ACT PARKS and CONSERVATION SERVICE

A SURVEY OF THE VERTEBRATE FAUNA OF MT AINSLIE, MT MAJURA AND BLACK MOUNTAIN, 1975-76

K. KUKOLIC

RESEARCH REPORT 1

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FOREWORD

The ACT Parks and Conservation Service has published technical and scientific information over a period of 18 years. Professor Lindsay D. Pryor, of the then Parks and Gardens Section – Department of the Interior, produced the first works. Since then publications have been intermittent, and several formats have been used.

Following the restructuring of the Service and a review of objectives and policies, new publications have been initiated to disseminate information more widely. They will present a wide range of new as well as historical research and survey information generated by officers of the Service.

This report is the first of the new Research Report Series. Most of the information was collected during a study in 1975. The information it contains has been quoted in several previous reports. Consequently, it was considered important that the data be made more widely available as a reference source. This report also contains a brief review of new data on the vertebrate fauna within Mt Ainslie, Mt Majura and Black Mountain Reserve gathered since the original survey was completed.

The survey provided baseline information on the status of the vertebrate fauna present at that time in three study areas. This information is particularly important for Mt Ainslie and Mt Majura where there has been a significant impact by bushfires and other human activities during the last decade, resulting in changes to fauna abundance and distribution. Such baseline surveys are essential for the sound and effective management as well as to guide the direction of future investigations of our natural resources.

G.J Fraser
Director
ACT Parks and Conservation Service

ACKNOWLEDGEMENTS

A number of staff members contributed in different ways to the success of this project. First, I wish to thank Mr G. D. Butt, former ranger with Canberra Nature Park, for his assistance in setting up pitfall traps and for carrying out the major part of the field work on Black Mountain Reserve. The survey was initiated and supervised by Dr M. Braysher who assisted with some of the field work and provided useful comments on the report.

The format and contents of the final manuscript were improved significantly by the comments, contributions and support of Dr K. D. Williams, Mr F. Ingwersen and Mr R. Bennett. I am indebted in particular to Mr W. S. Osborne who, in addition to his encouragement, discussed and shared with me his extensive knowledge of terrestrial vertebrates in general, and the herpetofauna of the Canberra region, in particular.

Finally, I am grateful to Mrs R. Saillard for preparing the figures, and my sincere thanks go to Ms G. Lansdown and Miss O. Esmonde-Morgan for their skill and patience in typing the full report.

ABSTRACT

This report is based on the first vertebrate fauna survey of Mt. Ainslie, Mt. Majura and Black Mountain Reserve carried out between March 1975 and January 1976. A total of thirty-three sites were sampled in various vegetation structures in an attempt to relate vertebrate fauna to habitat characteristics.

Small mammals were surveyed using Elliott traps. Reptiles and amphibians were assessed by pitfall trapping together with other reliable observations. Spot-lighting was used to identify nocturnal mammals. Data on bats and birds was based mainly on available information in the literature.

The range of fauna recorded was found to be diverse and representative of dry sclerophyll vegetation communities of the Canberra region. A total of twenty-one native and nine introduced mammal species were present or reliably reported as occurring in the study areas at the time of the survey. From a total of 5026 mammal trap nights, 121 individuals from five species were captured. During 1680 pitfall trap nights a total of 339 reptiles from eleven species were trapped or observed. For the same trapping effort, 94 amphibians from seven species were recorded.

Notes on the distribution, relative abundance and association with vegetation structures for each species observed are discussed. In addition to the common species, a number of uncommon or rare animals were recorded in the surveyed areas. These were; common dunnart *Sminthopsis murina*, wallaroo *Macropus robustus*, pink-tailed legless lizard *Aprasia parapulchella*, Burton's legless lizard *Lialis burtonis*, and Grey's skink *Menetia greyii*.

The bird fauna in the study areas is fairly well known. A combined list from various sources revealed the presence of 116 species from 45 families. On the other hand, the bat fauna is less well known with nine species considered likely to be present at various times of the year.

The introduced mosquitofish *Gambusia affinis* was found to be common in dams within the study areas.

The importance of the 1975-76 baseline survey is discussed in the light of some habitat modifications brought about by climatic changes, land management practices, accidental or intentional bushfires and the recent discovery of species not previously recorded in the Canberra region.

The study identifies faunal groups needing further work and makes a number of management recommendations.

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INTRODUCTION

Black Mountain Reserve, Mt Ainslie and Mt Majura are part of the Canberra Nature Park system and are managed by the ACT Parks and Conservation Service (ACTP&CS) under multiple land use guidelines. The broad management objectives are focused on the overall protection and conservation of indigenous flora and fauna present in these areas, and their preservation from further deterioration or total loss. An important part of this management is to provide interpretation of nature for educational and recreational purposes, as well as, for scientific studies.

This paper reports on the first systematic survey of the vertebrate fauna of Mt Ainslie, Mt Majura and Black Mountain carried out between March 1975 and January 1976. Its broad aim was to provide a species list of the animal wildlife of these hills, and to attempt to relate their distribution and abundance to habitat characteristics.

Since this report was completed in 1976, there has been continuing human influence on the Mt Ainslie and Mt Majura area with an increasing frequency of fire and further dissection of the managed areas by road, trails, powerlines and walking tracks. Bush fires have had the most significant impacts on Black Mountain. In addition to the above pressures, the period 1978 to 1984 was particularly dry in Canberra (Bureau of Meteorology, 1986) placing additional stress on fauna groups such as frogs (Osborne, 1986). The above study provided base-line data against which the influence of these environmental changes can be examined at a later stage.

STUDY AREA

Mt Ainslie and Mt Majura (also referred to as Ainslie-Majura) are part of a north - south aligned ridge bounding the eastern suburbs of northern Canberra (Fig 1). The summits of these hills reach an altitude of 843 m and 890 m respectively, and the managed area covers 1137 ha. Black Mountain Reserve rises to 812 m on the western side of the northern suburbs and covers an area of 521 ha. Their reliefs include both steep slopes (20^{o} - 30^{o}) and gentle lowlands (5^{o} - 10^{o}).

In most areas the soils of these hills are shallow and skeletal over bedrocks, with the exception of the footslopes where some deep profile formation is evident. More detailed descriptions of their physical and environmental characteristics are given by Elliott and Douglas (1972), and Ingwersen, Evans and Griffiths (1974).

The climate is of a continental type with hot summers and cold winters, but the altitude decreases both the summer and winter temperatures. While detailed climatic data of each study area is not available, a summary of meteorological data for Canberra AMO is presented (Table 1.) (Bureau of Meteorology, 1986). The total annual rainfall during 1975 was 771 mm, which was slightly higher than the long term average of 627 mm.

Table 1. Summary of Meteorological data recorded at Canberra AMO (Airport Meteorological Office) (Bureau of Meteorology, 1986).

	J	F	M	A	M	J	J	A	S	O	N	D
Average daily maximum temp ^{o}C (1939–86)	27.7	26.9	24.4	19.6	15.1	12.0	11.1	12.8	15.9	19.2	22.5	26.0
Average daily minimum temp ^{o}C (1975)	27.2	26.9	22.2	19.0	15.7	12.6	12.9	12.8	16.4	17.7	23.2	27.0
Average daily minimum temp ^{o}C (1939–86)	12.9	12.9	10.7	6.5	2.9	0.8	–0.3	0.8	2.9	5.9	8.4	11.1
Average daily minimum temp ^{o}C (1975)	10.5	12.7	9.9	5.9	3.7	0.5	1.3	1.8	4.9	6.7	9.8	13.6
Average days with terrestrial temp less than $0^{o}C$ (1939–86)	0	0	0	1	9	14	17	13	7	1	0	0
Average rainfall (mm) (1939–86)	60	57	54	49	48	38	38	49	52	69	61	49
Monthly rainfall (mm) (1975)	72	109	47	50	15	83	72	38	102	111	39	32

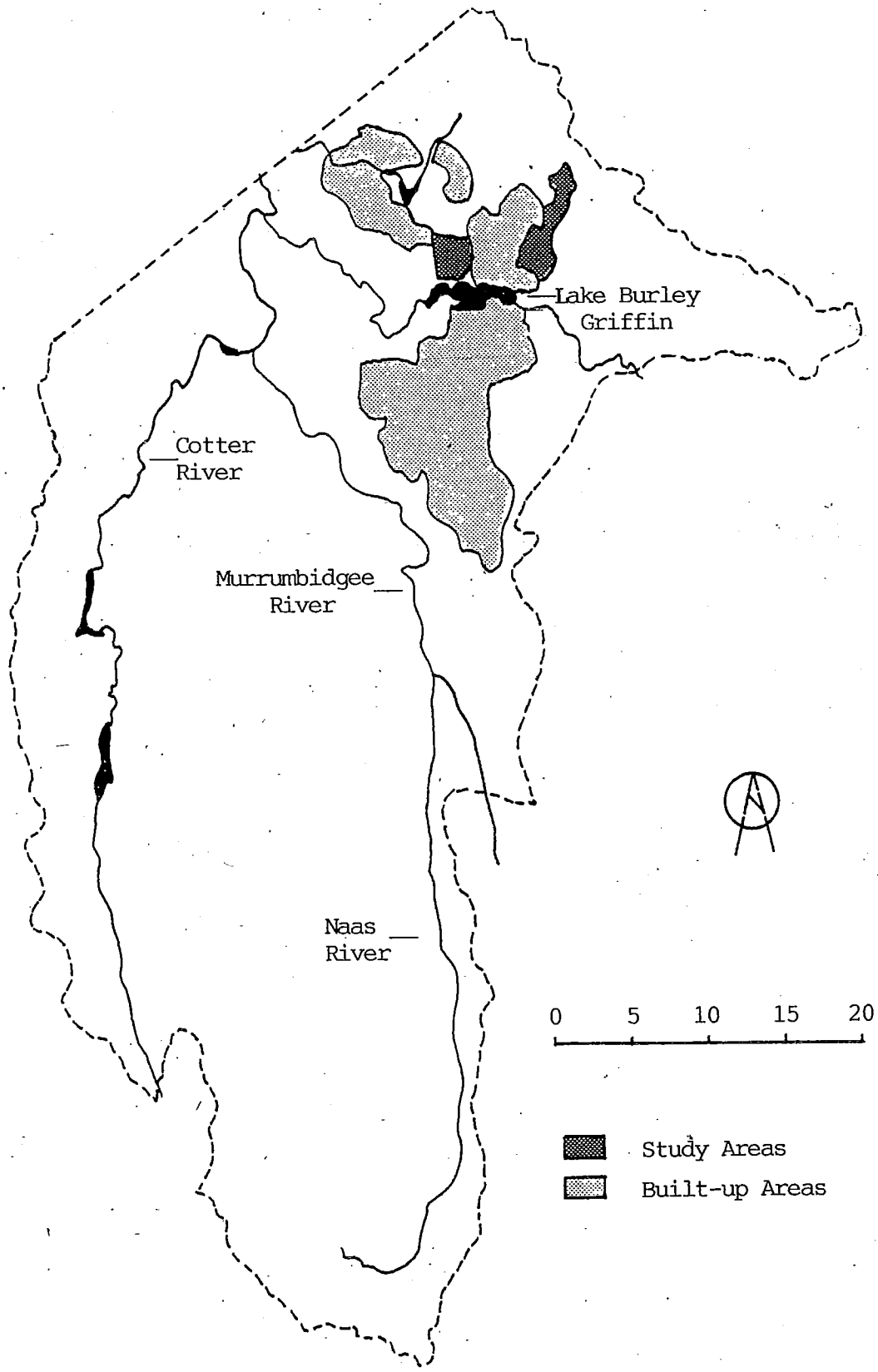

Figure 1. Map of Australian Capital Territory (ACT) showing location of study areas.

VEGETATION COVER

The areas investigated are dominated by dry sclerophyll vegetation. On Black Mountain, eucalyptus form several distinct communities. On Ainslie–Majura, casuarina stands were important among the dominant trees. All of those communities have suffered severely after the recent fires.

The vegetation of Ainslie–Majura was surveyed and analyzed by Ingwersen et al. (1974). They identified nine structural units (Table 2.). Vegetation structural units were not represented uniformly by the same species. They found that the floristic composition within the study area differed depending on aspect, altitude, soil and land use history.

Table 2. Structural classification on vegetation on Ainslie–Majura with abbreviations in brackets.

Vegetation Structures	
Low open forest	(LOF)
Open forest	(OF)
Low closed forest	(LCF)
Woodland	(W)
Low woodland	(LW)
Open woodland	(OW)
Low open woodland	(LOW)
Shrubland	(SH)
Grassland and pasture	(G)

The vegetation structures for Black Mountain Reserve were classified on the basis of a preliminary vegetation map by Elliott and Douglas (1972) and, on field observations. Variation in the floristic composition of Black Mountain vegetation was examined by Pook and Moore (1966) who emphasized its control by aspect. A detailed vegetation study is currently being undertaken (F. Ingwersen, pers. comm.).

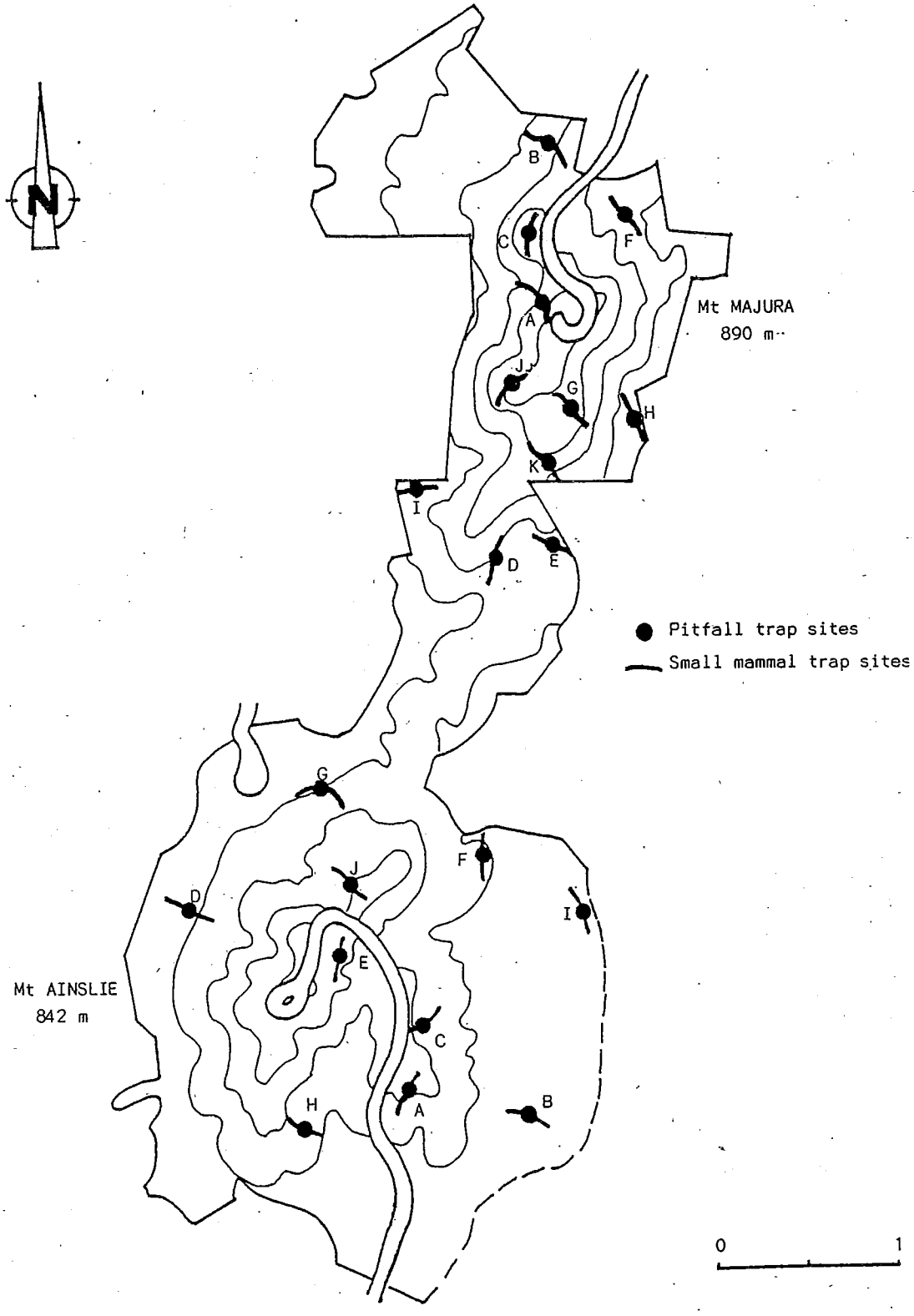

Figure 2. Mount Ainslie and Mt Majura study areas showing location of survey sites.

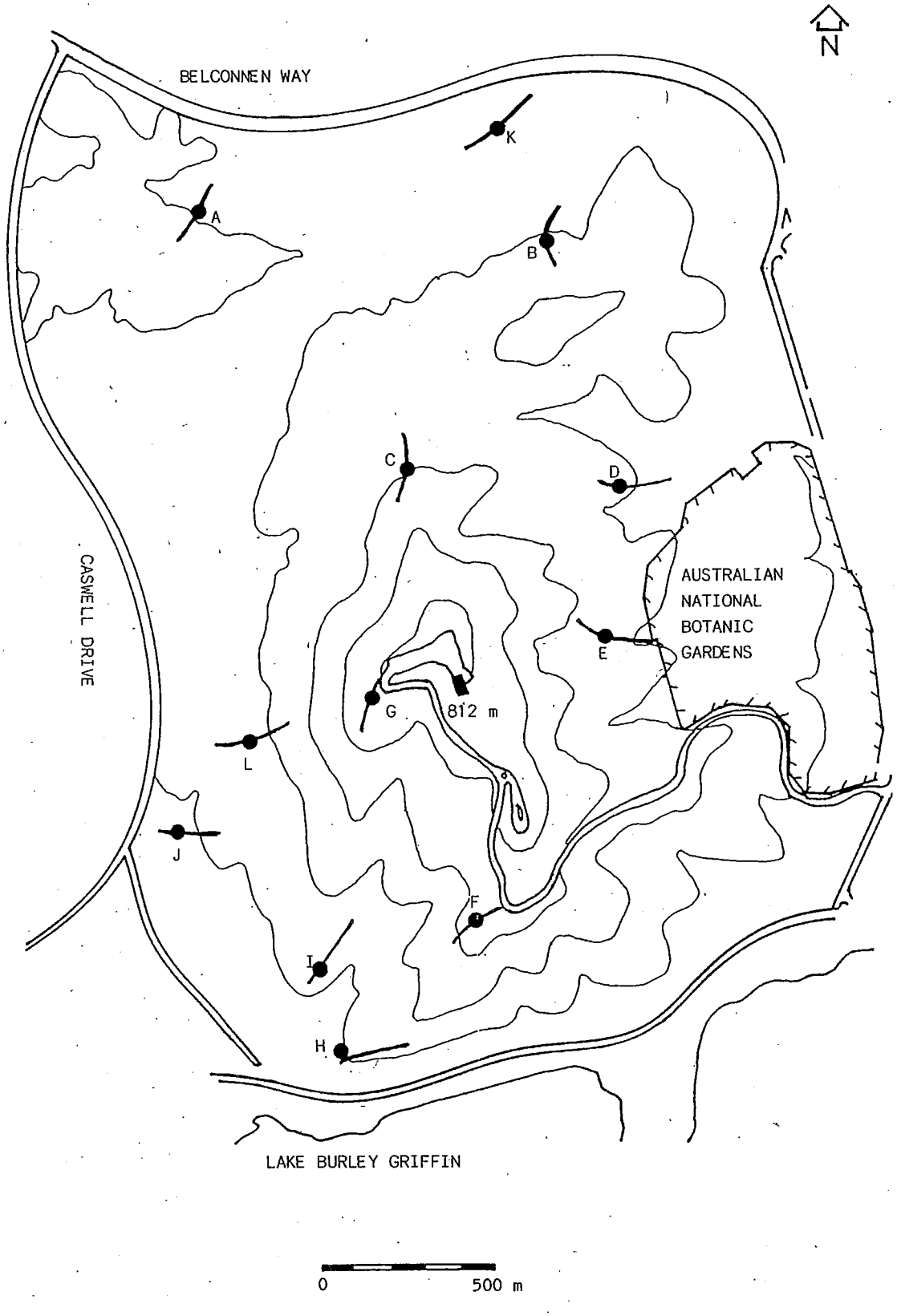

Figure 3. Black Mountain Reserve showing location of survey sites.

METHODS AND MATERIALS

Thirty three trapping sites were selected to sample the described vegetation structures, with ten on Mt Ainslie, eleven on Mt Majura and twelve on Black Mountain (Figs 2 and 3, Table 3). All sites were sampled twice during the survey period, once in summer and one in winter.

Table 3. List of sampling sites and respective vegetation structure on Mt Ainslie, Mt Majura and Black Mountain. The abbreviations used are explained in Table 2. The grid references are based on the ACT 1:10,000 Planning Series.

	Vegetation structures					
Sites	Mt Ainslie	Grid Reference	Mt Majura	Grid Reference	Black Mountain	Grid Reference
A	LCF	967942	LCF	984984	OF	903957
B	OF	977940	OF	985994	W	912954
C	LOF	968945	LOF	984987	SH	907948
D	W	957953	W	977970	OF	912947
E	LW	965950	LW	981971	OF	912943
F	OW	974954	OW	988988	W	905935
G	LOW	965957	LOW	985977	LW	904943
H	SH	963939	SH	988976	W	902932
I	G	983957	G	972973	G–OF	901934
J	LW–OF	966953	LCF–LW	981980	G	897938
K			LCF–W	982975	OF	912958
L					W	900941

Small mammals were trapped at each site using medium size Elliott traps (32 cm x 10 cm x 8 cm). These were set near places likely to be used by small mammals, such as rocky outcrops, hollow logs or grass tussocks. Normally, 20 traps were set in a single line approximately 10 m apart. Depending on the availability of suitable habitat, each line extended between 100–200 m.

The traps were baited with a mixture of rolled oats and peanut butter. Sufficient bait was available to maintain the animal alive. Some bait was also sprinkled leading up to each trap. Tissue paper bedding was put inside each trap to reduce mortality due to heat loss on cold nights.

A small number of Gordon wire mesh traps (36 cm x 13 cm x 14 cm) became available after the program had begun. Three or four of these were set out per line in addition to the Elliott traps. Some of these new traps were baited with fresh meat and others with peanut butter and rolled oats inside cheesecloth sacs. Early trapping showed that there was no preference for the type of bait used. Gordon traps subsequently were baited with meat only.

Small mammals were generally trapped over 4 consecutive nights. All traps were set out in the afternoon between 2–5 pm of the first day and checked in the morning of the following day. Afternoon trap inspections showed that no animals were captured during the day.

A small number of captured animals were preserved and catalogued for reference purposes. Their weights, body measurements, sex and general condition were recorded. Mammals were preserved in 70% alcohol. The remaining specimens were sexed, weighed, marked and released. The animals were marked in order to distinguish between new and recaptured individuals of particular areas, as well as to record their movements. As dye was found to be ineffective over any length of time, toe clipping was used to mark animals.

Traps containing animals were replaced during the day with clean ones. The used traps were washed in detergent and dried, so as to remove most of the previous or deterrent odours.

Pitfall traps were used to capture reptiles and amphibians. Five and ten litre plastic buckets were dug into the ground, level with the surface. Each trapline consisted of 10 buckets spaced approximately 5 m apart. A synthetic mesh fence approximately 35 cm high and supported by metal pegs was stretched so that it would run over the middle of all the containers, in order to guide animals into the traps.

The pitfall traplines were kept open for 3–4 consecutive days and nights, and when not in use the nets were removed and lids placed on the containers. Reptiles were identified using keys from Jenkins and Bartell (1980) (then in draft form) and Cogger (1975).

Some amphibians were hand collected but most specimens were obtained from pitfall traps. General hand searching by turning over rocks, logs, and litter was also carried out during

the trapping particularly during the cooler months. Identification keys used were from Cogger (1975) and Humphries (unpublished). Subsequent general information was obtained from Barker and Grigg (1977). Reference specimens were kept in 5% formalin.

Faecal presence was noted and used as broad identification of some animal species occurring in each area.

Spotlighting, mainly from a vehicle, was carried out in order to determine the presence of terrestrial and arboreal nocturnal mammals. Species, age status and activity were recorded. For arboreal mammals, species and part of the tree on which they were sighted was also noted. All the observations were made along the internal access tracks within the study areas.

A bird list was compiled from general information collected by staff from the ACT Parks and Conservation Service, and particularly from information made available by members of the Canberra Ornithologists Group (C.O.G.), "Canberra Bird Notes", and from "Birds in the Australian High Country" (Frith, 1969).

Information on the likely status of bats in the Ainslie-Majura and Black Mountain study areas was provided by Les Hall (pers. comm.), formerly from CSIRO's Division of Wildlife and Rangelands Research. While mistnetting for bats was not attempted, several other methods were experimented with without any success. Some of the dams and ponds were searched for aquatic vertebrates with a fine mesh net.

Where possible the following information was recorded for each specimen:

1. Date and time specimen collected
2. Identification of specimen (if possible)
3. Field number assigned to the specimen
4. Name of collector
5. Method of collection
6. Location
7. Vegetation
8. Weather and temperature
9. Sex and reproductive condition
10. General observation
11. Photographic record

For preserved specimens, the usual measurements such as weight, head–body, tail, ear and hind limb were recorded. These were kept for reference purposes.

RESULTS

Mammals

A systematic list of mammals found during the survey, including those reliably reported as occurring in the study areas, are presented in Table 4. Of the thirty species listed, nine were introduced. From the total of 5026 mammal trap nights, 4450 were Elliott and 576 were Gordon trap nights. Excluding recaptures, 121 animals from five species were caught giving a capture rate of approximately 3 percent. Details of the small mammal species trapped at each sampling site are outlined in Table 5. Total numbers of animals, percentage composition and sex ratios are shown in Table 6.

Notes on the distribution, abundance of the encountered species and their association with vegetation structures are given below.

MONOTREMATA

Echidna (*Tachyglossus aculeatus*)

The presence of echidnas was confirmed during the survey. Individuals were not observed during their hibernation period which extends between May and September. Only isolated animals had been reliably spotted previously from Mt Ainslie, Black Mountain and other hills within the perimeter of the city. Work carried out by Griffiths (1968) on a small resident population on Mt Majura found from recapture data that echidnas remained within an approximate 700 meter radius for extended periods of time. Given that echidnas are present throughout Australia in a wide variety of habitats, it appears that the main limiting factor is the availability of suitable food such as ants and termites (Griffiths, 1968).

Table 4. Systematic list of mammals recorded or reported for Ainslie–Majura and Black Mountain surveyed areas during 1975–76.

	MONOTREMATA
Echidna	*Tachyglossus aculeatus*
	MARSUPIALIA
Common Dunnart	*Sminthopsis murina*
Yellow–footed marsupial mouse	*Antechinus flavipes*
Brown Antechinus	*Antechinus stuartii*
Common Brushtail Possum	*Trichosurus vulpecula*
Common Ringtail Possum	*Pseudocheirus peregrinus*
Sugar Glider	*Petaurus breviceps*
Common Wombat	*Vombatus ursinus*
Eastern Grey Kangaroo	*Macropus giganteus*
Wallaroo	*Macropus robustus*
Red–necked Wallaby	*Macropus rufogriseus*
Swamp Wallaby	*Wallabia bicolor*
	CHIROPTERA
Grey–headed Flying Fox	*Pteropus poliocephalus*
Little Red Flying Fox	*Pteropus scapulatus*
Lesser Long–eared Bat	*Nyctophilus geoffroyi*
Greater Long–eared Bat	*Nyctophilus timoriensis*
Gould's Wattle Bat	*Chalinolobus gouldii*
Chocolate Bat	*Chalinolobus morio*
Little Brown Bat	*Eptesicus pumilus*
White–striped Bat	*Tadarida australis*
Yellow–bellied Sheath–tailed bat	*Taphazous flaviventris*
	CARNIVORA
European Fox *	*Vulpes vulpes*
Cat *	*Felis catus*
Dog *	*Canis familiaris*
	RODENTIA
Black Rat *	*Rattus rattus*
House Mouse *	*Mus domesticus*
	LAGOMORPHA
Rabbit *	*Oryctolagus cuniculus*
Brown Hare *	*Lepus capensis*
	ARTIODACTYLA
Cattle *	*Bos taurus*
	PERISSODACTYLA
Horse *	*Equus caballus*

* indicates introduced species

MARSUPIALIA

Common Dunnart (*Sminthopsis murina*)

One juvenile male was caught inside a pitfall trap on the 4/12/75 in site F, an open woodland area of Mt Ainslie. This carnivore, one of the smallest member of the family Dasyuridae, weighed 7.5 gm and was estimated to be 3 months old (D. Wood pers. comm.). After consulting scientists from CSIRO's Division of Wildlife and Rangeland Research it was established that only a few *Sminthopsis murina* have been captured in the area. This may be related to small population numbers, low density or possible trapping difficulty due to the animal's small size.

Brown Antechinus (*Antechinus stuartii*)

Only two Brown Antechinus were caught during this survey. These animals, one of each sex, were captured during winter at site A, in the fringe zone between the low closed forest and the low open woodland of Mt Ainslie. Both individuals were marked and released. No *A. stuartii* were caught on either Mt Majura or Black Mountain. However, previous Departmental survey records from Black Mountain show that two male animals were caught on 5/9/73, and several animals were trapped during 1978–79 (Dickman, 1980).

Yellow-footed Marsupial Mouse (*Antechinus flavipes*)

Yellow-footed marsupial mice were the most abundant dasyurid in the study areas making up 28 per cent of the total number of ground mammals trapped (Table 6). *A. flavipes* were widespread on Mt Majura occurring in most forest and woodland vegetation units; in moist sheltered gullies and on the exposed and windswept north western slopes near the summit. None were found in the grassland area. Of those *A. flavipes* caught in winter, seven were males and two were females. The latest date on which males were trapped was 17/7/75 when two were caught, one being found dead in the trap. Wollard (1971) and Braithwaite (1974) found that due to their extremely active courtship and copulation behaviour there was a general deterioration of the weight and condition of all males. This deterioration was found to be due to a negative nitrogen balance (Wollard, 1971) resulting in the excessive breakdown and eventual depletion of protein levels. At the same time the tissues of the body showed signs of aging.

Male Antechinus die in the wild before they are one year old. *A. flavipes* were found to die a month earlier than *A. stuartii* (Tyndale-Biscoe, 1973). This is because *A. flavipes* breed a month earlier, giving birth by late August or early September (Marlow, 1961).

During our survey, the first females carrying litters were caught on Black Mountain on 15/9/75. The litters averaged 6.3 suckling young. Lack of pelage on the young indicated that they were less than 20 days old (Marlow, 1961). The numbers of *A. flavipes* increased slightly during the summer months when ten males and four females were captured. Of the latter, two were classified as second year females because of their heavier weight, having an open pouch with worn rusty-brown appearance, and the presence of vestigial teats. The sex ratio of the trapped animals varied seasonally, however, males and females were equally abundant once the litters had become independent.

Table 5. Species and numbers of small mammals trapped during 1975–76 at various sites on Mt Ainslie, Mt Majura and Black Mountain Reserve.

SPECIES	SAMPLING SITES											
Mt MAJURA	A	B	C	D	E	F	G	H	I	J	K	TOTAL
Mus domesticus	7		4	6	4				3	6	1	31
Rattus rattus	2		1				1					4
Antechinus flavipes	1	7	1			1	3	4		5	1	23
No. of species	3	1	3	1	1	1	2	1	1	2	2	
Mt AINSLIE	A	B	C	D	E	F	G	H	I	J		TOTAL
Mus domesticus	5		1	8	5			11		2		32
Rattus rattus	1			1	1			2				5
Antechinus stuartii	2											2
Sminthopsis murina						1						1
No. of species	3	0	1	2	2	1	0	2	0	1		
BLACK MOUNTAIN	A	B	C	D	E	F	G	H	I	J	K	L TOTAL
Mus domesticus	1		1									1 3
Rattus rattus					1		1	2	1		1	3 9
Antechinus flavipes						4	5					2 11
No. of species	1	0	1	0	1	1	2	1	1	0	1	3

Common Brushtailed Possum (*Trichosurus vulpecula*)

Common brush-tailed possums were found to be abundant and widely distributed throughout forests and woodlands in the study areas (Table 7). They were observed from ground level to the canopy tops of *E. macrorhyncha, E. blakelyi, E. polyanthemos, E. bridgestana, E. manifera maculosa* and *Exocarpus cupressiformis*. Both adults and subadults, were present in May–June 1975. Sightings were of single individuals only, which is in accordance with their solitary social patterns (Tyndale-Biscoe, 1973).

Table 6. Total numbers, percentages and sex ratios of mammals trapped on Mt Ainslie, Mt Majura and Black Mountain Reserve.

SPECIES	TOTAL NO.	% OF TOTAL	SEX RATIO Male : Female
Mus domesticus	66	54.6	46 :20
Rattus rattus	18	14.9	9 : 9
Antechinus flavipes	34	28.1	18 :16
Antechinus stuartii	2	1.7	1 : 1
Sminthopsis murina	1	0.8	1 : 0

Common Ringtail Possum (*Pseudocheirus peregrinus*)

Common ringtail possums were also frequently observed, occurring on the tree trunks and canopies of *E. rossii; E. macrorhyncha; E. manifera maculosa* and *Casuarina stricta*. Most animals were recorded from Black Mountain Reserve, and surprisingly none were observed on Mt Ainslie.

Common ringtail possums were often found in close proximity to and in slightly greater numbers than the common brushtail possums. The numerical difference between the two species could be attributed to the fact that ringtails were often observed in pairs owing to their gregarious nature. Additionally, they have a smaller home range, and have a higher survival in their first year of life than common brushtails (Tyndale-Biscoe, 1973). Thomson and Owen (1964) showed that the ringtail is more restricted to forest habitat than is *T. vulpecula*, preferring a partially cleared and regenerating low scrubby habitat rather than the scant understory of densely timbered areas.

Sugar glider (*Petaurus breviceps*)

Sugar gliders were the most numerous arboreal mammal observed during the spotlighting trips, however, they were not evenly distributed (Table 7). Only two animals were recorded from Black Mountain during several spotlighting trips. They were observed together on an *E. manifera maculosa* on the south-western slopes near Lady Denman Drive. This finding verified previous sighting reports of sugar gliders in the woodland forest along Caswell Drive adjacent to the suburb of Aranda (H. Bell, pers. comm.).

Recent sightings by ACT Parks and Conservation staff of isolated individuals would suggest that sugar gliders may be more common on Black Mountain than originally thought. Prior to the 1975–76 survey there had been no reliable reports of the existence of this species on Mt Ainslie and Mt Majura (J. Calaby, pers. comm.). However, residents of suburbs bordering Ainslie–Majura had reported that domestic cats were catching sugar gliders (L. Tong, H. Tyndale–Biscoe, pers. comm.).

Table 7. Animals observed by spotlighting during the 1975–76 survey of Mt Ainslie, Mt Majura and Black Mountain Reserve.

		Mt Ainslie	Mt Majura	Black Mountain	TOTAL No
Number of spotlight hours		2	6.5	6.5	15
Common Brushtail Possum	*T. vulpecula*	3	4	3	10
Common Ringtail Possum	*P. peregrinus*		2	11	13
Sugar Glider	*P. breviceps*		18	2	20
Tawny Frogmouth	*Podargus strigoides*			1	1
Eastern Grey Kangaroo	*M. giganteus*			3	3
Swamp Wallaby	*W. bicolor*			1	1
Fox	*V. vulpes*			5	5
Cat	*F. catus*			3	3
Rabbit	*O. cuniculus*			7	7
Brown Hare	*L. capensis*	13			13

Spotlighting trips through Mt Majura confirmed the presence of sugar gliders. A single animal was recorded along Majura Lane, near the Federal Highway. A large number of sugar gliders were observed along the summit road of Mt Majura. Within a distance of one kilometre a maximum of eight animals were recorded in a single night's spotlighting. Most of the sugar gliders were found on *Acacia mearnsii* and *Casuarina stricta*, however, they also occurred on *E. manifera maculosa*, *E. bridgesiana*, *Acacia implexa* and *dealbata*. This finding is most interesting as the *Casuarina stricta* communities are one of the least natural vegetation assemblages, a result of a re-afforestation program undertaken some 50 years ago (Ingwersen et al. 1974).

Sugar gliders were not observed during our limited spotlighting trips through Mt Ainslie. However, the tail of one animal was found close to the Mt Ainslie summit road near site J (C. Mobbs, pers. comm.). Presumably this was the remains of a fox or cat meal.

Common Wombat (*Vombatus ursinus*)

None were sighted during the survey. A search for burrows also proved fruitless. While in the past the common wombat may have been abundant in the timbered areas surrounding the Canberra plain, this was certainly not the case at the time of the survey. From time to time wombats have appeared in some of the suburbs fringing the timbered areas of the reserves. Over the years, a small number of these animals have been released on Black Mountain Reserve. Additionally, one was observed entering this Reserve off Belconnen Way during May 1977 (C. Mobbs, pers. comm.).

Eastern Grey Kangaroo (*Macropus giganteus*)

The eastern grey was the most common and widespread kangaroo in the surveyed areas. Sightings were regular but identification was often difficult particularly in heavily timbered areas. Greys were generally easier to identify when in a group because of their inquisitive nature.

There were certain areas on Mt. Majura where fresh faeces and tracks were observed regularly. These were along the Majura summit road, the fire trail and down the slopes particularly around site H – in a steep shrubland on the eastern foothills. This species was most common on the lower slopes and eastern foothills of Ainslie-Majura. Groups of up to 20 individuals were regularly reported near the Dept. of Defence Buildings, East Ainslie. Only a few eastern grey sightings and faecal observations have been recorded from Black Mountain Reserve. Most of the animals there were observed on the western footslopes.

Wallaroo (*Macropus robustus*)

The status of the wallaroo in the study areas was either uncommon or rare. During the survey only one animal was recorded. It was observed in a low woodland–open forest community above the former Mt Ainslie garbage tip. Reports by rangers suggest that small numbers of wallaroos may exist on Ainslie–Majura.

Red-necked Wallaby (*Macropus rufogriseus*)

The status of this species is similarly uncertain, since no animals were actually observed in the study areas during the survey. Only isolated sightings just outside of these areas have been reported. One female with a very small pouch young was attacked by dogs in the suburb of Reid, near the western foothills of Mt Ainslie. A juvenile was killed on the corner of Lady Denman Drive and Tuggeranong Parkway, on the southwest of Black Mountain Reserve.

Swamp Wallaby (*Wallabia bicolor*)

Swamp wallabies were found to be common and widespread, occupying in similar habitats to the eastern grey, however, generally observed in lower numbers and considered less abundant than the greys.

CHIROPTERA

Bats were regularly observed and heard during spotlighting trips, however, no other detailed work on their distribution and relative abundance was carried out at the time of this survey. On the basis of the information provided (L. Hall, pers. comm.), nine species of bats (Table 4) representing four families were recorded. The grey-headed flying fox and the little red flying fox are not resident species and generally have been observed during their migratory flight through the ACT. The remaining species listed are resident and are known to inhabit tree hollows, rock crevices and occasionally other suitable habitats in suburban buildings adjacent to the study areas.

CARNIVORA

European fox (*Vulpes vulpes*)

Foxes were observed in all the study areas. They were found to be relatively common as evidenced by the wide distribution of sighting reports and from scat findings. Their abundance was not assessed.

Domestic Dog (*Canis familiaris*)

A small number of dogs were observed, particularly on the foothills of Mt Ainslie and Mt Majura near the surrounding suburbs. They were often accompanied by their owners.

Cat (*Felis catus*)

Observed on a number of occasions along the access roads in the daytime as well as during spotlighting trips. As these areas are adjacent to, and often surrounded by suburbs, it is probable that apart from those animals that commute daily to and from the reserves some have gone wild in the timbered areas.

RODENTIA

Black Rat (*Rattus rattus*)

The hardy black rat made up 15% of the total numbers of all mammals trapped (Table 6). They occurred throughout the year in habitats ranging from low closed forests to open woodlands with thick ground cover (Table 5). Males and females were caught in equal proportions, and recaptures of both sexes were common. One male rat on Black Mountain was retrapped the following night 70 metres away from the site at which it was originally caught. However, all the others were recaptured within 20 metres of their original trapping sites. No *R. rattus* were caught in open grasslands or grazed areas.

House mouse (*Mus domesticus*)

The house mouse was the most abundant mammal taken, making up 55% of all the mammals trapped (Table 6). They were widespread occurring in all vegetation types where abundant thick tussock grass cover was available and in or near fallen logs. None were captured in the heavily grazed and disturbed grassland and open forest of the eastern foothills of Mt Ainslie.

Widespread resident populations were encountered. Some mice were recaptured on three consecutive nights within a radius of 20 metres. The bulk of the numbers were caught during the winter trapping at which time most of the population was made up of juvenile males and non-parous females.

House mice were caught occasionally during the late spring-summer trapping. At this time one would have expected to have encountered greater numbers as a result of an influx in

numbers due to breeding (Newsome, 1969) and an increase in movement resulting from the effect of drier summer conditions on the availability of food.

The total male to female ratio of captured mice was 2:1 (Table 6). However, this result may have been influenced by the use of a single line Elliott trap method. According to A. Newsome, (pers. comm.) male mice are thought to travel greater distances than females, and have a greater capture rate. The same principle is known to apply to other species (Wood, 1971).

LAGOMORPHA

Rabbit (*Oryctolagus cuniculus*)

Scats and scratchings of rabbits were found in varying proportions along the higher ridges and shrubby lower slopes. Individuals were seen in woodlands, low open forests and particularly along clearings and road fringes. Only a small number of warrens were found and most of these had collapsed or were inactive. Some breeding still occurred, and one juvenile rabbit was caught in an Elliott trap on Mt Majura. Past eradication measures seem to have been successful in reducing populations to tolerable levels within the study areas. Rabbit sightings and faecal droppings were least abundant on Black Mountain.

Brown Hares (*Lepus europaeus*)

Brown hares were only observed along the south eastern lowlands of Mt Ainslie, near the Campbell Park Office complex. Groups of 12–15 animals were sighted on several occasions. The restriction of suitable habitat, together with predation and effective eradication programs in the past have prevented hare and rabbit populations becoming a serious problem.

PERISSODACTYLA

Horses (*Equus caballus*)

Horses have been agisted in specially fenced off areas on the north western lowlands of Mt Majura. Horse riding has been encouraged as a way of enjoying the environment, and special horse trails have been established. However, on a number of occasions it was noticed that riding had taken place along the walking trails. Horse riding is not permitted on Black Mountain Reserve.

ARTIODACTYLA

Cattle (*Bos bovis*)

At the time of this survey cattle were present in the saddle area between Mt Ainslie and Mt Majura and along the eastern foothills of Mt Ainslie. In the latter, the impact of grazing was particularly apparent around sites B, I and to a lesser extent F. The cattle were removed some years ago and grazing is no longer allowed within these areas.

Reptiles

A total of 339 reptiles from 1680 pitfall trap nights were trapped or observed during the survey period. This presented an approximate capture rate of 20 percent. Details of species and numbers of animals caught at each sampling site are shown in Table 8. A number of other species were observed while travelling along access tracks or during general hand searching in areas not near the sampling sites. The results are presented in Table 9. Included also are observations by ACT PCS staff as well as those recorded in the study areas by Jenkins and Bartell (1980). Pitfall trapping during late autumn-winter indicated that most lizards were inactive during the colder months. Their numbers increased markedly during the late spring–summer period. Members of the family Scincidae were the most abundant in both numbers and diversity during the 1975–76 survey. General notes on each reptile species together with any comments relating to the different vegetation structures are described below.

Bearded Dragon (*Pogona barbatus*)

Normally single animals were observed basking along access track and on tree stumps in woodland areas of Mt Ainslie, Mt Majura and Black Mountain Reserve. They were not caught in any of the pitfall traps.

Jacky Lizard (*Amphibolurus muricatus*)

This species was observed only on a couple of occasions in woodland areas of Mt Ainslie and Black Mountain, however, they have also been reported from Mt Majura. They were not considered to be as abundant as the previous species. Not recorded from pitfall traps.

Table 8. Details of species, and numbers of reptiles caught in pitfall traps or observed near each sampling site during 1975–76. Numbers in brackets are results of a preliminary pitfall trapping undertaken by ACT P&CS staff between Oct–Dec 1974.

MT MAJURA — **SAMPLING SITES**

SPECIES	A	B	C	D	E	F	G	H	I	J	K	TOTAL
Lampropholis delicata	14	3	12	4	6	9	1	9	2	4	1	65
Lampropholis guichenoti	1	1		5	7					2	1	17
Hemiergis decresiensis	2	2	2			3	1		1			11
Menetia greyii	1					1			14			16
Morethia boulengeri			1						2			3
Ctenotus taeniolatus								1		1		2
Tiliqua scincoides									2	1		3
Lialis burtonis									1			1

MT AINSLIE

SPECIES	A	B	C	D	E	F	G	H	I	J	K	TOTAL
Lampropholis delicata	3	2	4	5	38	1	7	46				106
Lampropholis guichenoti	1				1							2
Menetia greyii					14							14
Morethia boulengeri		4		3	1							8
Egernia cunninghami						2				3		5
Tiliqua scincoides										1		1
Pseudonaja textilis		1										1

BLACK MOUNTAIN — **SAMPLING SITES**

SPECIES	A	B	C	D	E	F	G	H	I	J	K	L	TOTAL
Lampropholis delicata	8	10	4	7	16	4	2	2		2	2	5	62
	(3)	(3)	(7)	(17)		(7)	(3)	(4)					(44)
Hemiergis decresiensis				1				1					2
										(2)			(2)
Morethia boulengeri			2										2
			(3)				(4)		(6)	(1)			(14)
Ctenotus taeniolatus	3	4	3			3						4	17
	(2)	(1)	(9)	(2)		(5)		(2)	(1)				(22)
Pseudonaja textilis						(1)							(1)
Diplodactylus vittatus			1										1

Table 9. Species list of reptiles found or likely to be present on Mt Ainslie, Mt Majura and Black Mountain Reserve based on data collected during the 1975–76 survey, observations by other ACT P&CS staff, and animals collected by Jenkins and Bartell (1980). Preferred habitats are noted together with the expected occurrence and relative abundance of each species.

Occurrence
P – Present (found during survey)
K – Known to occur (reliable sources)
L – Likely to occur (within range and suitable habitat)

Abundance
C – Common
M – Moderate numbers
R – Rare
? – Density unknown

Habitat (Vegetation structure code as per Ingwersen et al. 1974)
Var : Various habitats

Scientific Name / Commom Name	Occurrence – Abundance Mt Ainslie	Mt Majura	Black Mountain	Habitat
CHELIDAE				
Chelodina longicollis Long-necked tortoise	L–?	L–?	K–?	Semi–aquatic
AGAMIDAE				
Pogona barbatus Bearded Dragon	L–?	L–?	K–?	Semi–aquatic
Amphibolurus muricatus Jacky Lizard	P–R	K–?	P–?	Var (W)
GEKKONIDAE				
Diplodactylus vittatus Stone Gecko	K–?	K–?	P–?	OW, F
Phyllodactylus marmoratus Marbled Gecko	K–R	K–R	K–R	Var OW–F
PYGOPODIDAE				
Aprasia parapulchella Pink–tailed legless lizard	K–?	K–?	K–?	Well drained granitic country
Delma impar Legless lizard	L–?	L–?	K–R	Var – under rocks & debris
Lialis burtonis Burton's legless lizard	L–?	L–?	K–R	Var – under rocks & debris
SCINCIDAE				
Ctenotus taeniolatus Copper–tailed skink	L–?	P–R	P–C	Var
Egernia cunninghami Cunningham's skink	P–M	L–?	K–?	F,W (Granite outcrops)
Hemiergis decresiensis Three–toed skink	L–?	P–M	L–R	Var
Lampropholis delicata Delicate skink	P–C	P–C	P–C	Var
Lampropholis guichenoti Spotted grass skink	P–R	P–M	L–?	Var

Table 9. continued.

Scientific Name/ Commom Name	Occurrence – Abundance Mt Ainslie	Mt Majura	Black Mountain	Habitat
Menetia greyi Grey's skink	P–R	P–R	L–?	F, W and G
Morethia boulengeri Boulenger's skink	P–M	P–M	P–M	OW
Sphenomorphus tympanum Water skink (WTF)	–	–	P–?	Moist (Around O'Connor lab)
Tiliqua scincoides Common bluetongue	P–M	P–M	P–M	F,W,G
VARANIDAE				
Varanus varius Lace Monitor	K–?	K–?	K–?	Var?
ELAPIDAE				
Pseudechis porphyriacus Red–bellied Black snake	K–?	K–?	K–?	Var
Pseudonaja textilis Eastern Brown snake	P–M	K–?	K–?	Var (W–F)
Unechis spectabilis Black–headed snake	L–M	L–?	L–?	F,W
THYPHLOPIDAE				
Rhamphotyphlops nigrescens/Blind snake	K–M	L–?	K–M	Well drained soils
No. of species present	10	8	8	

WTF – Warm temperate form

Stone Gecko (*Diplodactulus vittatus*)

One animal was found in a pitfall trap at site C, an *E. polyanthemos* dominated shrubland in Black Mountain Reserve. Even though this species has been reliably reported from the other two study areas, its abundance status was unknown.

Pink-tailed Legless Lizard (*Aprasia parapulchella*)

The status of this endangered species in the study areas is rather uncertain since only one specimen was collected. It was found by another staff member at an unspecified location in the Ainslie-Majura reserve. Apart from its type locality at Coppins Crossing, on the Molonglo River, Jenkins and Bartell (1980) reported this species also occurring on Black Mountain Reserve.

Burton's Legless Lizard (*Lialis burtonis*)

This second member of the family Pygopodidae was collected in a pitfall trap at site I, a grassland area on the western foothills of Mt Majura. A dead specimen was found at the rear of the Australian War Memorial, Mt Ainslie, during 1986-87 (R. Bennett, pers. comm.).

Delicate Skink (*Lampropholis delicata*)

This was the most abundant and widespread reptile species within the areas surveyed. It was found in all vegetation structures, and in the vicinity of rocky outcrops or in soils with high rock content. *L. delicata* was particularly abundant in the rocky low closed and open *Casuarina stricta* forests of Mt Majura and in the shrubland of the lower eastern slopes. On Mt Ainslie most of the *L. delicata* were found at site E, a low woodland area and site H, a shrubland area. Thick tussock cover was present at both locations and the deep soils were almost rock free. Both sites had an easterly aspect. This species is highly adaptable, as indicated by the range and variability of habits in which the animals were found. A number of gravid females were found during the summer months.

Spotted Grass Skink (*Lampropholis guichenoti*)

Found in low numbers at six sites on Mt Majura, and only two specimens were collected from a forest site and a woodland site on Mt Ainslie. None were found on Black Mountain. From the pitfall trapping data, this species was not as abundant or widespread as it close relative *L. delicata*. A number of gravid females were also found.

Grey's Skink (*Menetia greyii*)

A surprising find was the localised high densities of *M. greyii*, a four fingered skink and probably the smallest member of the family Scincidae. All the specimens collected from Mt Ainslie were found in site E, an open woodland area near the summit. On Mt Majura most of the animals came from the grassland site I on the western foothills. Two other specimens were collected at sites A, a low closed forest and F, an open woodland area. The specimens were identified by R. Jenkins who had only found two other animals on Mt Majura during the past 11 years. A few were found in the Brindabellas by R. Longmore (pers. comm.). No specimens have been found so far on Black Mountain. This species appears to have a scattered and patchy distribution extending from WA to western NSW (Worrell, 1966). A number of gravid *M. greyii* were captured and retained for observation. While in captivity up to 3 rather large (3 – 5 mm) soft shelled eggs were laid per individual, all within a period of 24 hours.

Boulenger's Skink (*Morethia boulengeri*)

Present in all these surveyed areas in low numbers and rather limited distribution. Animals were found in woodland and forest vegetation communities, extending into shrubland and grassland sites. Preliminary pitfall trapping undertaken on Black Mountain Reserve between October and December 1974 suggested that numbers trapped could be highly variable.

Three-Toed Skink (*Hemiergis decresiensis*)

Was found to be most abundant on Mt Majura where this species occurred in a range of habitats from shrubland to low closed forest. Single individuals were encountered at two sites on Black Mountain, however, none were present on Mt Ainslie. A small number of gravid females were observed during the summer months.

Copper-Tailed Skink (*Ctenotus taeniolatus*)

This agile and conspicuous skink was most widespread and abundant at Black Mountain occurring in a range of woodland and shrubland sites with abundant leaf litter. Only three specimens were trapped at two sites on Mt Majura. None were recorded at the time on Mt Ainslie.

Water Skink (*Sphenomophus tympanum*) (WTF)

A small population of this warm temperate form (WTF) lived under *Westringia fruticosa* shrubs around a moist and shaded area of the ACTP&CS O'Connor Headquarters on the north eastern tip of Black Mountain Reserve. This species had not been recorded from this locality previously, and it was suggested that this population was introduced (R. Jenkins, pers. comm.). It no longer appears to be present there as it has been several years since an individual was sighted. No other records exist of this species in the study areas.

Cunningham's Skink (*Egernia cunninghami*)

This large member of the family Scincidae was not caught in pitfall traps, however, on a couple of occasions individuals were found in small mammal traps. Other records are based on sightings during the survey period and from other reliable sources. Only trapped on Mt Ainslie.

Common Blue tongue (*Tiliqua scincoides*)

Normally single individuals were found in all surveyed areas and in a variety of habitats. Not caught in pitfall traps, but one animal was found in a small mammal trap. They were probably widespread but occurring in low numbers.

Lace Monitor (*Varanus varius*)

Not observed during the study period but known to be present because of occasional sightings and reports of single animals on light poles or in private residences adjoining the Ainslie–Majura and Black Mountain area.

Eastern Brown Snake (*Pseudonaja textilis*)

Observed on a couple of occasions along fire trails on Mt Ainslie and Black Mountain Reserve. However, known to be common and widespread because of regular reports of snakes passing through private residences fringing the reserved lands.

Amphibians

Seven species were collected from Mt Ainslie, Mt Majura and Black Mountain Reserve. Only one species belonged to the family Hylidae, the others were members of the family Myobatrachidae. During this survey, a total of 94 amphibians from 1680 pitfall trap nights were recorded, representing a 5 percent capture rate. Details of numbers and species caught at each site are presented in Table 10. An estimate of abundance and occurrence of frogs in the study areas at the time of the survey, together with the habitat in which they were observed, is listed in Table 11. Also included in this table are species not encountered during this survey but whose known habitats suggest that they may have been present.

Table 10. Details of species and numbers of individual amphibians caught in pitfall traps or observed near each sampling site during 1975–76. Numbers in brackets are results of a preliminary pitfall trapping undertaken by ACT P&CS staff between Oct–Dec 1974.

LOCATION/SPECIES	SAMPLING SITES											
Mt Majura	A	B	C	D	E	F	G	H	I	J	K	TOTAL
Pseudophryne bibroni	2		2	4	13	4	5	3			10	43
Ranidella parinsignifera					1							1
Uperoleia laevigata								1				1
Mt Ainslie	A	B	C	D	E	F	G	H	I	J		TOTAL
Pseudophryne bibroni				1				5				6
Limnodynastes tasmaniensis		1				1			6			8
Limnodynastes dumerilii						2			1			3
Litoria verreauxii									1			1
Black Mountain	A	B	C	D	E	F	G	H	I	J	K	L TOTAL
Pseudophryne bibroni								1		5	4	10
		(1)	(1)			(1)						(3)
Limnodynastes tasmaniensis	1						1	2		4	2	10
		(1)	(1)			(1)						(3)
Raindella signifera								2		5	4	11
			(1)	(1)								(2)

Table 11. Species list of amphibians found, or likely to be present, on Mt Ainslie, Mt Majura and Black Mountain Reserve based on data collected during the 1975–76 survey and observations by other ACT PCS staff. Preferred habitats are noted together with each species expected occurrence and relative abundance.

Occurrence
P – Present (found during survey)
K – Known to occur (reliable sources)
L – Likely to occur (within range and suitable habitat)

Abundance
C – Common
M – Moderate numbers
R – Rare
? – Unknown

Habitat (Vegetation structure code as per Ingwersen et al. 1974)
Var: Various habitats

Scientific Name/ Common Name	Occurrence – Abundance Mt Ainslie	Mt Majura	Black Mountain	Habitat
HYLIDAE				
Litoria verreauxii Verreaux's Tree Frog	P–R	L–?	L–?	G – near water
Litoria raniformis Golden Bell Frog	L–?	L–?	L–?	Moist areas in and near water
Litoria aurea Green and Golden Bell Frog	L–?	L–?	L–?	Moist areas in and near water
Litoria peroni Perons Tree Frog	L–?	L–?	L–?	Arboreal
MYOBATRACHIDAE				
Limnodynastes dumerilii Eastern Banjo Frog	P–M	L–?	P–M	Terrestrial – burrowing
Limnodynastes peroni Brown–striped Frog	L–?	L–?	L–?	Moist areas near water
Limnodynastes tasmaniensis Spotted Grass Frog	P–C	L–?	P–C	Var – moist areas near water
Uperoleia laevigata Orange–Groined Toadlet	L–?	P–R	L–?	Var – terrestrial
Ranidella signifera Common Eastern Froglet	P–C	P–C	P–C	Var – moist areas near water
Ranidella parinsignifera Western Brown Froglet	P–?	P–?	L–?	Var – moist areas near water
Pseudophryne bibroni Brown Toadlet	P–C	P–C	P–C	Var – terrestrial
Neobatrachus sudelli Meeowing Frog	L–?	L–?	L–?	Var – terrestrial – burrowing
No. of species present	6	4	4	

The total numbers and species of frogs fluctuated with weather conditions, becoming more abundant and active during and after rain. This was particularly true of those species that are more dependant on the proximity of permanent waterholes for the completion of their life cycles.

Those amphibians not found near water seemed to prefer woodland and shrub vegetation structures with sufficient grass cover to keep the soil damp. Aspect appeared to be another limiting factor. The eastern, more protected slopes tended to be damper, thus providing a more suitable environment for frogs than the more exposed and windier western slopes. It was expected that most of the identified species were present around the permanent dams.

Pitfall traplines were particularly successful after rains. During dry periods mortality in the traps was quite high due to dessication, thus provision of sufficient water to cover the bottom of the containers was essential. Hand collecting during the day was found to be an unprofitable technique.

General notes and comments for each frog species observed are described below.

Brown Toadlet (*Pseudophryne bibroni*)

This species was the most abundant and widespread frog inhabiting all the vegetation types sampled. It occurred along the ridges and down to the lower slopes, often in dry areas away from waterholes. This may indicate that this species is well adapted to dry environments, thus enabling it to remain fairly active throughout the year. The numbers of *P. bibroni* found in Mt Majura were greater than anywhere else.

Subcutaneous swellings were observed on several *P.bibroni* from Mt Majura. One animal was dissected and 10 fly larvae were extracted. These were identified as "frog flies", Batrachomyia sp, family Chloropidae, endemic to Australia (R. Humphries, pers. comm.).

Western Brown Froglet (*Ranidella parinsignifera*)

Only one specimen was collected from site E, a low woodland area with thick tussock cover on the southern slopes of Mt Majura. The site was a few hundred meters away from two dams. At the time it was also reported from Mt Ainslie, on the basis of calls.

Common Eastern Froglet (*Ranidella signifera*)

Present in pitfall traps at Black Mountain Reserve from a variety of habitats. Whilst not trapped during the survey, this species was commonly heard calling in Ainslie–Majura.

Orange–groined Toadlet (*Uperoleia laevigata*)

A single specimen was collected from site H, a steep rocky shrubland on the eastern slopes of Mt Majura. On the basis of this survey the distribution and abundance of this species needs further review.

Spotted grass Frog (*Limnodynastes tasmaniensis*)

One of the most common frog species in the south–eastern region. On Mt Ainslie, individuals were found only in the grazed sites on the eastern foothills, in close proximity to semi–permanent water bodies. Particularly common on Black Mountain where animals were found throughout the Reserve. Not recorded at any of the Mt Majura sites.

Eastern Banjo Frog (*Limnodynastes dumerilii*)

Three frogs were found at sites F and I, two grazed sites near semi–permanent creek lines on the eastern foothills of Mt Ainslie. This species was heard but not trapped on Black Mountain. It is likely to be present on Mt Majura.

Verreaux's Tree Frog (*Litoria verreauxii*)

An uncommon species in our region. A single specimen was found at site I, on the eastern foothills of Mt Ainslie. Suitable habitats appear to be available for this species to occur at the other surveyed areas, however, its distribution is likely to be patchy.

Birds

Birds were the most vocal, diverse and abundant group of vertebrates encountered during the survey. Table 12 contains a combined list of 116 species representing 45 families, together with their relative abundance and residency status. The list is by no means a complete enumeration of all the species found in the ACT since the surveyed areas do not embrace the total range of vegetation structures, geographic formations and climatic conditions.

It must be borne in mind that many of these bird species occur only in specific areas and are not homogeneously distributed. This was clearly pointed out by the study carried out from March 1974 to April 1975 on the effect of powerline clearings on the population of birds of a particular area of Black Mountain Reserve (Bell, 1980).
The Australian National Botanical Gardens, a man made and highly modified environment adjacent to Black Mountain Reserve attracts many species not present on Ainslie–Majura. Many of these species colonize portions of Black Mountain surrounding the garden.

Fish

There are no rivers or creeks running through the managed land surrounding Ainslie–Majura or Black Mountain Reserve. However, several dams have been built across some of the gullies. These provide water and shelter for the various vertebrates and invertebrates that inhabit the forests, woodlands and grasslands. The only fish species found in these permanent waterholes and dams were mosquitofish (*Gambusia affinis*), a small exotic fish whose eggs are thought to be carried from one closed waterbody to another by waterbirds.

Table 12. Combined list of birds recorded from Mt Ainslie, Mt Majura and Black Mountain Reserve.

ABUNDANCE NOTATION:

C – Common
R – Regular in small numbers
U – Uncommon
I – Irregular in occurrence

RESIDENCY STATUS:

R – Resident i.e. remains in the area all year around
IV – An irregular visitor
RV – A regular visitor occurring mainly during the months shown.

SCIENTIFIC NAME	COMMON NAME	ABUND -ANCE	RESIDENCY STATUS
ARDEIDAE			
Ardea novaehollandiae	White-faced Heron	R	R
PLATALEIDAE			
Threskiornis spinicollis	Straw-necked Ibis	I	IV
ANATIDAE			
Anas superciliosa	Pacific Black Duck	U	R
Anas gibberifrons	Grey Teal	I	IV
Chenonetta jubata	Maned Duck	C	R
ACCIPITRIDAE			
Accipiter novaehollandiae	Grey Goshawk	I	IV
Accipiter fasciatus	Brown Goshawk	R	R
Aquila audax	Wedge-tailed Eagle	R	R
Hieraaetus morphnoides	Little Eagle	U	IV
Elanus notatus	Black-shouldered Kite	R	R
FALCONIDAE			
Falco longipennis	Australian Hobby	R	R
Falco peregrinus	Peregrine Falcon	U	R
Falco cenchroides	Australian Kestrel	C	R
Falco berigora	Brown Falcon	C	R
COLUMBIDAE			
*Columba livia**	Feral Pigeon	C	R
Phaps chalcoptera	Common Bronzewing	U	R
TURNICIDAE			
Turnix varia	Painted Button-quail	R	R
PHASIANIDAE			
Coturnix australis	Brown Quail	I	IV
Caturnix pectoralis	Stubble Quail	I	IV
CHARADRIIDAE			
Vanellus miles	Masked Lapwing	I	IV

Table 12. continued

SCIENTIFIC NAME	COMMON NAME	ABUND -ANCE	RESIDENCY STATUS	
CACATUIDAE				
Callocephalon fimbriatum	Gang-gang Cockatoo	R	RV	Mar-Oct
Cacatua roseicapilla	Galah	C	R	
Cacatua galerita	Sulphur-crested Cockatoo	R	R	
LORIIDAE				
Glossopsitta pusilla	Little Lorikeet	I	IV	
POLYTELITIDAE				
Alisterus scapularis	Australian King-parrot	I	IV	
PLATYCERCIDAE				
Lathamus discolor	Swift Parrot	I	IV	
Platycercus eximius	Eastern Rosella	C	R	
Platycercus elegans	Crimson Rosella	C	R	
Psephotus haematonotus	Red-rumped Parrot	R	R	
CUCULIDAE				
Cuculus pallidus	Pallid Cuckoo	R	RV	Sep-Feb
Cuculus pyrrhophanus	Fan-tailed Cuckoo	R	R	
Cuculus variolosus	Brush Cuckoo	U	RV	Nov-Mar
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo	R	RV	Aug-Feb
Chrysococcyx lucidus	Shining Bronze-Cuckoo	R	RV	Oct-Jan
Chrysococcyx osculans	Black-eared Cuckoo	I	IV	
STROGIDAE				
Ninox novaeseelandiae	Southern Boobook	R	R	
PODARGIDAE				
Podargus strigoides	Tawny Frogmouth	R	R	
AEGOTHELIDAE				
Aegotheles cristatus	Australian Owlet-nightjar	U	R	
APODIDAE				
Hirundapus caudacutus	White-throated Needletail	U	RV	Nov-Mar
Apus pacificus	Fork-tailed Swift	U	IV	
HIRUNDINIDAE				
Hirundo neoxena	Welcome Swallow	C	RV	Oct-Apr
Cecropis nigricans	Tree Martin	I	IV	
Cecropis ariel	Fairy Martin	I	IV	
ALCEDINIDAE				
Dacelo novaequineae	Laughing Kookaburra	C	R	
Halcyon sancta	Sacred Kingfisher	R	RV	Oct-Apr
MEROPIDAE				
Merops ornatus	Rainbow Bee-eater	R	RV	Sep-Mar

Table 12. continued

SCIENTIFIC NAME	COMMON NAME	ABUND-ANCE	RESIDENCY STATUS	
CORACIIDAE				
Eurystomus orientalis	Dollar Bird	R	RV	Oct–Mar
MOTACILLIDAE				
Anthus novaeseelandiae	Richard's Pipit	I	IV	
CAMPERHAGIDAE				
Coracina novaehollandiae	Black-faced Cuckoo-shrike	R	RV	Sep–Apr
Lalage sueurii	White-winged Triller	R	RV	Oct–Feb
SILVIIDAE				
Cinclorhamphus mathewsi	Rufous Songlark	V	RV	Oct–Mar
MALURIDAE				
Malurus cyaneus	Superb Fairy-wren	C	R	
ACANTHIZIDAE				
Gerygone olivacea	White-throated Gerygone	R	RV	Aug–Apr
Gerygone fusca	Western Gerygone	U	RV	Oct–Mar
Sericornis sagittatus	Speckled Warbler	U	R	
Sericornis frontalis	White-browed Scrub Wren	U	IV	
Smicrornis brevirostris	Weebill	R	R	
Acanthiza lineata	Striated Thornbill	C	R	
Acanthiza pusilla	Brown Thornbill	C	R	
Acanthiza reguloides	Buff-rumped Thornbill	C	R	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	C	R	
Acanthiza nana	Yellow Thornbill	U	R	
EPHTHIANURIDAE				
Ephthianura albifrons	White-fronted Chat	I	IV	
MUSCICAPIDAE				
*Turdus merula**	Blackbird	R	R	
Rhipidura fuliginosa	Grey Fantail	C	RV	Sep–Jun
Rhipidura leucophrys	Willie Wagtail	C	R	
Myiagra rubecula	Leaden Flycatcher	U	RV	Oct–Apr
Microeca leucophaea	Jacky Winter	U	R	
Petroica rosea	Rose Robin	I	IV	
Petroica multicolor	Scarlet Robin	R	R	
Petroica phoenicea	Flame Robin	C	R	
Melanodryas cucullata	Hooded Robin	R	R	
Petroica goodenovii	Red-capped Robin	U	R	
Eopsaltria australis	Eastern Yellow Robin	R	R	
Pachycephala olivacea	Olive Whistler	I	IV	
Pachycephala pectoralis	Golden Whistler	C	R	
Pachycephala rufiventris	Rufous Whistler	C	R	
Colluricincla harmonica	Grey Shrike-thrush	R	R	
Falcunculus frontatus	Crested Shrike-tit	R	R	
NEOSITTIDAE				
Paphoenositta chrysoptera	Varied Sittella	U	R	

Table 12. continued

SCIENTIFIC NAME	COMMON NAME	ABUND-ANCE	RESIDENCY STATUS	
CLIMACTERIDAE				
Climacteris leucophaea	White-throated Tree creeper	C	R	
Climacteris picumnus	Brown Treecreeper	C	R	
DICAEIDAE				
Dicaeum hirundinaceum	Mistletoebird	R	RV	Sep–May
PARDALOTIDAE				
Pardalotus punctatus	Spotted Pardalote	C	R	
ZOSTEROPIDAE				
Zosterops lateralis	Silvereye	C	R	
MELIPHAGIDAE				
Lichenostomus fuscus	Fuscous Honeyeater	I	RV	Apr–Nov
Lichenostomus chrysops	Yellow-faced Honeyeater	R	RV	Sep–Apr
Lichenostomus melanops	Yellow-tufted Honeyeater	U	R	
Lichenostomus penicillatus	White-plumed Honeyeater	U	RV	Mar–Sep
Lichenostomus leucotis	White-eared Honeyeater	U	RV	Mar–Oct
Melithreptus brevirostris	Brown-headed Honeyeater	R	R	
Melithreptus lunatus	White-naped Honeyeater	C	R	VOct–May
Phylidonyris novaehollandiae	New Holland Honeyeater	U	R	
Acanthorynchus tenuirostris	Eastern Spinebill	U	IV	
Philemon corniculatus	Noisy Friarbird	C	RV	Sep–Apr
Manorina melanocephala	Noisy Miner	R	R	
Anthochaera carunculata	Red Wattlebird	U	R	
FRINGILLIDAE				
*Carduelis carduelis**	European Goldfinch	C	R	
PLOCEIDAE				
Emblema temporalis	Red-browed Firetail	U	R	
Emblema guttata	Diamond Firetail	U	R	
Peophila bichenovii	Double-barred Finch	R	R	
STURNIDAE				
*Sturnus vulgaris**	Common Starling	C	R	
ORIOLIDAE				
Oriolus sagittatus	Olive-backed Oriole	R	R	
GALLINIDAE				
Grallina cyanoleuca	Australian Magpielark	R	R	
CORCORACIDAE				
Corcorax melanorhamphos	White-winged Chough	R	R	
ARTAMIDAE				
Artamus personatus	Marked Woodswallow	C	RV	Apr–Oct
Artamus superciliosus	White-browed Woodswallow	I	IV	
Artamus cyanopterus	Dusky Woodswallow	R	RV	Oct–Mar

Table 12. continued

SCIENTIFIC NAME	COMMON NAME	ABUND -ANCE	RESIDENCY STATUS	
CRACTICIDAE				
Cracticus torquatus	Grey Butcherbird	I	IV	
Strepera versicolor	Grey Currawong	U	RV	Apr–Nov
Strepera graculina	Pied Currawong	C	RV	Apr–Nov
Gymnorhina tibicen	Australian Magpie	C	R	
CORVIDAE				
Corvus coronoides	Australian Raven	C	R	
Corvus bennetti	Little Crow	U	RV	Dec–Jun
PASSERIDAE				
*Passer domesticus**	House Sparrow	C	R	

(*) indicates introduced species

DISCUSSION

The bulk of the data presented has remained largely unaltered to that cited previously as an internal report (National Capital Development Commission, 1984). However, a number of changes to content and presentation were made where necessary. It is thus essential that the results and species lists presented be viewed in their chronological context and not as the most up to date information available.

Traditional fauna surveys have concentrated mainly on mammals and birds and very little time has been spent investigating other vertebrates. During this survey equal importance, and an equal amount of time were allocated to the somewhat neglected reptiles and amphibians.

Native Mammals

The mammal fauna of our study areas was found to be reasonably diverse and representative of dry sclerophyll vegetation communities of the Canberra region. Their relative abundance, however, varied significantly from species to species. The overall capture rate for mammals was relatively low (3 percent) thus making it difficult to relate their distribution to vegetation structures, as originally intended.

The reasons for the low capture rate were not clear but could very well have been related to weather and animal activity. Hirth (1959) found that white-footed mice *Peromyscus leucopus noveboracenis* become more active as cloudiness increased and the numbers of animals trapped varied depending on whether it rained before or after the animals' main period of activity.

On Black Mountain a smaller than usual capture rate was observed following several days of continuous rain, when only one animal was caught from 320 trap nights. Comparisons of capture rates for Elliott and Gordon traps did not indicate any difference.

Several points need to be kept in mind when evaluating the significance and validity of the results obtained. Some vegetation structures on Mt Ainslie are composed of different floristic communities and support different understories, if any, than those on Mt Majura. For example, site A on Mt Ainslie was made up of a shallow and very rocky soil covered with leaf litter with no ground or shrub understorey, supporting young stands of *E. rossii*. On the other hand, site A on Mt Majura (another LCF), had relatively similar soil but contained a *Casuarina stricta* canopy with both ground and small shrub understorey present.

Moreover, some of the vegetation structures sampled were not very extensive and the mammal traplines sometimes entered into adjacent vegetation structures. Such was the particular case at site A on Mt Ainslie where the trapline traversed through the low closed forest (LCF) and extended into the adjoining low open woodland. All the animals captured in this trapline were caught in the ecotone. From these results it was not clear whether this reflected the fauna of the LCF.

M'Closkey and Lajoie (1975) established that the population density of white-footed mice *P. leucopus noveboracensis* "covaries with foliage profile structure among habitats, whereas floristic composition is unimportant". It is hard to estimate from these results whether the same relationships between flora and fauna apply to the different mammals present in our surveyed areas. Assuming that the animals captured at site A (Mt Ainslie) were not a true indication of occurrence, then the LCF on Mt Majura supported a greater diversity of ground mammals than does the LCF of Mt Ainslie.

It was unfortunate that only two brown antechinus *Antechinus stuartii* were captured during our survey. Such low capture numbers may have been related to their strong arboreal activity as noted by Wood (1970) and Recher et al. (1975). It is thought that *A. stuartii* may be less dependent on ground cover as a source of insect food and cover.

A. stuartii were recorded from Black Mountain Reserve in 1973 by ACTP&CS staff, yet none were captured during this survey. However, both species were recorded there during 1978-79 (Dickman, 1980). More recently, only two *A. stuartii* were caught over 360 trap nights (Seebohm, 1988).

Previous small mammal trapping on Mt Majura reported only *A. flavipes* and never *A. stuartii*. The reverse occurred on Mt Ainslie although only two *A. stuartii* were caught. Again, the reason for this is not known and it seems rather unusual since these species are known to be sympatric (Woolley, 1966). Competition for food and shelter should not be a limiting or isolating factor. Tyndale-Biscoe (pers.comm.) suggested that there may be a geophysical isolation, and the 2 species have not had the time or need to spread into the adjacent areas. This isolation may be related to the previous grazing history of Mt Majura, and its reafforestation some 50 years ago; or may be an artifact of the limited number of trapping sites. More intensive trapping particularly of the saddle area between Mt Ainslie and Mt Majura may show the outer limits of *A. stuartii* and *A. flavipes* and indicate whether there is an overlap in their territories.

The capture of a single common dunnart *Sminthopsis murina* specimen was of significance given their unknown status in the ACT. They also appear to have a rather patchy distribution in south eastern Australia. Species of mammals that occur in such low numbers are likely to be particularly susceptible to alterations or total destruction of their habitats brought about by management practices or natural causes such as wild fires. More detailed survey work is necessary in order to obtain a better understanding of its status in the ACT.

The abundance of sugar gliders (*Petaurus breviceps*) along the summit road of Mt Majura was unexpected since they appeared to be present in such small numbers elsewhere in the surveyed areas. They inhabited a very accessible area where nocturnal visits and other nature interpretation activities could be carried out with maximum success and with least damage to surrounding vegetation as there are no needs for the establishment of special walking trails in order to display these beautiful and graceful nocturnal creatures. Common brush-tail possums (*Trichosurus vulpecula*) and common ring-tail possums (*Pseudocheirus peregrinus*) were also observed, in much smaller numbers, along the summit road. This was thought to be a very valuable area since all three species of the families Phalangeridae and Petauridae were present. Unfortunately, since the survey was undertaken, this area of Mt Majura has been severely affected by several bush fires. While some vegetation regrowth has taken place, the impact on the arboreal or terrestrial mammal fauna has not been assessed.

The relatively limited spotlighting effort of 15 hours revealed an abundant yet patchy distribution of possums and gliders. Fewer hours were spent spotlighting Mt Ainslie and *T. vulpecula* was the only species observed. A greater, or at least more comparable effort, could have possibly revealed a greater species diversity. While the numbers of *T. vulpecula* have increased over the years, ACTP&CS staff have reported that *P. peregrinus* have been infrequently observed during nocturnal interpretation tours of the study areas. Clearly, further information is needed to establish the current status of possums and gliders within the managed City Hills and Reserves.

The status of the common wombat, *Vombatus ursinus* is considered as rare since there have been no recent sightings other than those already mentioned. Echidnas *Tachyglossus aculeatus*, on the other hand, whilst not regularly observed are common in natural bushlands of the ACT. They have been regularly reported by residents living nearby, particularly after echidnas come out of hibernation.

Four species of macropods were recorded in or adjacent to the areas surveyed. The most common being the eastern grey kangaroo *Macropus giganteus* followed by the swamp wallaby *Wallabia bicolor*. Wallaroos *Macropus robustus* and red necked wallabies *Macropus rufogriseus* were found to be rare. The presence of, and as in the case of Black Mountain Reserve, the total surrounding by busy ring roads of natural timbered areas, have over the years resulted in continuous road deaths of macropods. This is particularly more so now that certain species appear to be on the increase in our region.

Bats have been one of the least studied mammal groups within the surveyed areas. Little is known of their distribution and relative abundance in the various vegetation communities present. A survey of access tracks and the few water bodies present should be undertaken in order to acquire more recent and detailed information that for these areas appears to be lacking.

Introduced Mammals

The close proximity to urban areas was particularly reflected by the widespread distribution and abundance in most vegetation communities of house mice *Mus domesticus*. Together with the black rat *Rattus rattus*, these two introduced species made up approximately 69 percent of all trapped mammals.

The emphasis of the Nature Park System is to conserve and protect indigenous wildlife in all its forms, therefore, stray domestic animals or those gone wild, particularly in Ainslie–Majura, are undesirable. Cats *Felis catus* were reported from various parts of the reserves and were observed along the Mt Majura summit road. Similarly freely roaming domestic dogs *Canis familiaris* are also undesirable in Reserves or managed areas.

A number of studies investigating diets of cats (Jones and Coman, 1981, 1983) and european foxes *Vulpes vulpes* (Ryan and Croft, 1974; Croft and Hone, 1978) have been undertaken. The impact of introduced carnivorous mammals on the native fauna inhabiting our bushlands has been difficult to estimate without proper predator scat analysis surveys. As it was shown in the above diet studies young birds, reptiles, amphibians, arboreal and terrestrial native mammals (eg *P. breviceps* and *Antechinus* spp) are most probably the prey of cats and foxes. Indirectly, kangaroos, wallabies, and some of the larger reptiles could be potential victims of dogs allowed to roam free. Effective control measures of these introduced species are difficult to implement.

The numbers of rabbits *Oryctolagus cuniculus* and brown hares *Lepus europaeus* observed were relatively low as the result of previous population control measures. This was also reflected in the lack of evidence of significant adverse impact on the flora of the lower slopes. Without appropriate and continuous control, their numbers could really build up to problem levels.

It was visually evident at the time of the survey that cattle *Bos bovis* were causing in places considerable amount of damage to the flora, and that at the same time were having an undetermined effect on the fauna. Mammal and pitfall trapping in the grazed areas of Mt Ainslie failed to turn up any animals with the exception of *S. murina* (see table 5), suggesting that animals were in low numbers in these areas. This was not surprising, given that grazing had reduced the amount of suitable cover and shelter for small ground mammals and reptiles. The damage observed was not only caused by grazing but also by trampling.

The management objectives of Ainslie–Majura were not thought to be compatible with grazing. It was pointed out by Ingwersen et al. (1974) (pg. 48, Map 5) that grazing permitted the invasion and establishment of alien plant species following soil disturbance. They suggest that if weed eradication is to be successful, stock must be removed. These areas have been considerably disturbed and regeneration was to be encouraged (Ingwersen et al. 1974, Map 3, Table 4).

Given that grazing is no longer permitted, follow–up investigations of the recovery of both flora and fauna is particularly important. This information would prove to be essential for the effective management of such high use areas.

The horse riding trails have been used extensively over the years, and it was taken some time for the impact of this activity to be felt. Recent reports by ACTP&CS staff have confirmed that extensive damage to some horse trails has occurred (L. Nelson, pers. comm.). Whilst it was considered inevitable, this adverse impact was not apparent at the time of the survey. In order to minimize the damage, new trails are being considered through less sensitive vegetation communities, and along more suitable gradients (F. Ingwersen, pers. comm.). Future degradation to habitat and the dispersal of undesirable exotic weeds throughout Ainslie–Majura, via horse dropping, should be monitored regularly.

Reptiles

The areas surveyed supported a representative range of reptile species known to occur in the dry sclerophyll forests of our region (Jenkins and Bartell, 1980).

It was generally found that open woodlands and shrublands with thick ground vegetation were preferred by reptiles as habitat areas, where shelter was available and food was plentiful.

It must be remembered that the pitfall trapping method is usually only successful with the smaller reptiles as the depth of the buckets is not sufficient to retain the larger reptiles , or some of the smaller climbing species (eg. Geckos). This may be overcome by replacing the containers with deeper ones, or it may be possible to fit a lid with a hole cut in it but with a lip wide enough to prevent animals from escaping.

Skinks were the most abundant reptiles present in all areas and occurring in all habitat types. The delicate skink *Lampropholis delicata* was by far the most numerous species making up 69 percent of the total numbers of reptiles found. The next most widespread species was the spotted grass skink *Lampropholis guichenoti*, however, it only represented 6 percent of animals caught. three other skink species found had more localized and patchy distribution. Copper-tailed skinks *Ctenotus taeniolatus* were widespread and common mainly on Black Mountain Reserve, three-toed skinks *Hemiergis decresiensis* were present widely on Mt Majura, however, Grey's skinks *Menetia greyii* occurred only in an open woodland site on Mt Ainslie and mainly in a grassland site on Mt Majura. The localised densities of *M. greyii* were particularly significant given that in the previous 11 years only two specimens were found on Mt Majura (R. Jenkins, pers. comm.).

The results of preliminary pitfall trapping on Black Mountain (Table 3) showed that both distribution and numbers of reptiles can be highly variable from year to year as it was the case with Boulenger's skinks *Morethia boulengeri*. Thus, it is likely that the same degree of variability could occur in both Mt Ainslie and Mt Majura. This variability supports the argument for any survey to extend at least over a two year period.

While the status of both pygopodid specimens appeared to be rare, the finding of a single pink-tailed legless lizard *Aprasia parapulchella* was of particular importance. This species, listed as endangered in Australia (CONCOM, 1984), was collected by another staff member from an unspecified location on Ainslie-Majura, and it is to date the only record from that

area. However, this species recently was found in limited, disjunct locations in the Murrumbidgee River Corridor (Osborne, Lintermans, Williams, in prep.).

Most of the other larger reptiles observed were most likely more common and widespread than what was recorded during this survey. This has been particularly the case with the eastern brown snake *Pseudonaja textilis*.

The continued population growth and subsequent urbanization of the "Limestone Plains" has resulted in the total surrounding by roads and houses of Ainslie-Majura, and in particular of the smaller Black Mountain Reserve. This development could have long term impact not only on macropods, but also on the population of the larger reptiles, such as the lace monitor *Varanus varius*, by reducing the available habitat, restricting movements, and causing road kills.

Some internal management practices may also have adverse effects on the reptile population. Regular control burns, in order to minimize risks of wildfires, are one such example. Whilst this practice may be necessary, the frequency of such fires and the areas where the control is to take place may prevent continued survival of small ground litter reptiles such as *M. greyii* and Burton's legless lizard *Lialis burtonis*.

The reptile survey provided much useful information, however, the list of species found or reported by other people as occurring in the study areas during 1975-76 needs to be reviewed and updated. General and more comprehensive hand-searching may reveal the presence of other reptile species in each of the areas. Some casual observations have already confirmed the presence of *H. decresicensis* on Mt Ainslie, with shinglebacks *Trachydosaurus rugosus* and black-headed snakes *Unechis spectabilis* reported from Mt Majura (W. Osborne, pers. comm.). The relative lack of systematic reptile survey data has been highlighted recently with the discovery of Rosenberg's monitor *Varanus rosenbergi* specimens in the ACT. (ACTP&CS, unpublished data). There have been suggestions that this species has been present in the ACT region for some time, but generally confused with *V. varius*. This view is supported by photographic evidence of a *V. rosenbergi* like animal recorded during 1968-69 from the summit road of Black Mountain Reserve (Coyne, 1969).

The need for more accurate and up to date information is obvious, and further more detailed reptile surveys are recommended.

Amphibians

Generally amphibians do not show the same degree of association with broad vegetation structures as do other vertebrates. Taking into consideration that pitfall trapping was the main amphibian sampling techniques used, the range of species and numbers of animals observed suggested a diverse and abundant frog fauna. The seven species collected compared favourably with the suggestion that nine species could be present in the Ainslie–Majura area (Osborne, 1985). The whole amphibian composition in the study areas has been complicated because thirteen of the sixteen species known to occur in the ACT are found in the Australian National Botanical Gardens (R. Humphries, pers. comm.). One would expect that at some stage most of these species may enter Black Mountain Reserve and remain along a narrow zone close to the Black Mountain botanical gardens boundary. Mt Ainslie and Mt Majura contain more dams and waterholes than Black Mountain, however, they do not have the lushness of the ponds in the controlled environment of the botanical gardens.

Among those species collected, the eastern banjo frog *Limnodynastes dumerilli* and the meeowing frog *Neobatrachus suddelli* (known to occur in Ainslie–Majura, (Osborne, 1985)), are the only true burrowing frogs that can avoid dry conditions by burrowing. However, all frogs require water for breeding and move to ponds during the breeding season. At other times of the year they are capable of dispersing many hundreds of meters away from the breeding sites. As already mentioned in the results, the abundance of ground cover together with the more protected eastern slopes provided damper and more suitable habitats where frogs could survive throughout the year. This would explain why frogs were found throughout the study sites.

Three species of frogs dominated the fauna. The brown toadlet *Pseudophryne bibroni* was by far the most abundant (63 percent), followed by the spotted grass frog *Limnodynastes tasmaniensis* (19 percent) and then by the common eastern froglet *Ranidella signifera*. The status of the other species remains relatively uncertain. There has been little work done on the distribution and relative abundance of amphibians in the ACT region in general. On the basis of a brief survey of Ainslie–Majura during 1985 and other personal communication, it appear that the population of *P. bibroni* has undergone a significant reduction (Osborne, 1985, 1986). The reasons for this demise could well be due to environmental changes, coupled with modification and reduction of habitat caused by wildfires. As it was the case with reptiles, amphibians also showed variability between sites at Black Mountain Reserve when the results of this survey were compared to some preliminary work during October, December 1974 (Table 10). Surveys extending at least over 2 years would record some of

this variability. It is unlikely that pitfall traps would be expected to sample all species present. Thus, it is recommended that more comprehensive surveys of frog communities should include searches during the breeding season of each of the species along the lines suggested by Osborne (1985). The information collected should provide indications of changes in occurrence, abundance and species diversity.

Appropriate management policies would also by expected to have a positive impact on the amphibian community. An increase in the numbers of small dams throughout the drainage lines of Ainslie–Majura and Black Mountain Reserve together with the establishment of a variety of aquatic vegetation within these dams, would in the long run enhance the available habitat and increase the numbers and diversity of frog species.

Birds

As a result of their conspicuous and vocal nature birds have been the best known vertebrate group. The range of species present, while variable from area to area is considered consistent with dry scherophyll forests of our region. In the study areas the bird fauna has been enhanced not only by the presence of the Australian National Botanical Gardens but also because of the spread of suburban gardens and the extensive planting of a wide variety of food producing plant species. Additionally, the importance of the edge–effect where the forest stops and clearings or low shrubs commence was highlighted by the study on the effect that power–line clearing had on the bird population of a section of Black Mountain Reserve (Bell, 1980). While Bell observed an increase in the numbers of birds present, these habitats were artficially maintained by the regular manual clearing of some of the taller trees. The benefits of these interfaces would soon disappear if this labour intensive management could not be maintained.

The primary aim is to manage and preserve the surrounding bushlands as natural dry sclerophyll forests. If enhancement of bird habitat is desirable, then care must be taken not to plant any species that would not naturally occur in that particular area, and that in the longer term may not be able to be maintained because of limited resources.

CONCLUDING REMARKS AND RECOMMENDATIONS

Mt Ainslie, Mt Majura and Black Mountain Reserve are centrally located dry sclerophyll forested areas that feature prominently in the Canberra landscape. Because of their relatively undisturbed nature they provide significant refuge for a wide range of native flora and fauna. Their recreational and scientific value are well recognized. Prior to this survey there were only scant records of the vertebrates occupying these reserved areas, and this report discusses those species which were present during 1975–76 as well as other species which have been reliably reported since then. Unfortunately, there has been no subsequent systematic collection of information on changes to the fauna as a result of some significant changes to the environment, or past land use management policies.

In view of the multiple land–use guidelines of the Nature Park System, it would be highly desirable to maintain a close watch on the effects that these land–use policies have on both flora and fauna. This applies particularly to Ainslie–Majura reserve in view of extensive proposed development. To this end, this report provides useful base–line information on the vertebrate fauna. Additionally, fauna groups needing follow up survey work have been identified and recommendations made.

Whilst it is not possible to implement or follow up all the recommendations made, their identification in this report is aimed at generating some thought and may facilitate the planning of future fauna management investigations.

These recommendations are as follows:

i) more detailed survey work is necessary in order to obtain a better understanding of the status of the common dunnart *Sminthopsis murina* in the ACT.

ii) undertake an assessment of the impact of several bushfires on the arboreal and terrestrial mammal fauna of the study areas.

iii) further information is needed to establish the current status of possums and gliders within the managed hills and Reserves.

iv) acquire more recent information on bat species distribution and relative abundance through the survey of access tracks and available water bodies within the managed areas.

v) investigate the recovery of both flora and fauna in areas known to have been grazed in the past.

vi) regular monitoring of horse riding trails should be carried out in order to anticipate further deleterious impact on the flora, reduce soil erosion and prevent the spread of exotic weeds.

vii) undertake systematic surveys of reptiles and amphibians, in the light of recently discovered new species in the study areas.

viii) that the above surveys extend at least over a 2 year period to allow for temporal population variations, and in the case of amphibians, the surveys are to include the breeding periods of the various species.

ix) where possible, increase the numbers of dams so as to provide additional breeding habitat for frogs.

x) plan the frequency of control burns so as not to have a long term adverse impact on the leaf litter fauna.

xi) in order to attract a greater variety of bird species to the managed areas, enhancement of forest–shrubland interfaces may be considered. However, labour intensive management practices should be avoided.

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APPENDIX

Notes on possible cold torpor in *Antechinus spp.*

During cold winter mornings it was noticed that most trapped marsupials were sluggish in their movement. These observations suggested that the animals may enter into a state of torpor in order to overcome the low ambient temperature inside Elliott traps. *Antechinus spp.*, however, were reported not to go into daily torpor (Tyndale-Biscoe, 1973).

This presented an ideal opportunity to record in the wild some rectal temperatures of those animals that displayed sluggish movements. The apparatus used was a YS1 model 46 TVC Tele-thermometer with a rectal temperature probe model 402. Glurr's Neutral Glycerin jelly was used to assist rectal penetration. Most animals objected to the rectal probe and their continuous defecation prevented penetration deeper than 1.5 cm into their rectal ducts. Ambient temperatures were also recorded. The information from the three animals sampled is outlined below :

Species	Sex	Observation record	Date	Time	Ambient Temp. (T_A)	Body Temp (T_B)*
A. stuartii	F	AA51	13.6.75	12.15	13.5°C	30.4°C
A. flavipes	F	MH57	16.7.75	10.15	8.5°C	25.5°C
A. flavipes	M	MJ58	17.7.75	10.40	4.0°C	29.0°C

* Recorded when temperature remained constant for 2-3 seconds.

Wallis (1976) reported that subcutaneous body temperature of *A. stuartii* fluctuated between 33.2 °C in the morning and 37.9 °C at night. The results presented above suggested low T_A may have contributed to the lowering of the T_B in the animals measured. It could have been possible that the T_B values were underestimated, as in his study Geiser (1988) inserted the thermometer 3 cm into the rectum. Unfortunately, the data collected from this study was insufficient for any statistical analysis, and interpretation of results would have been assisted if the T_B of animals displaying normal movements had been available.

It appears *A. flavipes* and *A. stuartii* enter some form of daily torpor. The factors controlling this reduction in body temperature, and thus saving of energy appear to be varied. According to Wallis (1976), *A. stuartii* entered torpor in winter as the direct result of food starvation. Nevertheless, he also stated that animals from moderate and cold environments experienced slight drops in T_B (up to 5 ^oC) throughout the year. On the other hand, Geiser (1988) suggested seasonal changes are less important, and that torpor is influenced more by actual body mass.