nearly every part of the river corridor is used.

iv. Return migration in spring. Two small flocks of White-naped Honeyeaters were recorded migrating upstream at Gigerline and Angle Crossing in spring. These are the first records of return migration in the river corridor.

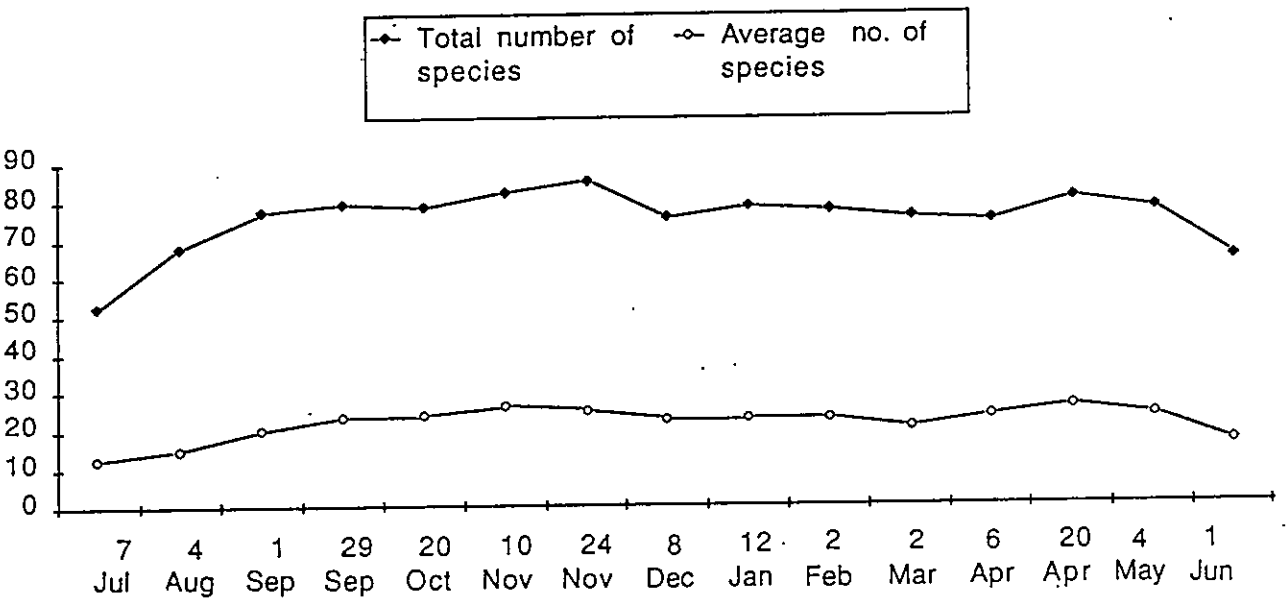
v. The river may also be a migration corridor for species other than honeyeaters. Great Cormorants, Pacific Black and Maned Duck, Silvereyes and Red-browed Firetails were all recorded moving along the corridor. At this stage, it is impossible to determine to what extent these represent local or long-range movements.

6. SEASONAL VARIATION

6.1 Inner corridor

The total number of species per survey and the average number per site per survey are shown in Fig. 7. The number of species recorded in the inner corridor was lowest in winter. In June and July, the inner corridor was dominated by the resident species, although a number of winter migrant species were also present. These included Rose, Flame and Scarlet Robins, Golden Whistler and White-eared Honeyeater.

FIG.7 SEASONAL VARIATION: INNER CORRIDOR



The first summer migrants, including Fan-tailed Cuckoo, Welcome Swallow, Tree Martin, Clamorous Reed-Warbler and Western Gerygone, began to arrive in early August. By early September the Pallid Cuckoo, Horsfield's and Shining Bronze-Cuckoo, Fairy Martin, Black-faced Cuckoo-shrike, Rufous Songlark, Yellow-faced Honeyeater and Dusky Woodswallow had arrived.

At the end of September the first Rainbow Bee-eater, White-throated Gerygone, Noisy Friarbird and Mistletoebird were recorded. During the month, large numbers of Rufous Whistlers arrived; none were present on 1 September but they were recorded at 11 sites on 29 September. A significant influx of Yellow-faced Honeaters also took place during September and by the end of the month, they were present in all 18 sites. Grey Fantails, Willie Wagtails, Yellow-rumped Thornbills, Silvereyes and European Goldfinches became increasingly common in the inner corridor as spring progressed.

The late summer migrants, the Dollarbird, White-winged Triller and Leaden Flycatcher, had arrived by late October, by which time the winter migrants including the Rose and Scarlet Robins, Golden Whistler and White-eared Honeyeater had departed.

The last summer arrivals were the Sacred Kingfisher and Olive-backed Oriole which were not recorded until 10 November. The last winter migrant, the Flame Robin was last recorded in the inner corridor on 8 December.

The total number of species recorded in the inner corridor reached a peak in late spring. Early summer saw a slight drop, but numbers remained relatively stable through the summer and early autumn.

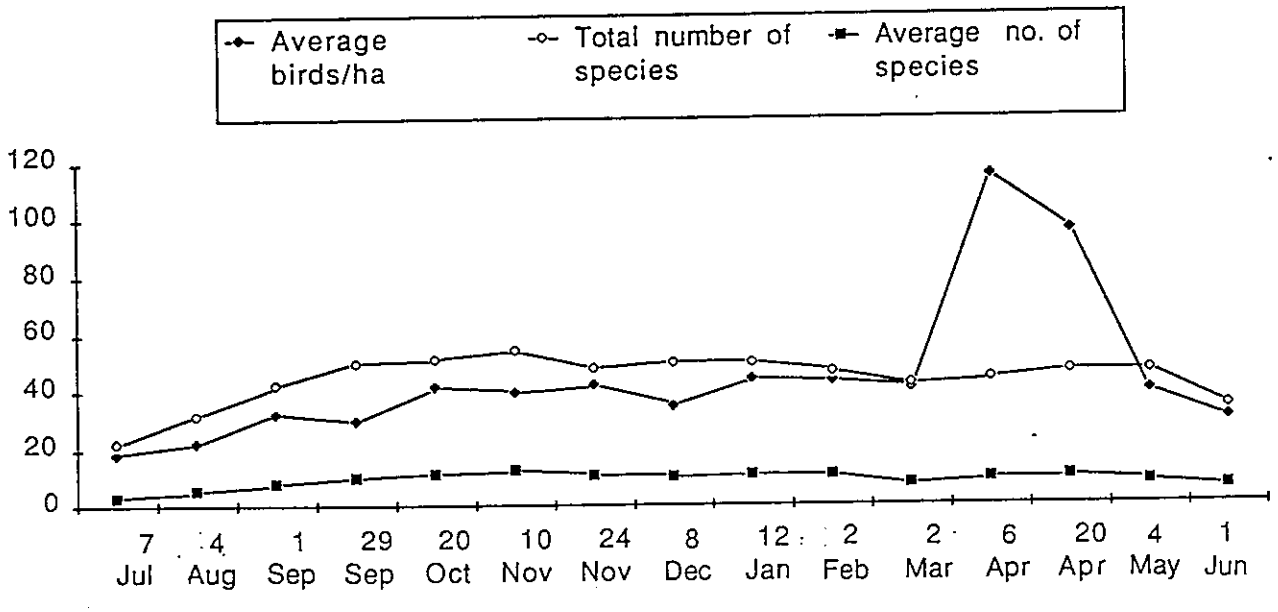
Many summer migrants were departing during March and by early April, the Sacred Kingfisher, Bee-eater, Dollarbird, Tree Martin, Clamorous Reed-Warbler and White-throated Gerygone had all disappeared. Numbers of Silvereyes and Grey Fantails also began to fall rapidly. At the same time, winter migrants such as the Flame and Scarlet Robins, Golden Whistler and White-eared Honeyeater reappeared.

During April and May large numbers of honeyeaters of a variety of species migrated along the river corridor resulting in an increase in the total number of species recorded.

6.2 Vegetated habitats

The average and total number of species in vegetated habitats follow a pattern similar to those for the entire inner corridor (see Fig. 8). The number of species climbed rapidly as the spring progressed. It declined slightly in early summer and then remained relatively stable until the honeyeater migration began in autumn, when a slight rise was recorded. After that, numbers fell to the winter minimum.

FIG. 8 SEASONAL VARIATION: VEGETATED HABITATS

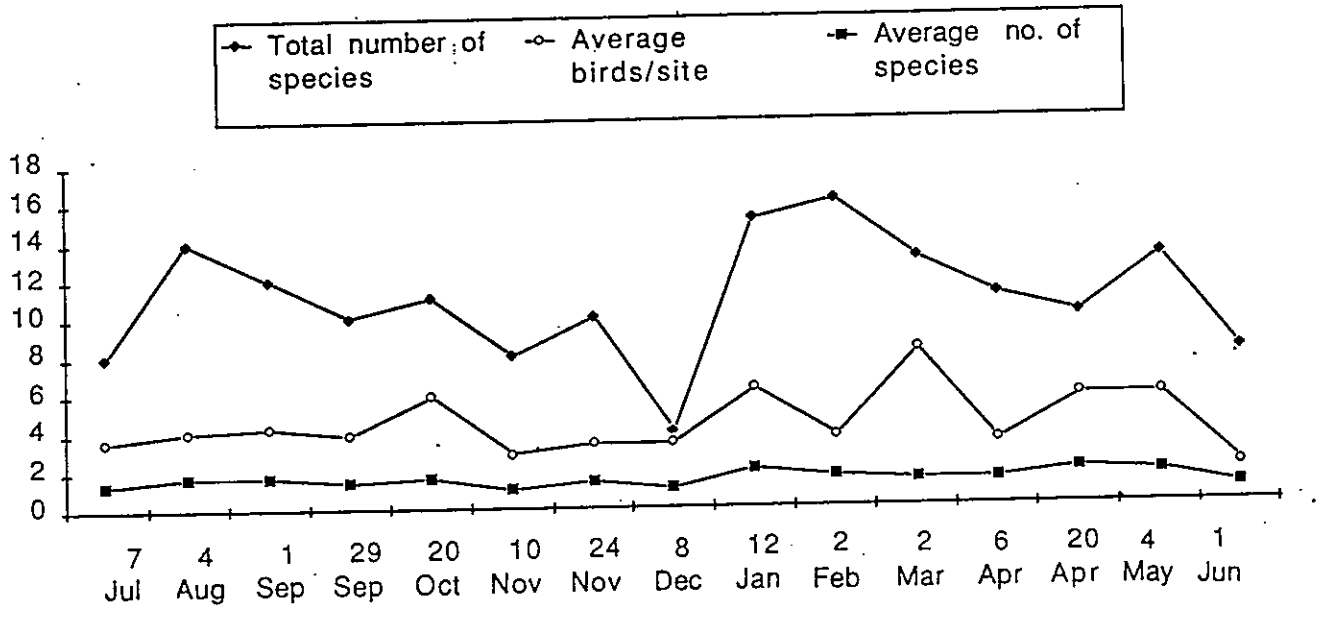


The average number of birds per hectare increased between winter and summer, but was highest in April when thousands of honeyeaters migrated along the river.

6.3 Riverine habitats

The average number of birds per hectare, the total number of species per survey and the average number of species per hectare are shown for riverine habitats in Fig. 9.

FIG.9 SEASONAL VARIATION: RIVERINE HABITATS



While the average number of species per site remained relatively constant during the year, the average numbers of birds and species fluctuated with no discernible pattern. The one exception was 8 December. During the preceeding week, heavy rains had fallen, with the result that water levels were very high and the river was flowing swiftly. All sand bars were submerged and the still pools which usually supported large numbers of waterfowl had disappeared. These poor conditions resulted in a significant reduction in the number and diversity of birds in riverine habitats.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Avifauna

The inferred relative avifaunal value of each corridor unit is shown in Maps 4-7. Riverine habitats are shown on the right, vegetated habitats are on the left. These values are intended as a general guide only.

The relative value of each corridor unit is inferred from the value of the survey site in that unit. These values are based on the summary values of vegetated and riverine habitats given for each site in Section 3.2 above. For corridor units which did not contain a survey site, the value is inferred from data from similar units.

Note that this is intended as a guide only. Owing to the variable nature of the vegetation communities and river profile over short distances, pockets of higher and lower value can be expected in each unit area.

Areas of high ornithological significance are shown, as are areas suitable for development as interpretational sites.

The areas of most consistently high value are located between Gigerline and Pine Island South. Here the river is broad and flows slowly. There are many still pools with shallow, gently sloping muddy banks. Extensive sand bars are common. The vegetation is varied and well-structured: open areas with grasses, shrubs and young trees, mature trees and old trees.

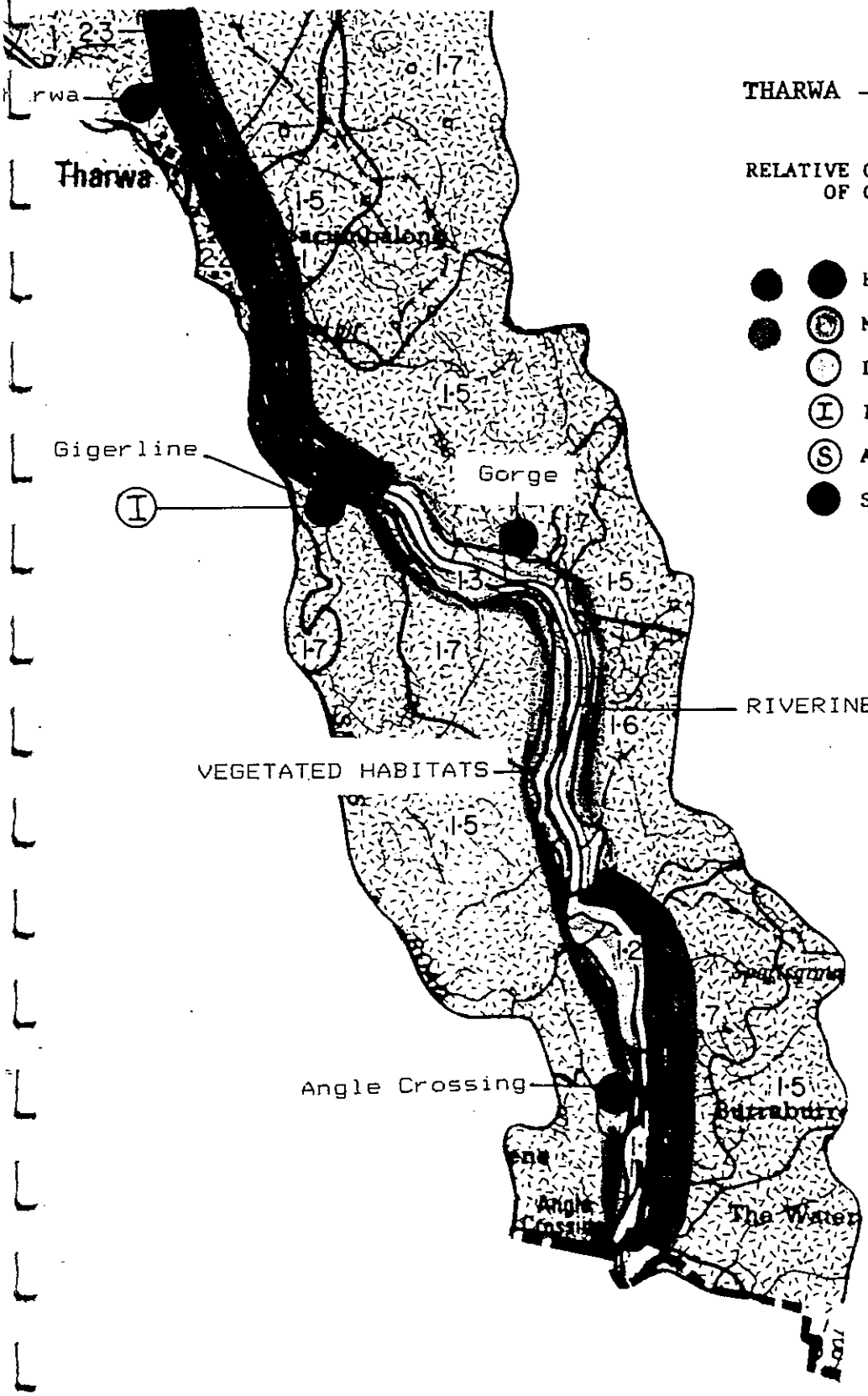
The northern sections of the river are characterised by fast-flowing water and steep banks with less varied vegetation, with the result that the avifauna is generally poorer than in the southern portion.

MAP 4.

THARWA - ACT BOARDER

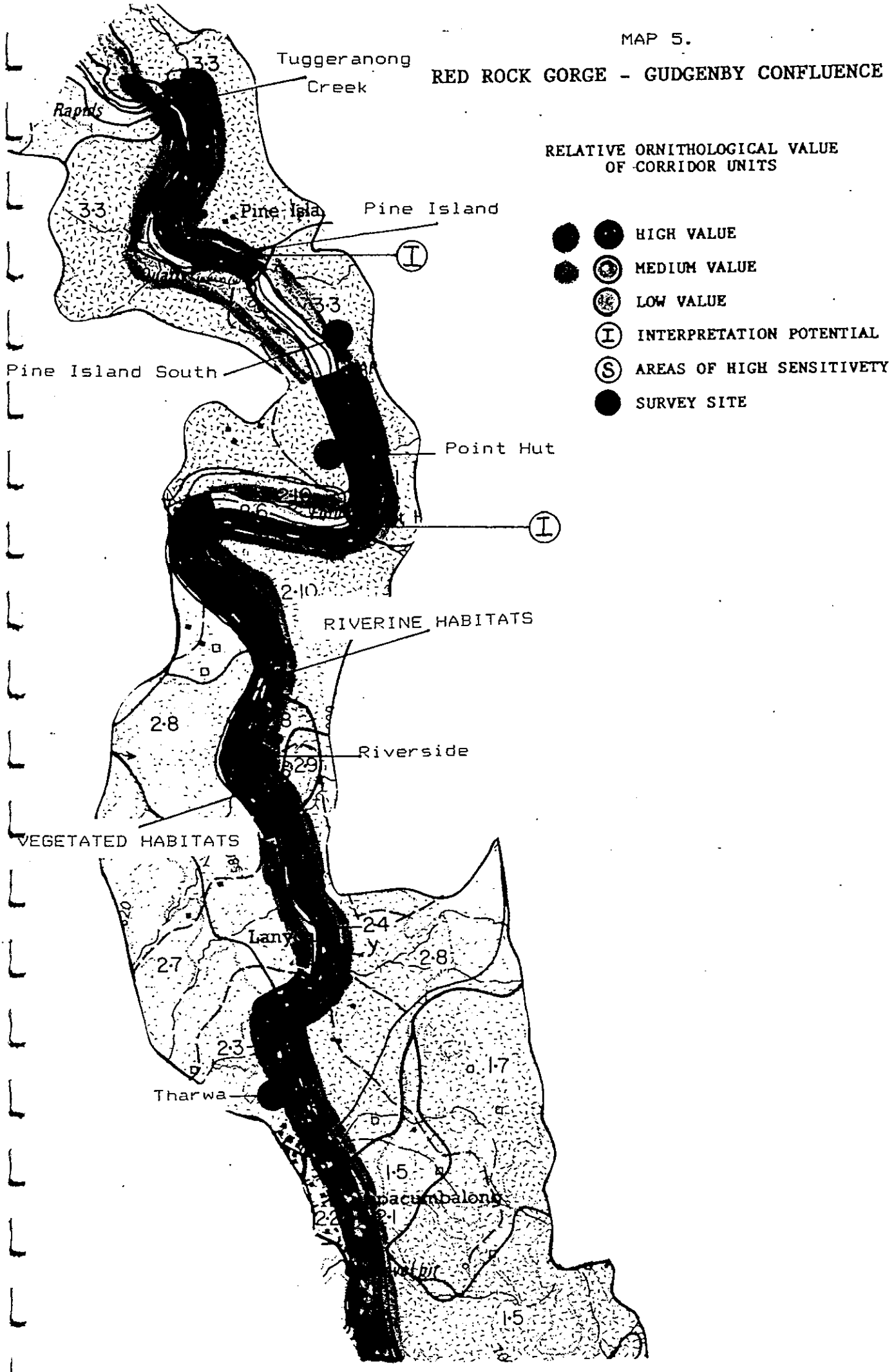
RELATIVE ORNITHOLOGICAL VALUE
OF CORRIDOR UNITS

- HIGH VALUE
- MEDIUM VALUE
- LOW VALUE
- (I) INTERPRETATION POTENTIAL
- (S) AREAS OF HIGH SENSITIVETY
- SURVEY SITE



MAP 5.

RED ROCK GORGE - GUDGENBY CONFLUENCE

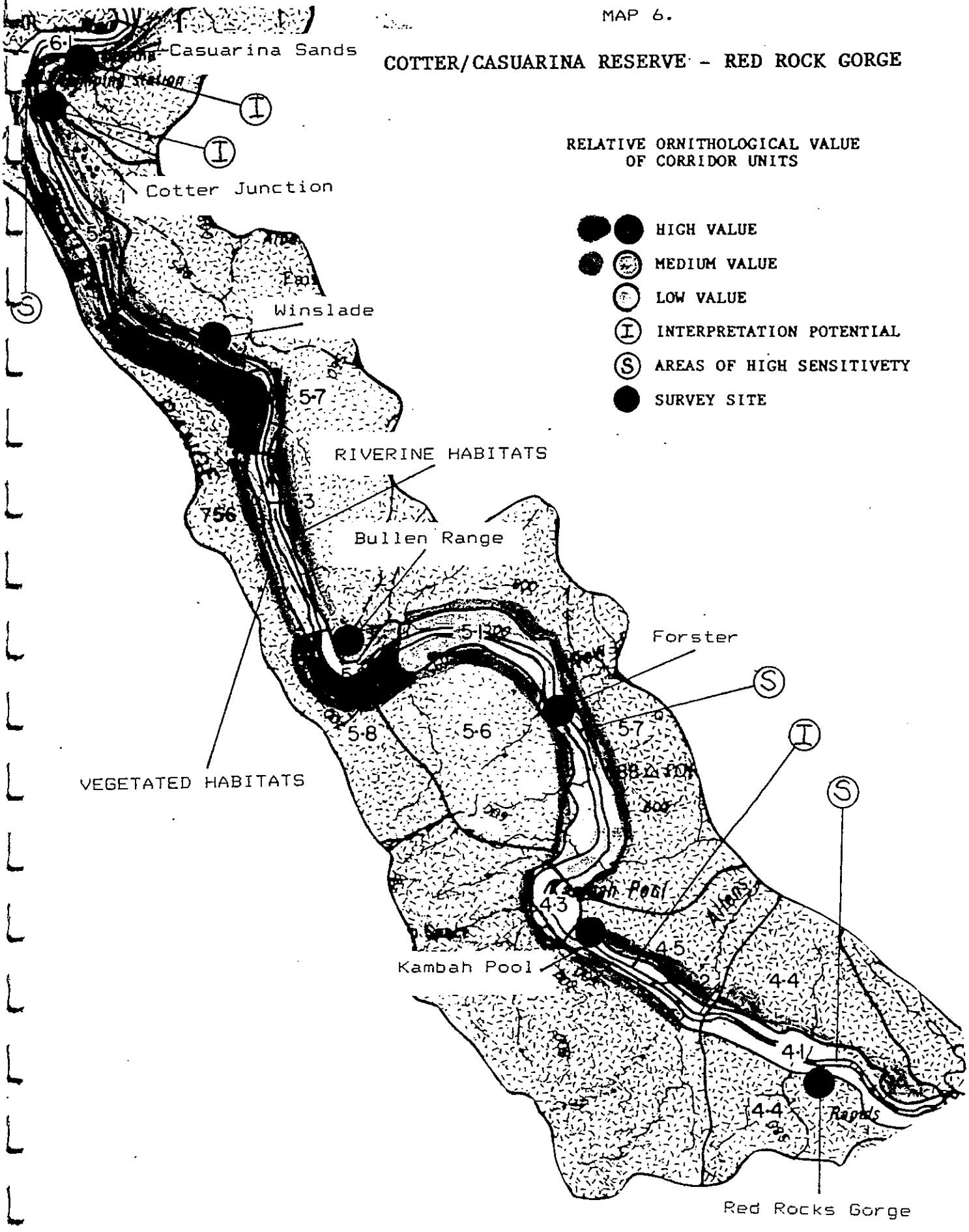


RELATIVE ORNITHOLOGICAL VALUE OF CORRIDOR UNITS

- HIGH VALUE
- MEDIUM VALUE
- LOW VALUE
- (I) INTERPRETATION POTENTIAL
- (S) AREAS OF HIGH SENSITIVETY
- SURVEY SITE

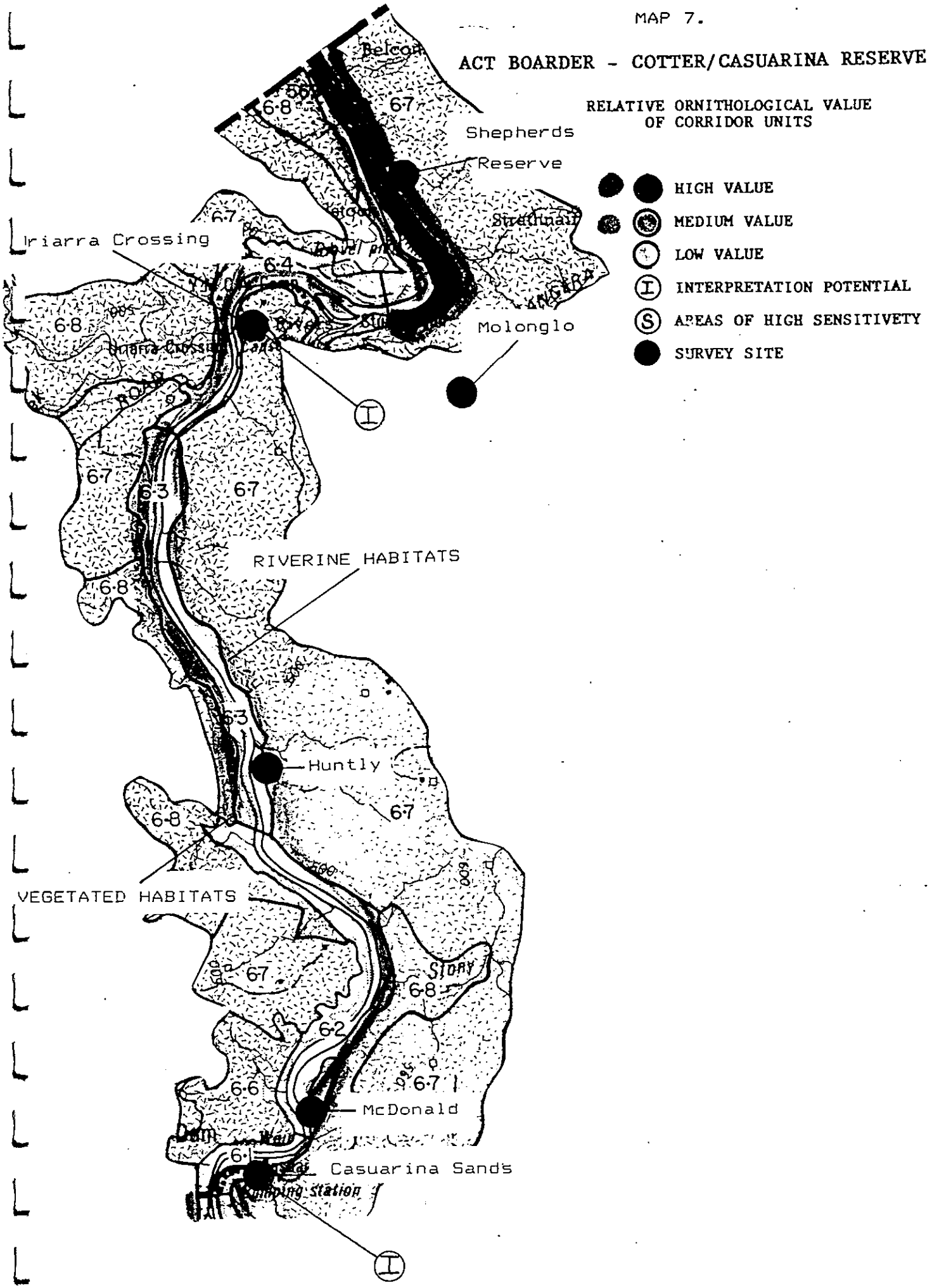
MAP 6.

COTTER/CASUARINA RESERVE - RED ROCK GORGE



MAP 7.

ACT BOARDER - COTTER/CASUARINA RESERVE



7.2 Planning and management

General planning considerations for the inner corridor are given below. Specific considerations for individual sites are given in the Section 3 above.

1. Murrumbidgee Nature Park

To facilitate the planning, management and conservation of the river corridor, it is strongly recommended that the entire inner corrdior be included in a Murrumbidgee Nature Park and managed in a manner similar to the Canberra Nature Park.

2. Interpretation

Gigerline, Point Hut, the Pine Island - Kambah Pool walking trail, the Cotter and Uriarra Crossing present ideal opportunites for development as interpretational sites.

3. Areas of high sensitivity

Three specific localities near Red Rocks Gorge, Forster and the Cotter are considered to be particularly sensitive. Steps should be taken to ensure that human disturbance is excluded from these areas. Walking trails may need to be closed to the public during the breeding season.

4. Further studies

River profile and the composition of vegetation communities are two factors which have a strong influence on avifaunal value of a site. These factors may vary greatly over short distances. Pockets of ornithological value may be found even in corridor units of generally low value. It is recommended that brief avifaunal studies be undertaken in the early planning stages of any particular development in the inner corridor.

5. Revegetation

Revegetation of the inner corridor using species which are native to the corridor will greatly improve many areas as habitat for birds.

6. Exclusion of Grazing

Grazing causes problems of erosion, soil compaction and devegatation. It is recommended that grazing be excluded from the inner corridor.

7. Pine Plantations

It is generally acknowledged that pine plantations are poor habitat for birds (Frith 1984, Davidson 1974). It is recommended that the proposal (NCDC 1983) to expand plantations in the river corridor be dropped.

8. REFERENCES

Canberra Ornithologists Group (1985a). *Murrumbidgee River Corridor Bird Survey: Initial Report - June 1985.* NCDC report (unpublished).

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APPENDIX 1

MURRUMBIDGEE RIVER SURVEY - SURVEY PROCEDURES

1. Surveys will be conducted on Sunday mornings (see attached sheet with survey dates), commencing at 8.00 a.m. Assume that surveys will go ahead unless notified to the contrary by your team co-ordinator.

2. Co-ordinators should attempt to contact members of their teams during the week before each survey. If a number of team members are unable to take part in a survey, team co-ordinators should ring the project officer, Ian Taylor, who will attempt to arrange emergency replacements.

3. All sites allocated to each team should be surveyed on each survey day, but sites should be surveyed in a different order on consecutive occasions.

4. Before you commence a survey, make sure you complete the details on the top of each data sheet. This may seem trivial at the time, but all of this additional information is essential.

5. The beginning and end of each transect has been clearly marked, but not the width. Make sure you have a clear idea of the correct width - 40 metres.

6. An important facet of the survey is the comparison of different sites. For this to be possible, all surveys must be carried out in a standard way. Spend precisely 30 minutes at each transect, proceed slowly from one end to the other. Walk ten paces then stop for one minute, then walk another ten paces and so on.

7. Any bird seen during the survey period which is in some way dependent on the survey area should be recorded. A bird involved in any of the following activities is regarded as being dependent on an area: perching, feeding, hunting, hovering, loafing.

Each transect consists of two parts: a vegetated part and a riverine part. The vegetated component is 250 m long and 40 m wide, measured from the point where the vegetation begins above the waterline. It includes all vegetated habitats on the survey bank and vegetation on islets and growing in the stream, including reeds, grass, shrubs, trees and dead vegetation on land. Note however, that snags in the river are included as part of the riverine habitat.

In the column marked 'V' for 'Vegetated', recorded the total number of birds of each species dependent on the vegetated area.

The riverine component includes the entire unvegetated area of river between the vegetation lines on both banks. This includes the surface of the river itself, rocks, beaches, sand bars, snags, unvegetated areas of islets etc. This will vary in width in different places, but will average about 50 m.

In the column marked 'R' for 'Riverine', recorded the total number of birds of each species dependent on the riverine area.

If a bird is seen in both the vegetated and riverine areas, record it only once. Enter the bird in the column for whichever area it appears to be most dependent on, discounting any effect of disturbance by the observer. If several birds of the same species occur in both areas, you may record some in one column and some in the other, if this reflects their undisturbed dependence on the areas.

8. In the column marked 'O' for 'Outside and overhead' place a tick for the following:

a) Species recorded outside the transect area, (e.g. on the opposite bank, high up on the bank being surveyed etc,) but within the river corridor (generally taken to mean within 200 m of the river).

b) Species seen flying over the transect area, but not dependent on it (i.e. not feeding in the air, hawking or displaying above the site)

c) Species seen anywhere within the river corridor before each survey commences or after it has concluded.

Note: a tick will suffice: there is no need to record actual numbers in the 'O' column.

There is no need to record a species in the 'O' column if it has already been recorded in the 'V'and/or 'R' column.

Complete an Unusual Record Report Form for those species for which such reports are required.

9. In the column marked 'B' for 'breeding' record the following:

'C' for 'confirmed breeding', including nests with eggs or young, or dependent young incapable of sustained flight.

'U' for 'unconfirmed breeding', including sustained territorial song, disused nests, adults carrying food or nesting material, nest building, copulation etc.

10. It is important that each site be surveyed by the equivalent of one good observer. One able observer plus one or two less experienced observers is the equivalent of one good observer. If a team has more than one good observer, then observers may split up and tackle one or two sites each.

11. One copy of the data sheet should be filled out in the field at each site. A clean and accurate copy should be made later that day and posted to Ian Taylor, 69 Tyson Street, Ainslie ACT 2602

on the Monday after each survey. The original data sheets completed in the field should be retained by the co-ordinator. For this survey to succeed, it is imperative that there is no delay in typing the information into the computer. Data sheets must be in hand as early as possible.

As soon as printout is available, computerised versions of the data sheets will be sent to co-ordinators. These should be checked against the originals made in the field.

12. Team co-ordinators are asked to phone Ian Taylor (476 315) after each survey to provided feed-back on the day's findings.

13. Watch the Murrumbidgee Survey news spot in Gang-Gang, where the features of the preceding survey will be summarised.

14. Some survey sites can only be reached through private property. The lessees have been advised by the DoT that we will be coming. Please show the usual courtesies when crossing private property - leave gates as you find them, etc. Team co-ordinators should carry the letters of introduction from the NCDC with them. Some sites may be inaccessible during the lambing season. Strictly no dogs on private property, please.

REVISED MURRUMBIDGEE SURVEY DATES 1985-86

1985	1986
7 July	12 January
4 August	2 February
1 September *	2 March
29 September *	6 April
20 October	20 April
10 November	4 May
24 November	1 June
8 December	6 July

* = revised date

APPENDIX II

[R]UMBIDGEE BIRD SURVEY Data Sheet. Site Angle Crossing Observer P. Roberts

[D]ate 7.7.85 Time begun 1005 Time ended 1035 Weather Fine, cold

[R]emarks Viewing conditions: Fair

	V	R	O	B
[P]ary-headed				
[A]ustral Grebe				
[M]arter				
[G]reat Cormor				
[L]ittle Pied				
[L]ittle Black				
[P]acific Heron				
[W]hite-faced				
[G]reat Egret				
[L]ittle Egret				
[N]ankeen Nt Heron				
[G]lossy Ibis				
[C]rested Ibis				
[B]lack-necked				
[B]lack Duck				
[M]allard				
[G]rey Teal				
[C]hestnt Teal				
[S]hoveler				
[W]ood-eared				
[P]ochard				
[M]ountd Duck				
[B]lack Duck				
[B]lack-sh Kite				
[W]histlng Kite				
[S]harp hawk				
[G]oshawkhawk				
[W]edge-tailed				
[L]ittle Eagle				
[P]eregrine				
[A]ustral Hobby				
[B]rown Falcon				
[N]ankeen Kestrel				
[D]usky Moorhen				
[P]urple Swamp				
[R]ussian Coot				
[M]asked Lapwng				
[C]ommns Snipe				
[B]lck-frnt Plvr				
[C]rest Pigeon				
[C]omm Bronzwng				

	V	R	O	B
Y-T BlackCock				
Gang-gang				
Galah				
Sulphur-crest				
King Parrot				
Crimson Rosel			✓	
Eastern Rosel				
Red-rumped				
Pallid Cuckoo				
Fantail Cucko				
Horsfields BC				
Shining BC				
WT Needletail				
Kookaburra				
Sacred Kingf				
Bee-eater				
Dollarbird				
Skylark				
Welc Swallow				
Tree Martin				
Fairy Martin				
Richards Pipt				
Blckfcd CkShr				
W-w Triller				
Blackbird				
Flame Robin	2	1		
Scarlet Robin				
Yellow Robin			✓	
Golden Whistr				
Rufous Whistr				
Grey Shrk-thr	1			
Lead Flyctchr				
Satn Flyctchr				
Rufous Fantal				
Grey Fantail				
Willie Wagtal				
Reed-Warbler				
Lit Grassbird				
Rufous Snglrk				
Fairy-wren	7	2		
Scrub-wren	2			

	V	R	O	B
Weebill				
West Gerygone				
W-th Gerygone				
Brown Thrnbll	2			
Bfrmpd Thrnbl	4			
Yellow-rumped	10			
Yellow Thrnbl				
Striated Thrn	4			
Varied Sitell				
W-thr Treecrp			✓	
Red Wattlebd				
Noisy Friarb				
Noisy Miner				
Yell-faced HE				
Wht-eared HE				
Fuscous HE				
Wht-plumed HE				
Brown-head HE				
Wht-naped HE				
Crescent HE				
New Hollnd HE				
East Spinebll			✓	
Mistletoebird				
Spotted Pard				
Striated Pard				
Silvereye				
Goldfinch	6			
House Sparrow				
Rd-brwd Frtail	13			
Dbl-bar Finch				
Starling				
Olv-bk Oriole				
Wht-wg Chough				
Magpie-lark				
Dusky Woodswal				
Austr Magpie			✓	
Pied Currawng				
Grey Currawng				
Austral Raven			✓	
Little Raven				

APPENDIX III

Diagrammatic representation of the method used to determine high, medium and low rank of attributes for each survey site.

