

ACT PARKS and CONSERVATION SERVICE



DISTRIBUTION, POPULATION DENSITY AND HABITAT OF THE PINK-TAILED LEGLESS LIZARD *APRASIA* *PARAPULCHELLA* IN CANBERRA NATURE PARK

WILLIAM S. OSBORNE and FIONA V.C. MCKERGOW

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IN CANBERRA NATURE PARK, ACT

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A list of other publications produced by the ACT Parks and Conservation Service is on page

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ABSTRACT

This report presents the results of a survey of the distribution and population density of the endangered pink-tailed legless lizard *Aprasia parapulchella* in Canberra Nature Park. The report also summarises the result of previous surveys and observations in this area. Funds to support this component of the program were provided by Canberra Nature Park (ACT Parks and Conservation Service) and the National Estate Grants Program. The Australian Trust for Conservation Volunteers (ATCV) kindly assisted with field work.

Aprasia parapulchella were found at 20 of the 84 sites surveyed and a total of 108 live specimens were observed. The lizards were recorded in 6 of the 12 Nature Park units sampled, being found most commonly on Mt Taylor (78 specimens), but also occurring on Cooleman Ridge (14), Urambi Hills (6), Farrer Ridge (1) and The Pinnacle (9). Several previous records indicated that the species once occurred on Red Hill, although intensive searches throughout Red Hill did not yield any specimens during this survey. There are also confirmed records of *Aprasia parapulchella* from Oakey Hill but this reserve was not examined as it was not part of the CNP system at the time of the survey.

The absence of the lizards from suitable rocky areas with native grasses on Mt Majura, Mt Ainslie and Tuggeranong Hill is surprising but may relate to differences in vegetation. The lizards apparently do not occupy habitats dominated by *Stipa* spp. (speargrasses) and *Chionochloa pallida* (red-anthered wallaby grass) tussock grassland. Differences in the density of *Aprasia* in the reserves where they occurred can be partially explained by variation in habitat quality. Mt Taylor has had little pasture improvement and supports extensive swards of *Themeda australis* (kangaroo grass) grassland in association with suitable rocky substrate. In contrast, the other hills where the lizards occurred have had considerable pasture improvement or more intensive livestock grazing. This has led to a greater proportion of exotic ground cover vegetation in what would otherwise be suitable habitat. Further research is required to explain the ecological basis of these differences in lizard population densities.

Within Canberra Nature Park the occurrence of outcroppings and surface scatters of partially buried volcanic rocks and a cover of kangaroo grass (*Themeda australis*) remains the best indicator for determining potential habitat for *A. parapulchella*. Areas with deeply imbedded stones are less likely to support the lizards, as are areas dominated by exotic pasture grasses, weeds or thickets of woody vegetation.

Management recommendations are made for *A. parapulchella* in Canberra Nature Park. These include exclusion of livestock grazing and horse agistment from some areas, and the prevention of disturbance to rocks. Rehabilitation of some areas of native grassland is recommended.

INTRODUCTION

The pink-tailed legless lizard *Aprasia parapulchella* (Plate 1) is a nationally endangered species (Burbidge and Jenkins 1984) whose distribution is thought to be restricted largely to the Canberra region (Osborne, Lintermans and Williams 1991). In the ACT substantial populations have been found on Mt Taylor (McKergow 1990) and at several sites near the Murrumbidgee and Molonglo Rivers (Osborne *et al.* 1991; Barrer 1992; Jones 1992). Osborne *et al.* (1991) carried out a regional survey for the species which included searches throughout the ACT and surrounding areas in NSW. Whilst their survey sets the regional distributional limits of the species and broadly describes the habitats that the lizards are found in, a detailed knowledge of the distribution and abundance of the species in conservation reserves is lacking.

Osborne *et al.* (1991) indicated that there was an urgent need to carry out further surveys that included estimates of population density. In particular, they recommended that the abundance of *A. parapulchella* should be determined for all reserves to provide information on the size of the protected population.

With funding assistance provided by Canberra Nature Park (particularly to cover the field component of the survey and the costs of the Australian Trust for Conservation Volunteers) and the National Estate Grants Program (to cover wages of FVCM and some materials) such surveys were carried out throughout Canberra Nature Park (CNP) in Spring 1991. This report presents the results of this survey, summarises the results of previous surveys, and makes recommendations for the management of the species in Canberra Nature Park.

METHODS

Site selection

All units comprising the CNP reserve system were visited to map the extent of potential habitat. Although Osborne *et al.* (1991) concluded that a cover of native grasses was a necessary feature of the habitat for the species, it was decided that the study could provide additional ecological information if study sites were not always confined to areas that included only native grasses. Some areas dominated by woody vegetation were surveyed. Sampling sites were initially chosen throughout the CNP network on the basis of the presence of a single habitat feature: the occurrence of a considerable surface scatter of partially buried stones. These sites were usually, but not always, associated with nearby rock outcrops (Plate 2).

Twelve areas within CNP (Fig. 1), incorporating a total of 84 sites were selected for surveying. Geographic details of the sites are given in Appendix 1 and the locations of all sites are indicated on Maps 1-12 in Appendix 2.

Sampling period

Aprasia parapulchella can be found throughout the year by searching beneath shallowly imbedded stones when both living specimens and skin sloughs can be found (Osborne *et al.* 1991). Living specimens are particularly difficult to detect, however, during hot, dry weather when the subsoil has dried considerably and temperatures beneath stones exceed those tolerated by reptiles. Because capture success previously had been highest in spring and early summer when the soil was moist and relatively cool, the survey was conducted over four weeks, between 16 September and 11 October 1991. Precipitation prior to, and during this period, was considered to be average.

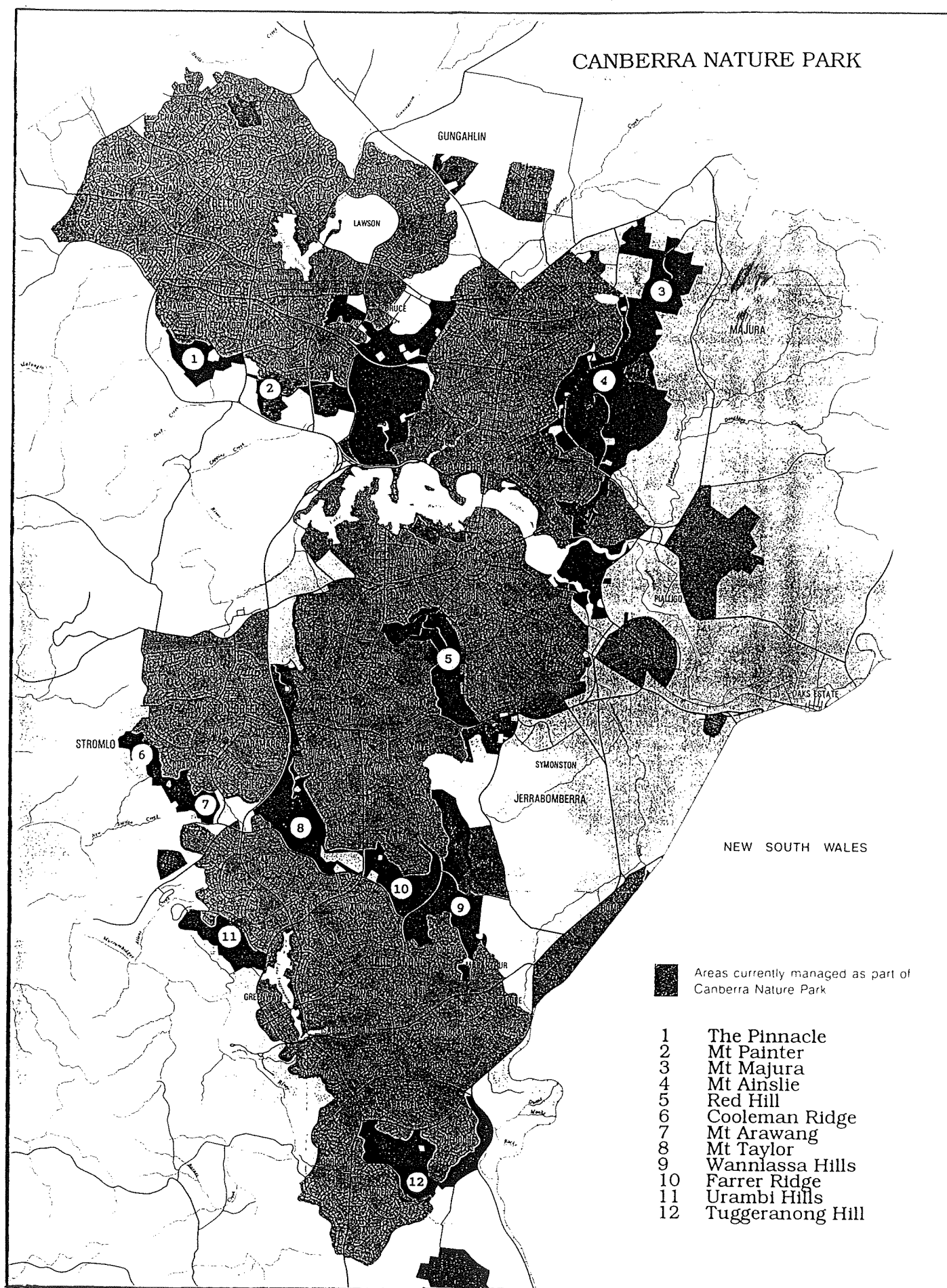


Figure 1. Reserves in Canberra Nature Park that were surveyed for the presence of *A. parapulchella* (numbered reserves only).



Plate 1. The pink-tailed legless lizard,
Aprasia parapulchella.



Plate 2. Potential habitat for *A. parapulchella*.

Survey procedure

The survey technique was developed jointly with S. Jones (see Jones 1992). At each site a defined rectangular-shaped search area was delineated and the boundary marked by flagging tape or cord within this area (Plate 3). The plots were of variable size because of the varying stone density and spread in each site. Lengths of cord were laid out to define "lanes" to facilitate rock turning, enabling people to survey a well-defined area without turning stones that had already been examined. The number and width of lanes was dependent on the density of stones and the ease with which they could be turned. The number of lanes was increased and the width of each lane decreased if there was a higher density of turnable stones. All stones examined were carefully replaced in their original position. Each field assistant recorded the number of rocks that they turned. This enabled an estimate of the density of *A. parapulchella* in relation to rock density to be calculated.

Specimens of *A. parapulchella* and/or the presence of their sloughed skins (Plate 4) were recorded. All specimens caught were measured (snout-vent length SVL, tail length TL, regenerated TL) and weighed to the nearest 0.1 g. The microhabitat of each individual was recorded and included stone size (length X height X width), soil and burrow temperature, the presence of ants and burrow details. Other site details recorded included weather conditions at the time of sampling, aspect, slope (measured with a clinometer), rock type, a visual estimate of stone cover (percentage), vegetation type and the composition of predominant ground cover.

Other reptile species caught were individually identified, measured and recorded. Details recorded included species name, microhabitat (under rock, on log), age class (juvenile, sub-adult, adult), and the presence of any regenerated tail.



Plate 3. A site showing the layout of lanes marked with string to standardise the search method.



Plate 4. The distinctive shed skin (slough) of *A. parapulchella*.

All the data recorded was entered onto observation cards of the Vertebrate Atlas of the ACT.

RESULTS

Distribution and population density

Aprasia parapulchella were found at 20 of the 84 sites examined, and occurred in 6 of the 12 nature park units sampled (Table 1, Maps 1- 12). A total of 108 live individuals and 41 sloughed skins were recorded. Fifty-seven per cent of all live specimens were found on Mt Taylor.

The species was found in the following reserves: Mt Taylor, Cooleman Ridge, Urambi Hills, Farrer Ridge and The Pinnacle. They were not detected during surveys in the following reserve units: Mt Painter, Ainslie-Majura, Red Hill, Wanniasa Hills and Tuggeranong Hill. There is, however, a historical record of a specimen being found on the SW side of Red Hill (Map 5, R. Bennett pers. comm.), and confirmed records of their occurrence on Oakey Hill (D. Cook, ATCV Canberra, pers comm).

There was considerable variation in the number of *A. parapulchella* found in each reserve unit, although to some extent this reflects search effort. Nevertheless, the relative density of the species also varied, being highest on Mt Taylor (0.66 specimens found per 100 stones examined) and lowest on Urambi Hills (0.13/100 stones) (Table 1).

Population demography

There was considerable variation in the body size of the specimens collected (Fig. 2). Snout-vent length [SVL] of individuals ranged from 54 mm to 150 mm. There was a significant positive relationship between SVL and total body length ($R=0.94$, $F=314.656$, $d.f.=1,44$, $p<0.001$; regression equation: $y = 21.67 + 1.44x$). The distribution of body lengths of individuals (Fig. 3) indicated that the adult population sampled (individuals >90 mm SVL) was considerably greater than that of juveniles (individuals <90 mm SVL). At Urambi Hills only adults were found, whereas in all other reserves with *A. parapulchella* there was evidence of breeding (Fig 4). The single specimens from Mt Arawang and Farrer Ridge were adults.

The incidence of tail loss (Table 2) was moderately low, although sample size in a number of areas was too low for comparisons to be made. Thirty-three per cent of the population sampled on Mt. Taylor ($n = 65$) displayed some level of tail regeneration.

Habitat description

All records of *A. parapulchella* are from areas underlain by Mid- to Late-Silurian acid to intermediate volcanics. This is consistent with the findings of Osborne *et al.* (1990). The soils in these areas consist of friable sandy-loams which are shallow, rocky and, apart from a slight accumulation of organic matter in the surface layers, show little differentiation of horizons.

All specimens were found beneath shallowly embedded stones except for one individual which was captured as it moved from the surface of one rock to beneath another, after being disturbed while basking in direct sunlight.

Table 1. Distribution of *A. parapulchella* in the units of Canberra Nature Park. Results of the survey in Spring 1991.

Nature Park Unit	Number of sites sampled	Search effort ¹	Number of sites with <i>Aprasia parapulchella</i>	Density ²	Total number of <i>Aprasia parapulchella</i> found
Mt Taylor	12	13043	9	0.66	78
Red Hill	12	9681	0	0	0
Mt Tuggeranong	9	9570	0	0	0
Urambi Hills	8	8198	4	0.13	6
The Pinnacle	7	5963	2	0.47	9
Mt Ainslie	7	4003	0	0	0
Cooleman Ridge	6	4541	3	0.45	13
Wanniassa Hills	6	5278	0	0	0
Farrer Ridge	5	2170	1	0.25	1
Mt Arawang	5	2666	1	0.24	1
Mt Majura	5	4299	0	0	0
Mt Painter	2	2239	0	0	0
Total	84	71651	20		108

¹ Total number of stones examined.

² Density of *Aprasia parapulchella* (number of individuals/100 stones).

Table 2. Proportion of individuals in each reserve unit with regenerating tails (such tail loss may be indicative of levels of predation operating in each area).

Reserve	Number of individuals	tail loss (%)
The Pinnacle	9	33
Cooleman Ridge	9	22
Mt Arawang	1	0
Mt Taylor	65	33
Farrer Ridge	1	100
Urambi Hills	6	83

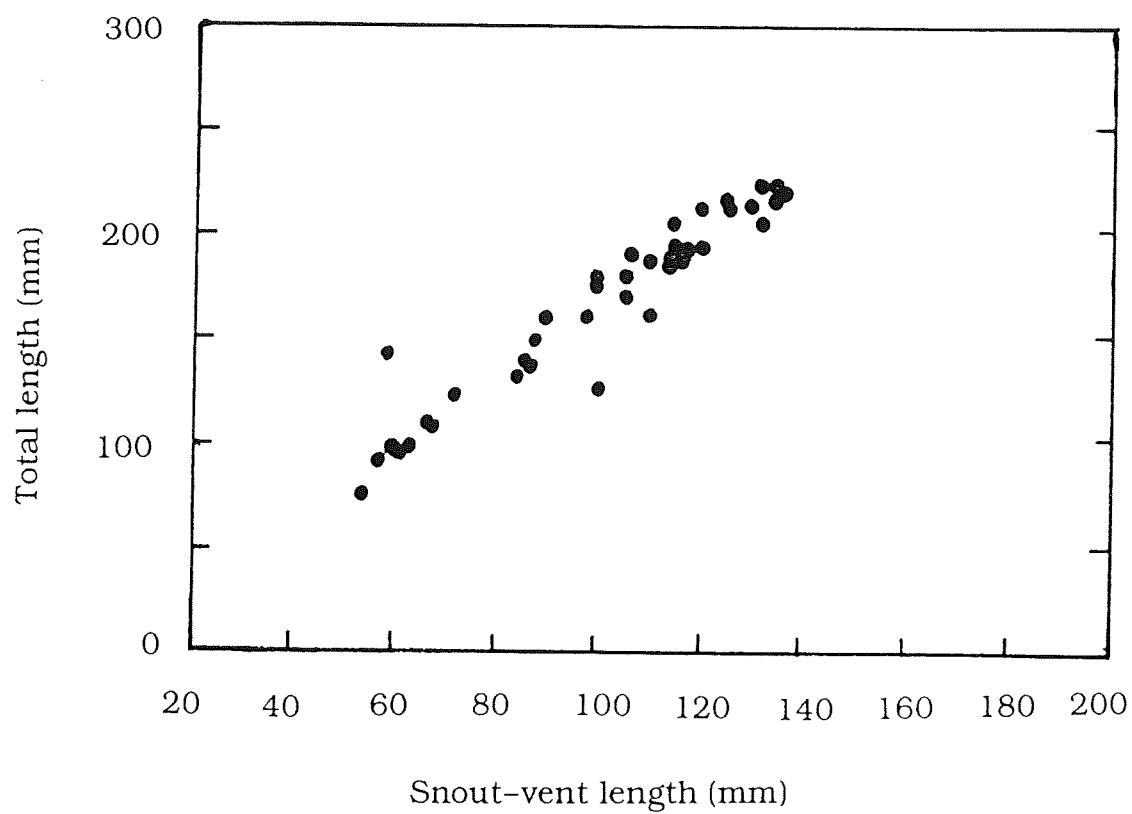


Figure 2. Relationship between snout-vent length and total body length (snout-vent length plus tail length) of all specimens of *A. parapulchella* found in Canberra Nature Park.

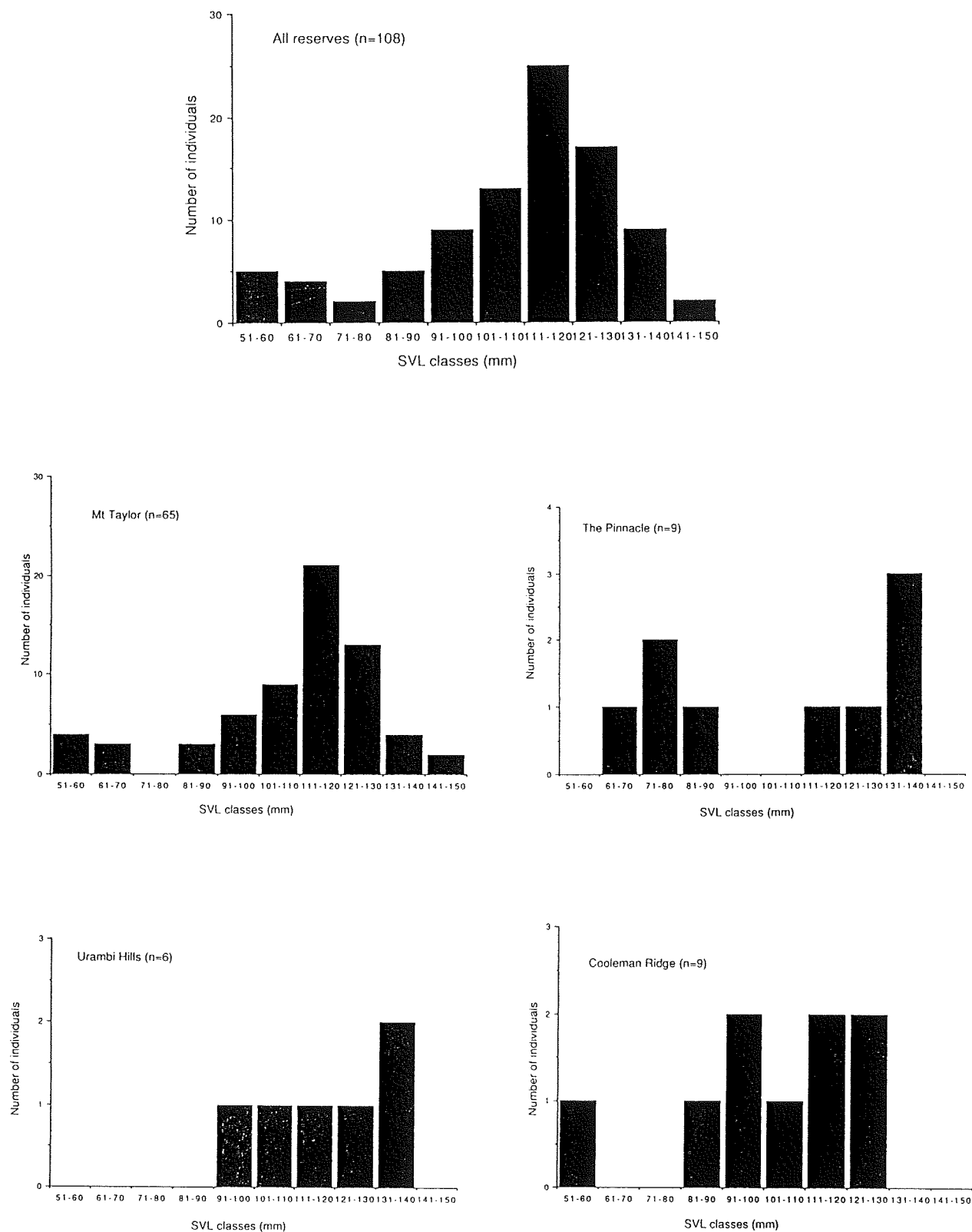


Figure 3. Snout-vent length (SVL) frequency distribution histograms for *A. parapulchella* found in Canberra Nature Park

The vegetation of the sites surveyed has been analysed in detail by Jones (1992). The following description of the vegetation is intended to provide an overview only.

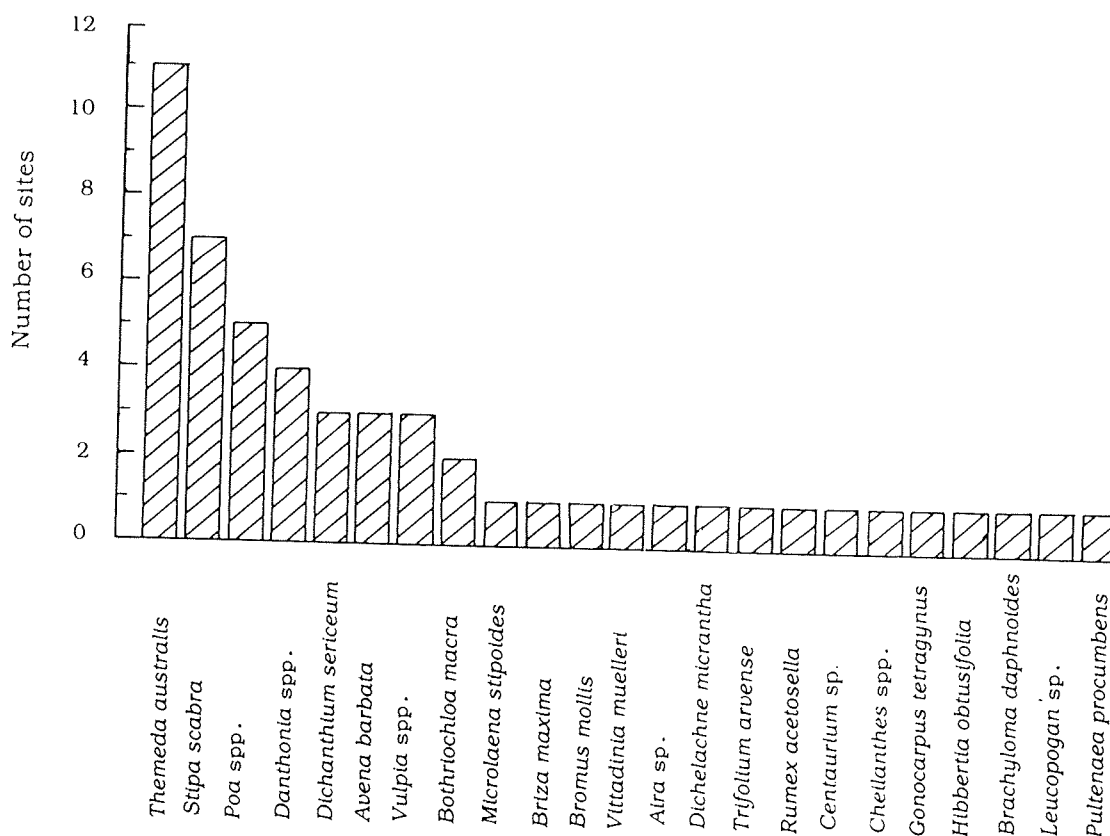
Almost all sites which had specimens of *A. parapulchella* had a good cover of native grasses particularly *T. australis* (Fig. 4). Other plant species associated with the sites included, in decreasing order of importance (Fig. 4), *Stipa scabra*, *Poa* sp., *Danthonia* sp. *Dichanthium sericeum*, *Avena barbata*, *Vulpia* spp. and *Bothriochloa macra*.

Sites with *A. parapulchella* were consistently less subject to invasion by exotic grasses and weeds in comparison to sites where they were not found. For example, of the seven sites surveyed on The Pinnacle, the two sites where specimens were found had a greater cover of native plants including the genera *Themeda*, *Lomandra*, and *Helichrysum*. Similarly, on Urambi Hills (site UH12), Cooleman Ridge (sites CR33, CR35, CR36) and Mt Arawang (A39) specimens were found in rocky grassland areas which were dominated by *Themeda australis* (kangaroo grass) or at least had a presence of this native grass species and other native herbs and forbs. Elsewhere in these reserves other sites sampled which did not yield specimens were in areas with a larger component of exotic vegetation.

Areas where specimens were not found fall into three habitat classes:

(1) heavily modified or improved pastures (parts of The Pinnacle, Cooleman Ridge, Mt Arawang and Red Hill)

(2) *Stipa falcata* sp. (spear grass) and *Danthonia* spp. (wallaby grasses) tussock grassland (Tuggeranong Hill), and



Scientific and common names of plant species.

<i>Themeda australis</i>	kangaroo grass
<i>Stipa scabra</i>	slender speargrass
<i>Poa</i> spp.	snowgrasses
<i>Danthonia</i> spp.	wallaby grasses
<i>Dichanthium sericeum</i>	Queensland blue grass
<i>Avena barbata</i>	wild oats
<i>Vulpia</i> spp.	fescue
<i>Bothriochloa macra</i>	redleg grass
<i>Microlaena stipoides</i>	weeping grass
<i>Briza maxima</i>	quaking grass
<i>Bromus mollis</i>	soft brome
<i>Vittadinia muelleri</i>	fuss weed
<i>Aira</i> sp.	hair grass
<i>Dichelachne micrantha</i>	short-haired plume grass
<i>Pultenaea procumbens</i>	-
<i>Hibbertia obtusifolia</i>	Guinea flower
<i>Brachyloma daphnoides</i>	-
<i>Leucopogon</i> sp.	-
<i>Gonocarpus tetragynus</i>	raspweed
<i>Cheilanthes</i> spp.	rock fern
<i>Rumex acetosella</i>	sorrel
<i>Trifolium arvense</i>	clover
<i>Centaureum</i> sp.	centaurium

Figure 4. Plant species which occurred commonly in association with *A. parapulchella* in Canberra Nature Park. Species listed occurred at more than one site and had a cover greater than 10 per cent at any one site.

(3) *Chionochloa pallida* (red-anthered wallaby grass) tussock grassland (Mt Majura and Mt Ainslie). Full details of differences in vegetation will be presented at a later date by S. Jones (in preparation).

Other reptiles recorded

A total of 19 different reptile species were recorded in the survey including three snakes and 16 lizards (Table 3). Six of the reptile species recorded are regarded as rare and/or are species for which we have very little information. These have been denoted by a double asterisk in Table 3.

DISCUSSION

It has been suggested that the limited distribution of *A. parapulchella* simply may reflect a lack of sampling effort under ideal conditions for surveys (e.g. Ehmann and Cogger 1985). However, whilst the results of the present survey have increased the number of known sites in Canberra (6 of the 12 nature park units sampled supported at least some individuals), the results still indicate a surprisingly restricted or patchy distribution. Although potential habitat is extensive and widespread throughout CNP, the lizards were located at only 20 of the 84 suitable sites examined, and 57 per cent of these were at one locality, Mt. Taylor. Five other reserve units were found to support smaller and quite sparse populations; these were Urambi Hills, Cooleman Ridge (including one site on Mt Arawang), Farrer Ridge and The Pinnacle.

Such a restricted and patchy distribution in the Canberra region is unexpected and requires explanation. The species appears to avoid areas where the underlying geology is of Ordovician origin (mainly sedimentary rock types) (Osborne et al 1991). However, in Canberra Nature Park Ordovician sediments are generally confined to the Black Mountain, Aranda, and Bruce Ridge areas (Bureau of Mineral Resources,

Table 3. Numbers of individuals of each species of reptile found in each reserve unit or sub-unit.

Latin name	Common name	MT	TH	UH	RH	CR	ARA	WH	FR	MPA	PIN	A	M	Total no.
<i>Ctenotus robustus</i>	striped skink	27	16	8		22	51	6	21	14	45			211
<i>Morethia boulengeri</i>	Boulenger's skink	13	13	4	44	8	4	3	6	3	3	9	2	112
<i>Aprasia parapulchella</i> **	pink-tailed legless lizard	78		6		13	1		1		9			108
<i>Lampropholis delicata</i>	delicate skink	3	5	19	7	3	6	1	1	2		7	1	55
<i>Egernia cunninghami</i>	Cunningham's rock skink	5		3	3	12	1				5			26
<i>Ctenotus taeniolatus</i>	copper-tailed skink							13	2			1	5	18
<i>Menetia greyii</i> **	Grey's skink	2	2	2	5								1	15
<i>Pogona barbata</i>	bearded dragon		3		1								2	6
<i>Phyllodactylus marmoratus</i>	marbled gecko	1		1	5		2							9
<i>Ramphotyphlops nigrescens</i> **	blind snake	1					2			2	1	1		6
<i>Tiliqua scincoides</i>	common blue tongue	1		1					1	1	1			5
<i>Delma inornata</i> **	inornate legless lizard	1	1	2		1	1							6
<i>Pseudonaja textilis</i>	eastern brown snake	1	1								3			5
<i>Amphibolarus muricatus</i>	jacky lizard							3					1	4
<i>Unechis spectabilis</i>	black-headed snake		3					1						4
<i>Ctenotus uber</i> **	an unnamed skink		4									1		4
<i>Hemiergis decresiensis</i>	three-toed skink			2										3
<i>Carlia tetradactyla</i>	four-fingered skink		2				1							3
<i>Lialis burtonis</i> **	Burton's legless lizard											1		1

** Species regarded as rare and/or are species for which there is little information.

Reserve Units:	MT	Mt Taylor	WH	Wanniassa Hills
	TH	Tuggeranong Hill	FR	Farrer Ridge
	UH	Urambi Hills	MPA	Mt Painter
	RH	Red Hill	PIN	The Pinnacle
	CR	Cooleman Ridge	A	Mt Ainslie
	ARA	Mt Arawang	M	Mt Majura

Geology and Geophysics 1:50 000 geology map: Canberra, Queanbeyan and Environs 1980). Therefore, explanation for the absence of the lizards in areas similar to Mt. Taylor which are comprised of Mid-Silurian to Late-Silurian volcanics

(Mt Ainslie, Mt Majura, Red Hill and Mt Tuggeranong), must be sought elsewhere. Differences in vegetation and land use which may have influenced the distribution of *A. parapulchella* are discussed below.

Influence of shrub and tree cover

There is considerable circumstantial evidence to indicate that the species avoids, or at best occurs in only very low densities in, dense woodland and shrublands. In a study based at Mt Taylor, McKergow (1990) found that the lizards avoid areas that have thick shrub or tree cover. Similarly, despite a number of searches in woodland, forest and scrub immediately adjacent to sites with *A. parapulchella*, Barrer (1992) found only one specimen in *E. macrorhyncha* woodland. Barrer also found several specimens in clearings within *Kunzea ericoides* scrub, but not within the thickets themselves.

In the present survey some sites surveyed were located in regenerating woodland on Mt. Taylor in areas with fairly dense tree cover (sites MT 48,49,51). No specimens were found at these woodland sites, but they were found in several open stands of *Casuarina stricta*. The understorey vegetation of the open woodland was predominantly *Stipa* sp. while the understorey of the *C. stricta* stand was *Themeda australis*.

Influence of pasture improvement and livestock grazing

Osborne et al (1991) suggested that pasture improvement may have been a factor influencing *A. parapulchella*. Areas of suitable rocky habitat that were dominated by an extensive cover of exotic species (such as in old sheep camps and areas which have been improved by application of fertilizer) were found to rarely, if ever, support the lizards. Such sites are now characterised by a thick cover of introduced pasture grasses and weeds.

The pasture improvement that commenced some thirty years ago in the Canberra region involved the widespread use of superphosphate fertilizer. Such pasture management practice is likely to have influenced profoundly the distribution of the lizards. Mt Taylor was one of the few cleared hills which did not have applications of superphosphate (Hueneker 1976). The high population density of *Aprasia* on this hill may in part be explained by tree clearing which may have increased the area of habitat available, and by the lack of pasture improvement. The present day combination of extensive surface scatters of rocks over well-drained skeletal soils, and the presence of a good cover of native grasses dominated by *T. australis* apparently has favoured colonies of *A. parapulchella* in this area.

Continued intensive livestock grazing can lead to a reduction in the cover of palatable species such as *T. australis*, leading to their replacement with less-palatable native grasses such as *Danthonia* spp. and *Stipa* spp. (Moore 1962, 1967; Whalley et al. 1978). Intensive grazing also can lead to invasion by weeds and exotic grasses. In the Canberra region, the tendency of sheep to camp in the highest point in a paddock has led to the nutrification of rocky knolls that may once have supported *A. parapulchella*. Following years of use by sheep these areas become dominated by thistles and other weeds.

If livestock grazing is to be continued as a pasture management practice in parts of Canberra Nature Park it is recommended that wherever possible areas that still have a good cover of native grasses be excluded from grazing. Other areas should be grazed as lightly as possible for management purposes in conjunction with native grassland rehabilitation.

Absence from Tuggeranong Hill, Mt Ainslie and Mt Majura

The reason for the absence of the lizards from Tuggeranong Hill is difficult to determine. The reserve has extensive areas of suitable rocky ground cover amongst native grasses. However, the grassland may never have been of the type suitable for *Aprasia*. Today the ground cover is dominated by speargrasses (*Stipa* spp.) and wallaby grasses (*Danthonia* spp.); grasses that are not commonly associated with

A. parapulchella sites (P. Ormay and W. Osborne unpublished data; S. Jones in preparation). It is also possible that prior to clearing of the vegetation, red-anthered wallaby grass *Chionochloa pallida* may have dominated the woodland understorey. This grassland is abundant on the nearby Wanniasa Hills and in the Ainslie-Majura reserve. This habitat type apparently is not utilized by the species.

R. Dencio (ACT Herpetological Association pers. comm.) reported that some 30 years ago specimens of *A. parapulchella* were found regularly beneath stones in the Canberra suburb of Reid near Ainslie Avenue. These sites, which are now in residential areas, were close to the western edge of the Ainslie - Majura reserve, indicating that there was the possibility of the species occurring in the reserve (The Wildlife Research Unit has a preserved specimen of *A. parapulchella* apparently from the Ainslie - Majura reserve. This specimen was collected by C. Southwell who unfortunately no longer remembers collecting the

specimen [see also Kukolic 1991]). Inspection of the eastern edge of Reid, near CSIRO and the Australian War Memorial, revealed the presence of some *Themeda* grassland areas with volcanic rock outcrops. These sites may provide potential habitat, although the site sampled at this location in the present study (site W) did not yield any specimens.

Further upslope in the reserve the ground vegetation is dominated by *Chionochloa pallida* which apparently is unsuitable habitat (see also results for Cooleman Ridge which has substantial areas of *C. pallida* and did not support the lizards). Further searches should be conducted in the Ainslie - Majura reserve in suitable areas of *Themeda* grassland.

Habitat of *A. parapulchella* in CNP

Potential habitat for *A. parapulchella* within Canberra Nature Park includes relatively open sites where there is a moderate to extensive cover of partially buried rock fragments and small boulders derived from outcropping rhyodacite or other Silurian volcanic rock types; and where there is a moderate to good cover of kangaroo grass (*Themeda australis*) amongst the rocks.

Potentially suitable rocky areas which have been pasture improved by fertilizer application, or have had a history of over-grazing or use as sheep 'camps' are unlikely to support viable populations. Specimens may occasionally be found in degraded sites where the cover of *T. australis* is greatly reduced. Specimens also may be found in open stands of hill oak *C. stricta* provided that there is a cover of *T. australis* amongst the stones.. A detailed analysis of the vegetation present at the CNP sites and at other sites in the ACT is given by Jones (1992).

MANAGEMENT CONSIDERATIONS

The impact of humans on habitat quality

Osborne *et al.* (1991) considered that the main threats to *A. parapulchella* were: (1) livestock grazing (2) weed/exotic flora invasion, (3) disturbance to rocks (e.g. children rolling rocks down hill slopes) and (4) removal of rocks for landscape gardening. The protection of many of the sites with the lizards will require a program of ongoing management and monitoring.

Whenever possible, livestock grazing should be discontinued at sites known to support populations of *A. parapulchella*. Grazing has been withdrawn from all or parts of the following reserve units which contain *A. parapulchella*: Mt Taylor, Cooleman Ridge (part only), Oakey Hill and The Pinnacle. However, grazing continues on part of Red Hill and part of the Urambi Hills.

Invasion by woody weeds, (e.g. Cootamundra wattle *Acacia baileyana*, briar rose *Rosa rubiginosa* and blackberry *Rubus fruticosus*), and the spread of exotic grasses and forbs (e.g. serrated tussock *Nasella trichoma*, African lovegrass *Eragrostis curvula* and St. Johns wort *Hypericum perforatum*) present possible threats to some sites and requires an active program of weed eradication or control.

The loss of rock for landscaping purposes and disturbance to rocks presents a more difficult problem because of the close proximity and ease of access to the reserves, and the difficulty in enforcing measures to slow or cease such activities. Interpretation programs should be prepared to alert reserve users to the value of rocks as providing critical wildlife habitat.

In addition to current impacts occurring in the CNP reserves, past impacts have also had a significant effect, and may, as explained above, be a determining factor related to the distribution of the lizards. For example, the absence of the lizards from some areas may relate to the higher alien content of the ground flora which has resulted from former nitrogen enrichment of the soil from grazing (especially around old sheep camps). Rehabilitation of some of these sites with native grasses may allow for recolonisation by the species.

Management considerations for specific areas are discussed briefly below.

Areas of immediate concern for management

1. Red Hill

Unfortunately, the grassland on Red Hill has deteriorated to the extent that potential habitat for *A. parapulchella* is now probably unsuitable in much of the reserve. The prior (and recent) records of specimens from this area indicate that the species at least had the potential to occur at the 21 sites now sampled in this reserve. Any further surveys at Red Hill should concentrate on areas that have not been grazed, such as occurs immediately outside the outer fenced boundary. In addition, the sites where specimens were collected by

R. Bennett should be surveyed.

2. Urambi Hills

The Urambi Hills reserve contains many areas of good quality habitat. Not surprisingly, the lizards were found at six of the 11 sites sampled in this reserve (Map 11). However, continued livestock grazing within the area is of concern.

More baseline research is needed to determine the extent of native grass cover in the reserve (our preliminary observations indicate that the native grasslands are in good condition in this reserve). If grazed heavily the conservation value of the rocky grassland may deteriorate.

3. Mt Taylor horse-holding paddocks

A number of specimens of *A. parapulchella* were found in the heavily-grazed horse paddocks on the eastern side of Mt Taylor. Most individuals were found in and near rock outcrops adjacent to a large ungrazed enclosure within the paddock. These specimens were within close dispersal distance of the nearby protected enclosure where *Themeda* dominated grassland prevailed. Although the grazed horse paddock still supports native grasses, the dominant species in the grazed and ungrazed areas differed greatly. In the grazed area *Bothriochloa macra* (a species characteristic of grazed and disturbed sites; F. Ingwersen pers. comm.) is dominant, with a greatly reduced cover of *Danthonia* spp. and *Themeda australis*. Introduced weeds also were abundant in this area. In contrast, the dominant species in the ungrazed enclosure is *T. australis* with occasional tussocks of *Poa sieberi*. The close proximity of the two areas of differing habitat quality may explain why most *A. parapulchella* collected in the horse holding paddock were found near the ungrazed enclosure. Searches in rocky areas in other parts of the paddock revealed few additional specimens, indicating that habitat disturbance through grazing in the area may have resulted in the loss of the lizards from some suitable rocky areas in the horse paddock.

It is of concern that potentially suitable areas on Mt. Taylor are grazed and it is our view that the use of the area as horse-holding paddocks should be discontinued before further habitat degradation and fragmentation occurs.

Mt Taylor supports the only substantial population of *A. parapulchella* in the CNP network and its size must be maximised to include all potential habitat for this nationally endangered species. This issue will be addressed further in a management plan currently being prepared for the species.

4. Cooleman Ridge

Much of the Cooleman Ridge area is unsuitable for *A. parapulchella* having had considerable pasture improvement and extensive livestock grazing in the past. The rocky tops of the hills are dominated by nutrient rich thickets of weeds and rank pasture grasses such as *Phalaris aquatica*. These areas probably once supported populations of *A. parapulchella*. Remaining areas of suitable habitat now occur on the lower northern slopes, particularly in areas which obviously have been excluded from grazing for a longer period. Without active rehabilitation of native grassland in this reserve the reserve can be expected to support only very localised colonies of the lizards over the short-term.

5. The Pinnacle

Suitable habitat for the lizards in The Pinnacle reserve is very limited. Much of the area is dominated by exotic pasture. The few sites still supporting remnant populations of the lizards in the area are threatened by weed invasion and, to a lesser extent, tree plantings.

6. Oakey Hill

The Oakey Hill reserve has not yet been fully assessed for potential *A. parapulchella* habitat by staff of the Wildlife Research Unit, and requires further survey. The few specimens found on Oakey Hill have been located in small, open pockets of rocky *Themeda* grassland.

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Appendix 1. Geographic information for sites surveyed in
Canberra Nature Park during Spring 1991.

Site	Area ¹	Grid Ref.	Altitude (m)	Geology ²	Number of Aprasia ³
1	PI	850966	680	MSV	
2	PI	856960	705	MSV	
3	PI	853961	680	MSL	
4	PI	856960	655	MSV	5 (1)
5	PI	957855	665	MSV	4 (1)
6	PI	957855	675	MSV	
7	PI	957855	675	MSV	
8	MP	873956	670	MSV	
9	MP	875956	670	MSV	
10	MM	993984	700	MSV	
11	MM	985996	760	MSV	
12	MM	981981	750	MSV	
13	MM	977984	800	MSV	
14	MM	977984	805	MSV	
15	MM	972976	670	MSV	
16	MA	967945	825	MSV	
17	MA	967945	825	MSV	
18	MA	967945	700	MSV	
19	MA	962952	750	MSV	
20	MA	962950	765	MSV	
21	MA	961949	780	MSV	
22	MA	955938	600	MSV	
23	RH	910887	655	LSV	
24	RH	915888	670	LSV	
25	RH	920890	680	LSV	
26	RH	924881	695	LSV	
27	RH	925885	700	LSV	
28	RH	922878	695	LSV	
29	RH	925877	680	LSV	
30	RH	920875	740	LSV	
31	RH	924871	720	LSV	
32	RH	924869	715	LSV	
33	RH	924866	710	LSV	
34	RH	927865	710	LSV	
35	CR	832857	670	LSV	6 (2)
36	CR	832857	700	LSV	
37	CR	843857	710	LSV	5 (4)
38	CR	852850	700	LSV	2
39	CR	850843	680	LSV	
40	CR	852842	570	LSV	
41	AR	858844	710	LSV	1 (2)
42	AR	841857	745	LSV	
43	AR	840857	750	LSV	
44	AR	838858	755	LSV	
45	AR	860840	730	LSV	
46	MT	880835	690	LSV	6 (1)
47	MT	880835	710	LSV	5
48	MT	880835	700	LSV	
49	MT	884834	705	LSV	3
50	MT	884834	715	LSV	
51	MT	884834	730	LSV	
52	MT	985996	800	LSV	7 (4)

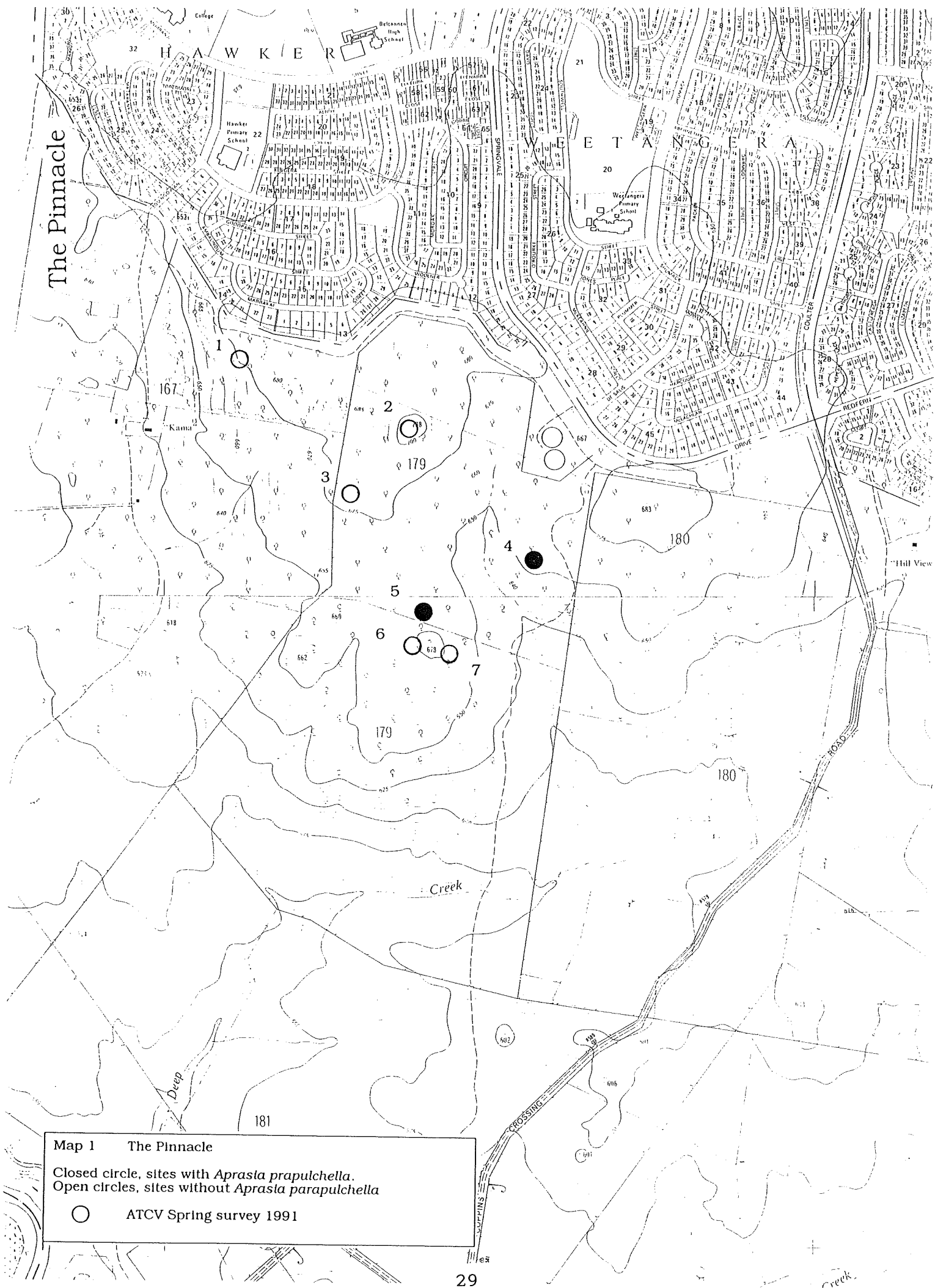
53	MT	993884	810	LSV	22 (5)
54	MT	886835	765	LSV	19 (11)
55	MT	896825	665	LSV	1 (1)
56	MT	896825	660	LSV	8 (1)
57	MT	896825	655	LSV	6 (2)
58	WH	920614	775	LSV	
59	WH	920614	790	LSV	
60	WH	923817	790	LSV	
61	WH	923818	775	LSV	
62	WH	927810	765	LSV	
63	WH	927809	730	LSV	
64	FR	913818	710	LSV	1 (1)
65	FR	912816	700	LSV	
66	FR	912817	730	LSV	
67	FR	914818	750	LSV	
68	FR	914817	735	LSV	
69	UH	861809	660	LSV	2
70	UH	861808	650	LSV	
71	UH	865807	685	LSV	1 (3)
72	UH	866806	660	LSV	1 (1)
73	UH	864805	700	LSV	
74	UH	864803	650	LSV	
75	UH	865799	600	LSV	
76	UH	884830	585	LSV	2 (3)
77	TH	905750	655	LSV	
78	TH	905747	690	LSV	
79	TH	905747	705	LSV	
80	TH	905750	690	LSV	
81	TH	929757	640	LSV	
82	TH	930755	640	LSV	
83	TH	927743	770	LSV	
84	TH	925742	790	LSV	

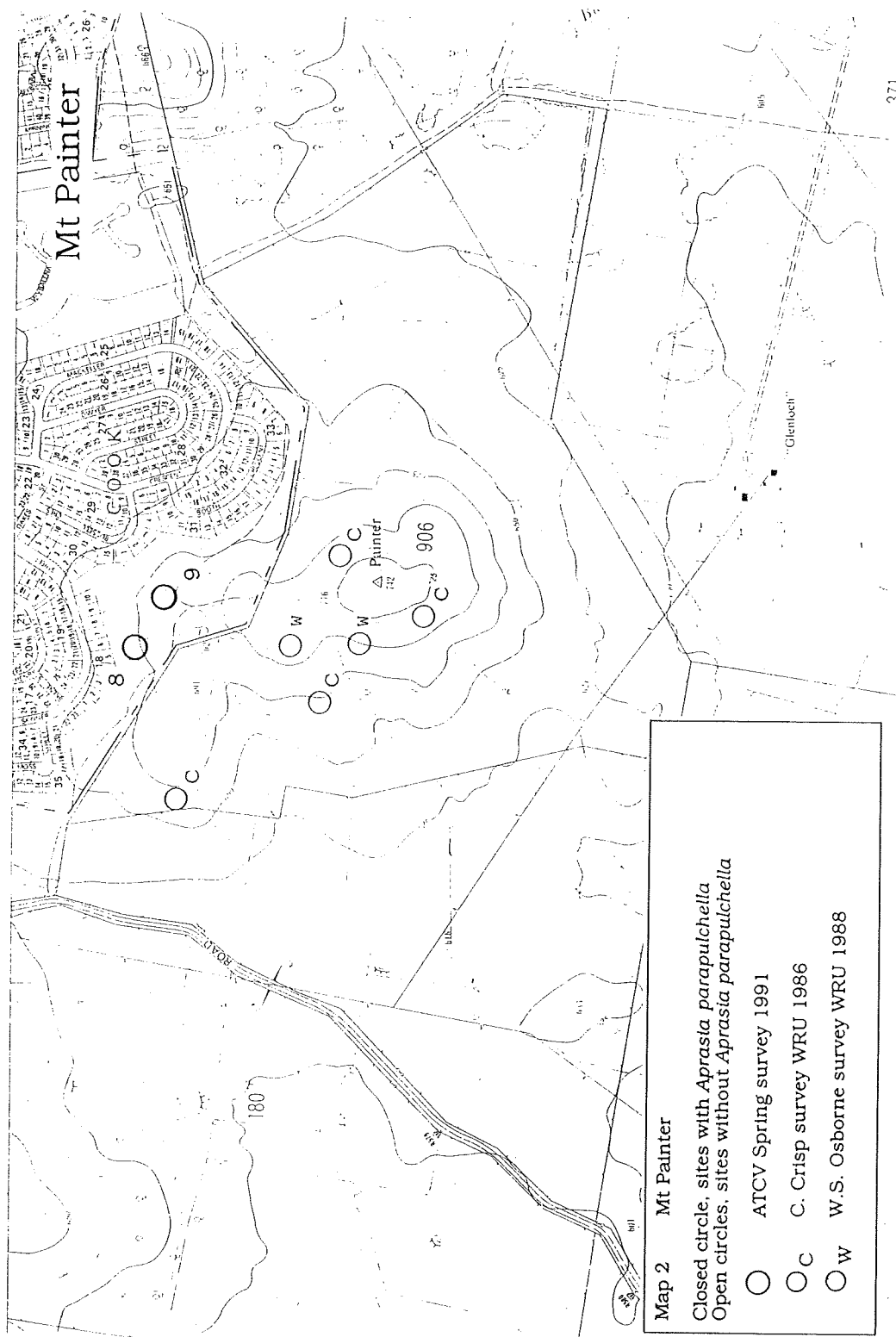
- 1 Reserve Unit Code:
 - PI - The Pinnacle
 - MP - Mt Painter
 - MM - Mt Majura
 - MA - Mt Ainslie
 - RH - Red Hill
 - CR - Cooleman Ridge
 - ARA - Mt Arawang
 - MT - Mt Taylor
 - WH - Wanniasa Hills
 - FR - Farrer Ridge
 - UH - Urambi Hills
 - TH - Tuggeranong Hill
- 2 Geology codes:
 - MSV - Mid Silurian Volcanics
 - MSL - Mid Silurian Limestone
 - LSV - Late Silurian Volcanics
- 3 The number of live individuals including sloughed skins in brackets.

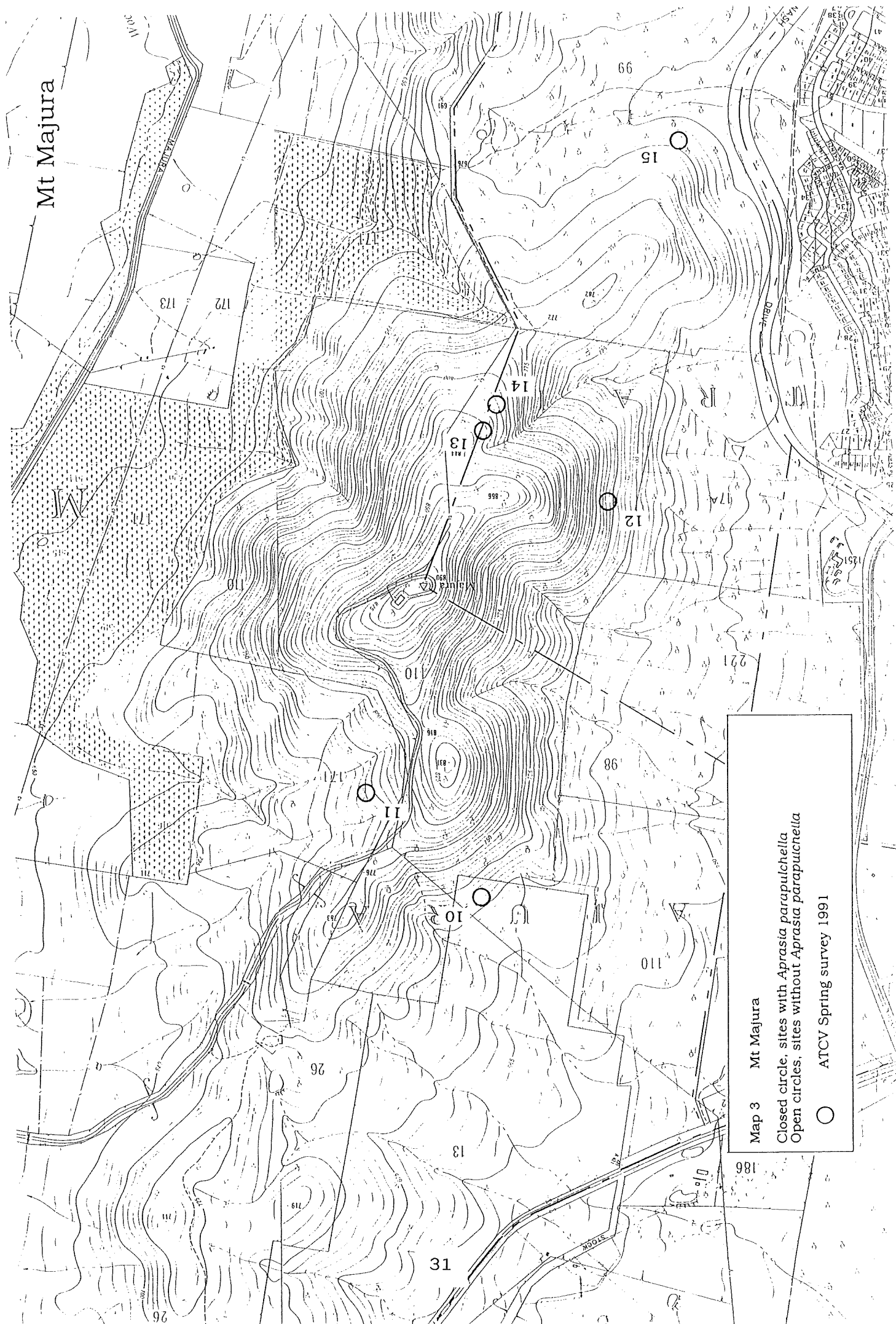
Appendix 2.

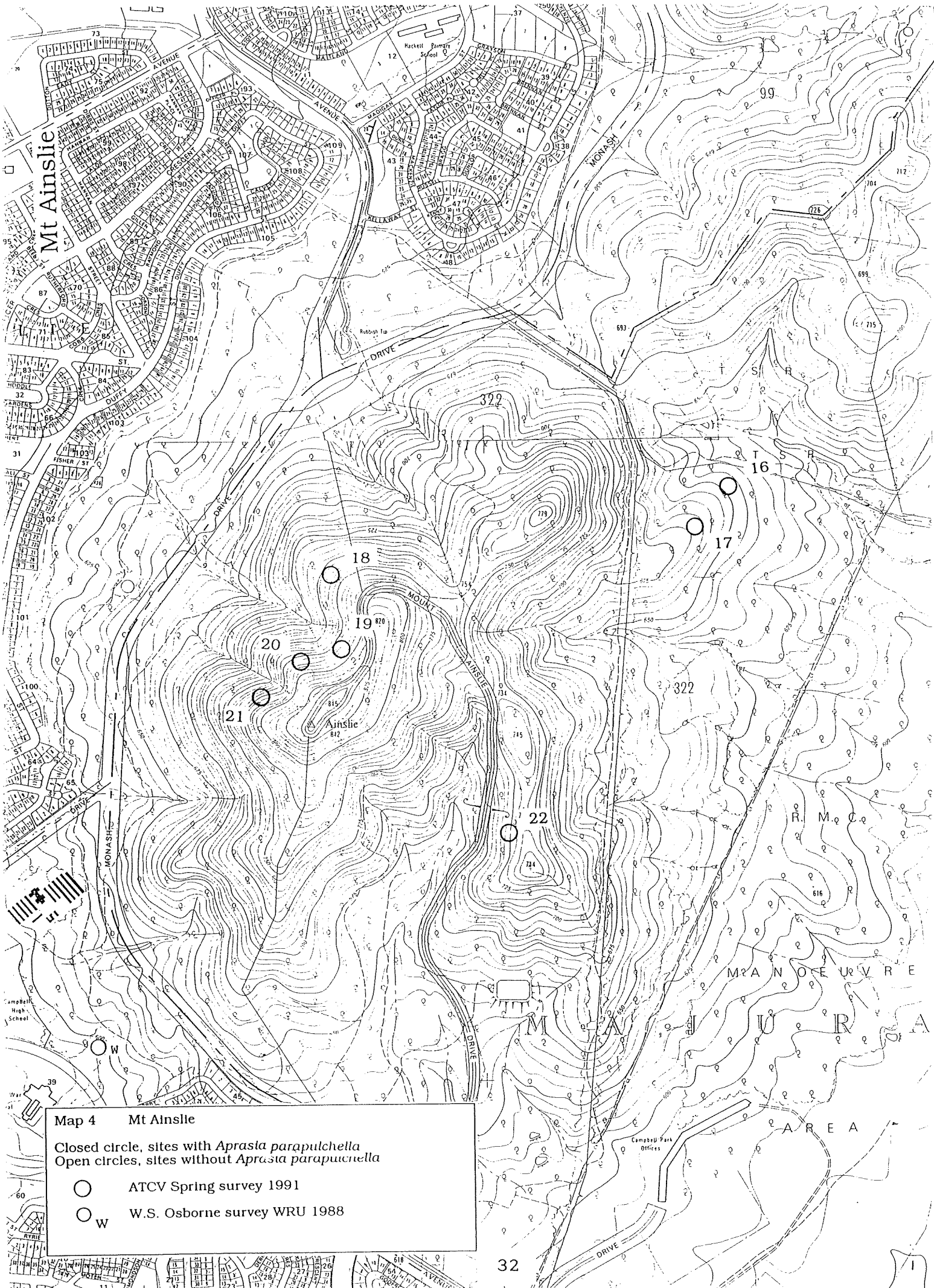
Maps showing the location of all sites that have been surveyed for *A. parapulchella* in Canberra Nature Park. Includes the results of any previous surveys undertaken by the ACT Parks and Conservation Service. Sites where *A. parapulchella* have been found are shown as closed circles, sites surveyed but where *A. parapulchella* were not found are shown as open circles.

- | | |
|---------|------------------|
| Map 1. | The Pinnacle |
| Map 2. | Mt Painter |
| Map 3. | Mt Majura |
| Map 4. | Mt Ainslie |
| Map 5. | Red Hill |
| Map 6. | Cooleman Ridge |
| Map 7. | Mt Arawang |
| Map 8. | Mt Taylor |
| Map 9. | Wanniassa Hills |
| Map 10. | Farrer Ridge |
| Map 11 | Urambi Hills |
| Map 12. | Tuggeranong Hill |







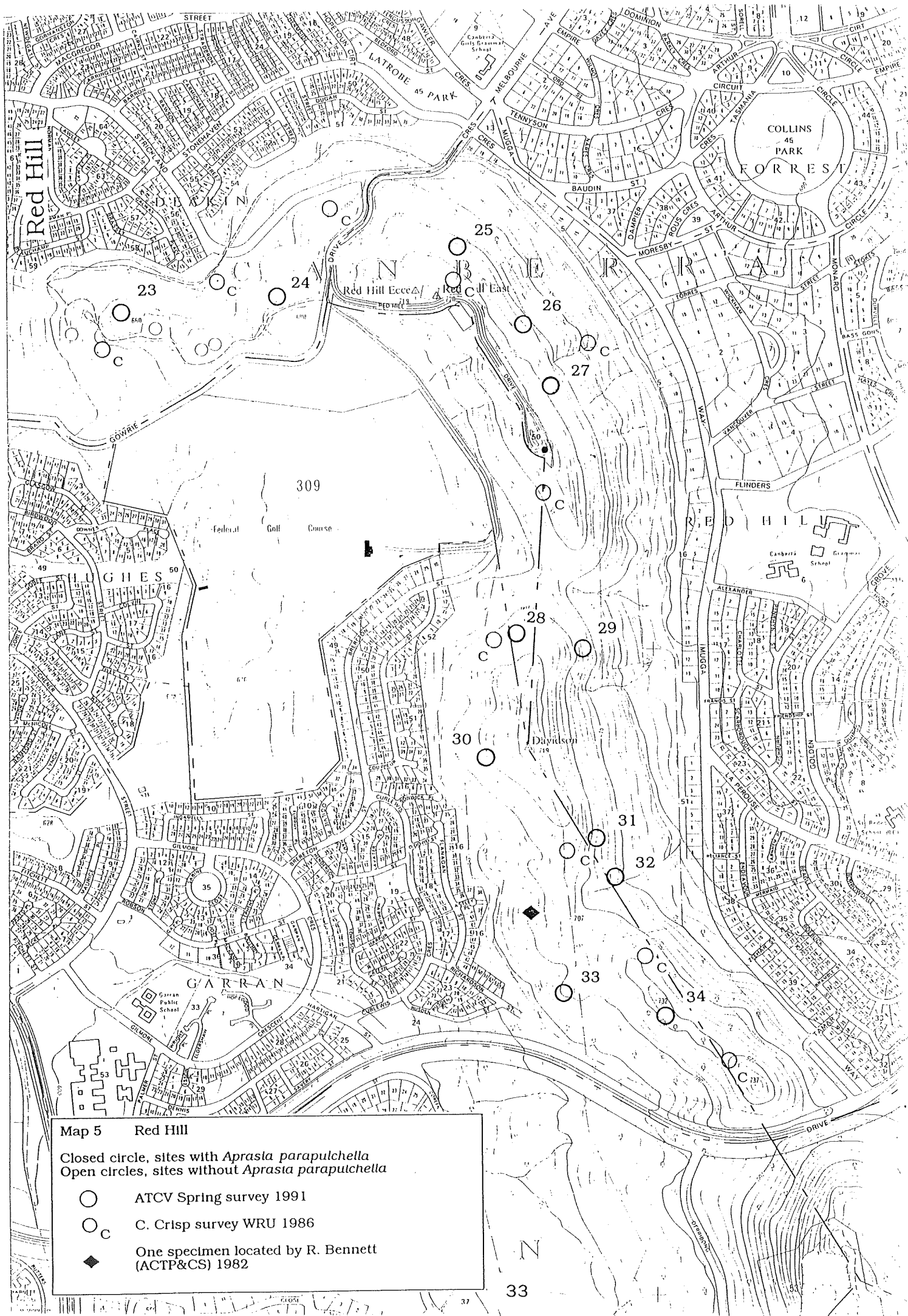


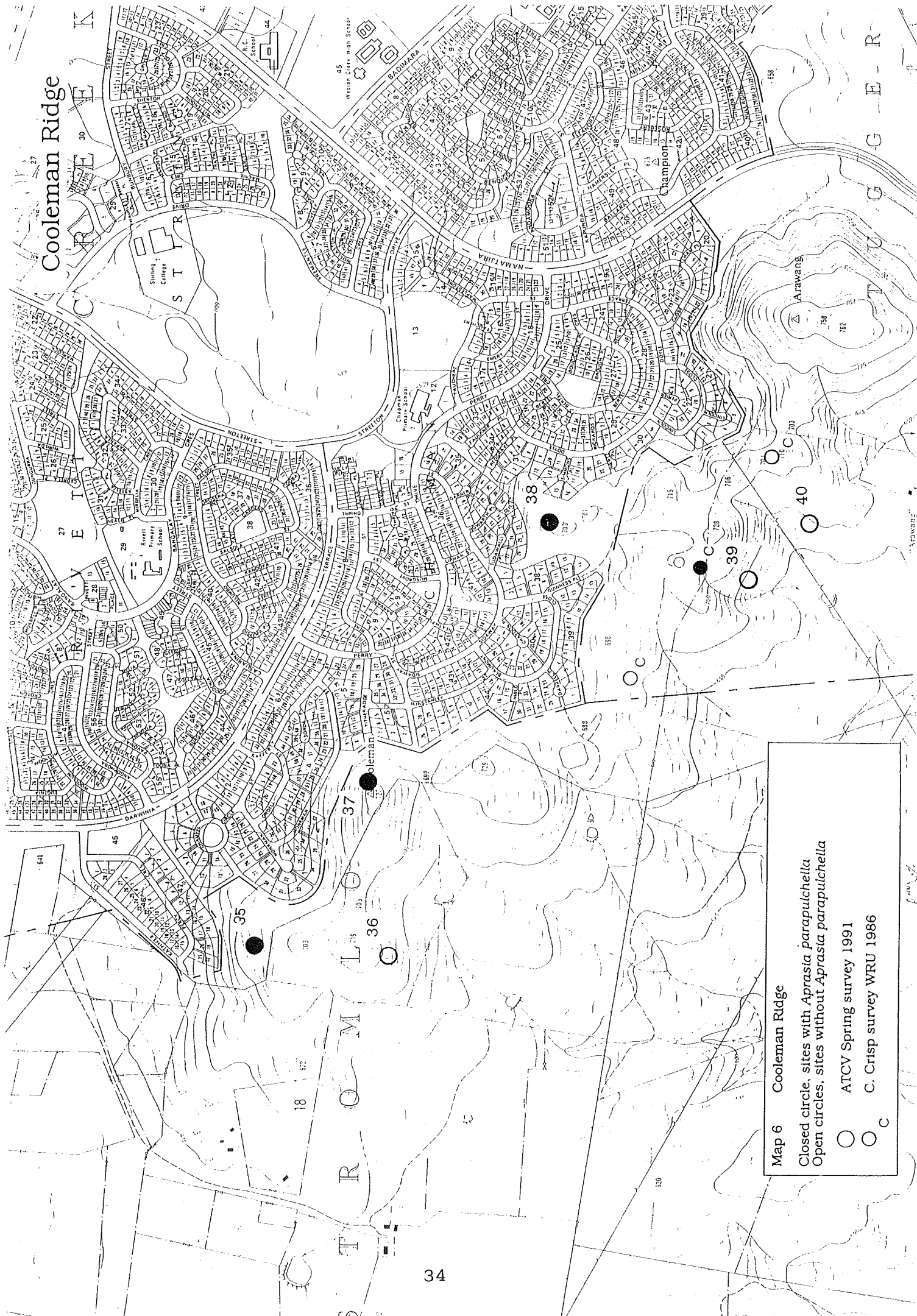
Map 4 Mt Ainslie

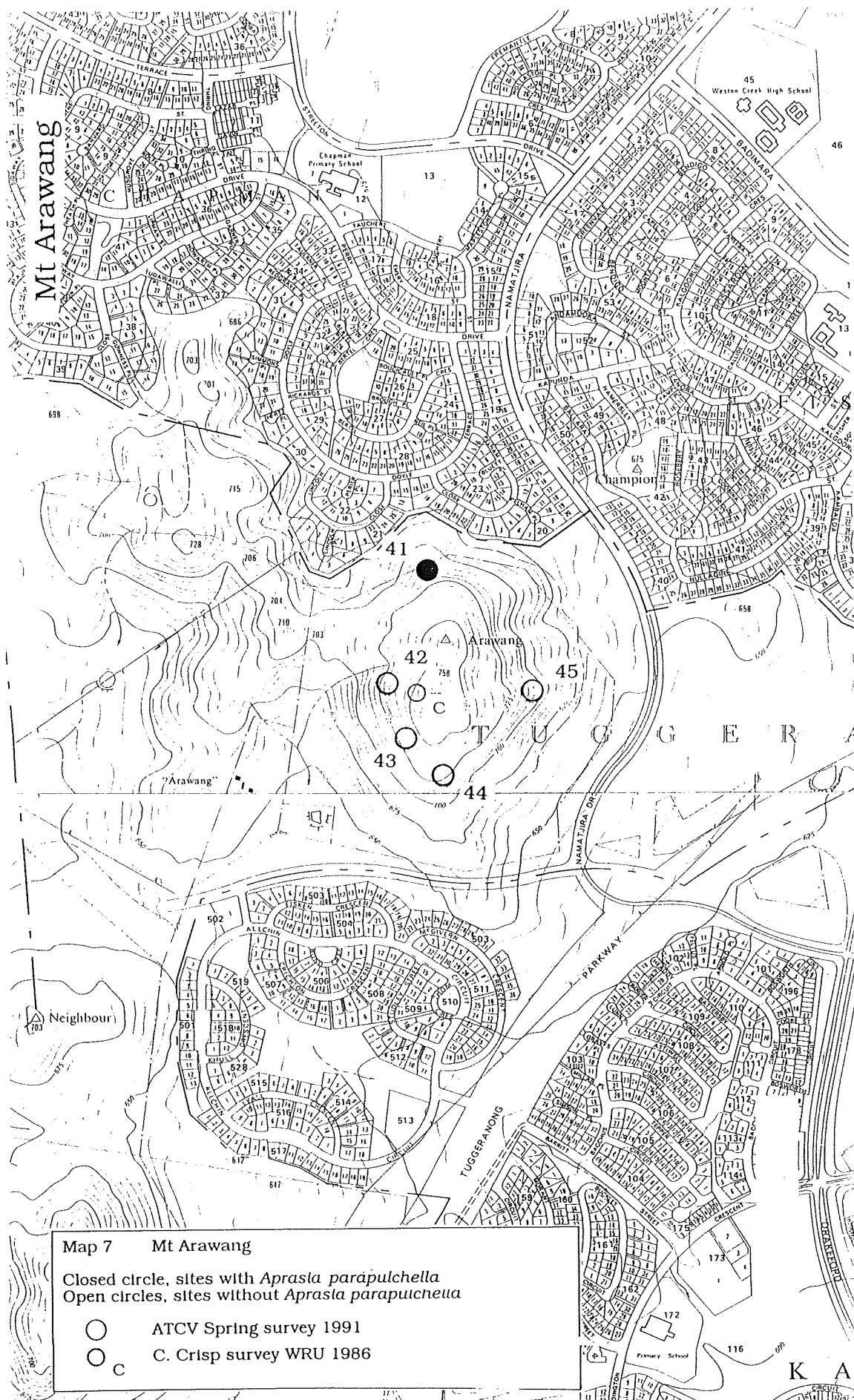
Closed circle, sites with *Aprasia parapulchella*
Open circles, sites without *Aprasia parapulchella*

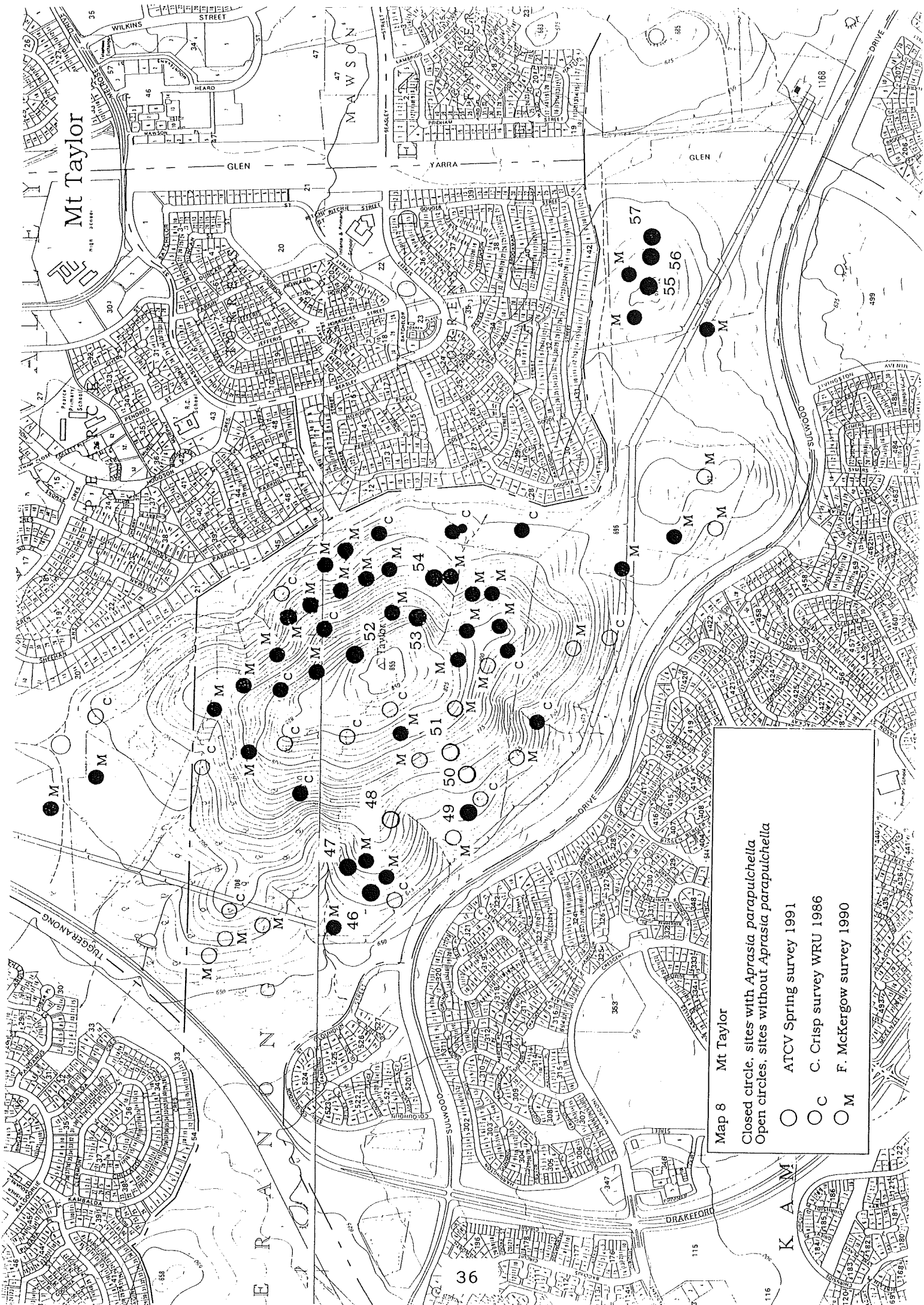
○ ATCV Spring survey 1991

○ W S. Osborne survey WRU 1988







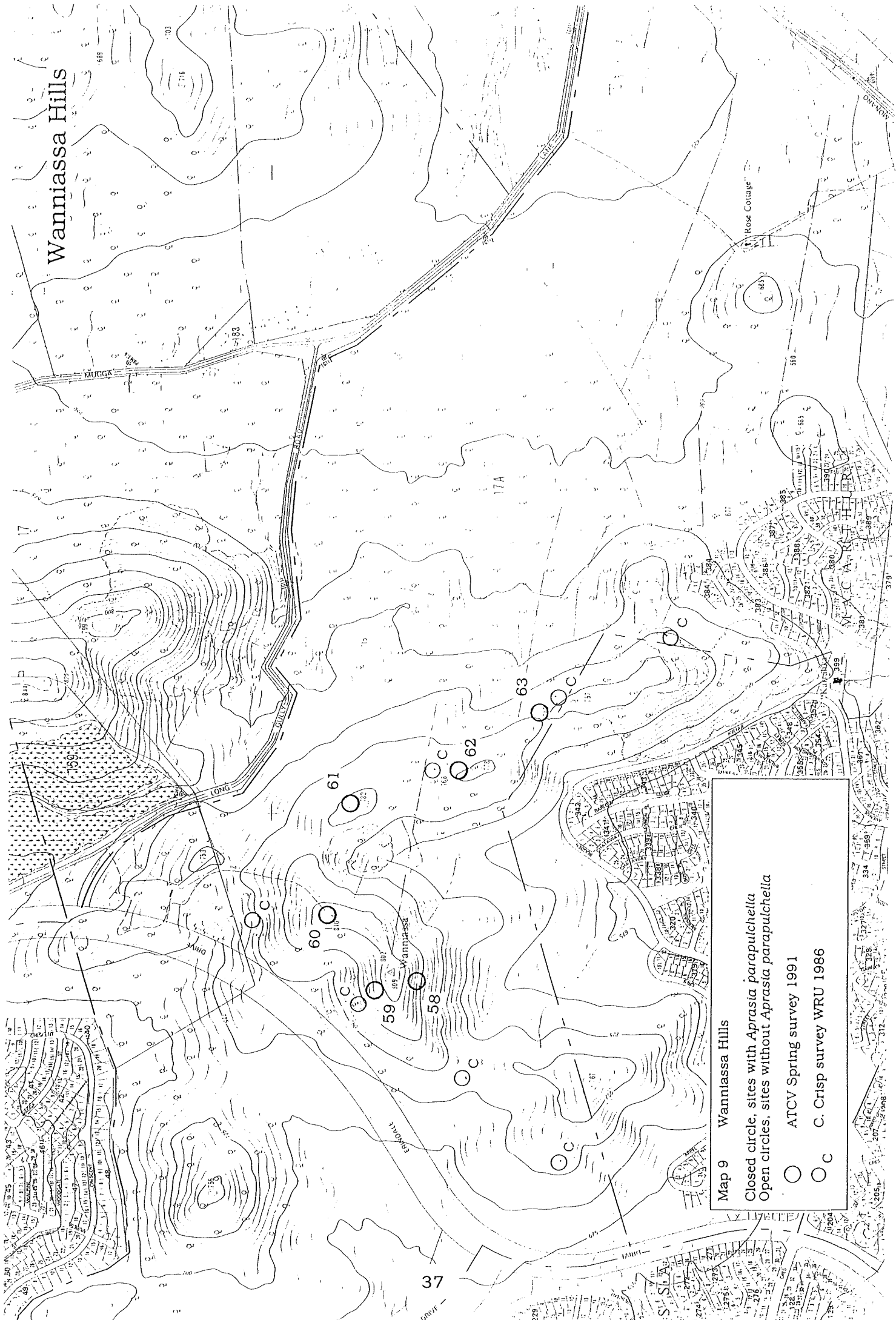


Map 8 Mt Taylor

Closed circle, sites with *Aprasia parapulchella*
Open circles, sites without *Aprasia parapulchella*

- ATCV Spring survey 1991
- C. Crisp survey WRU 1986
- F. McKergow survey 1990

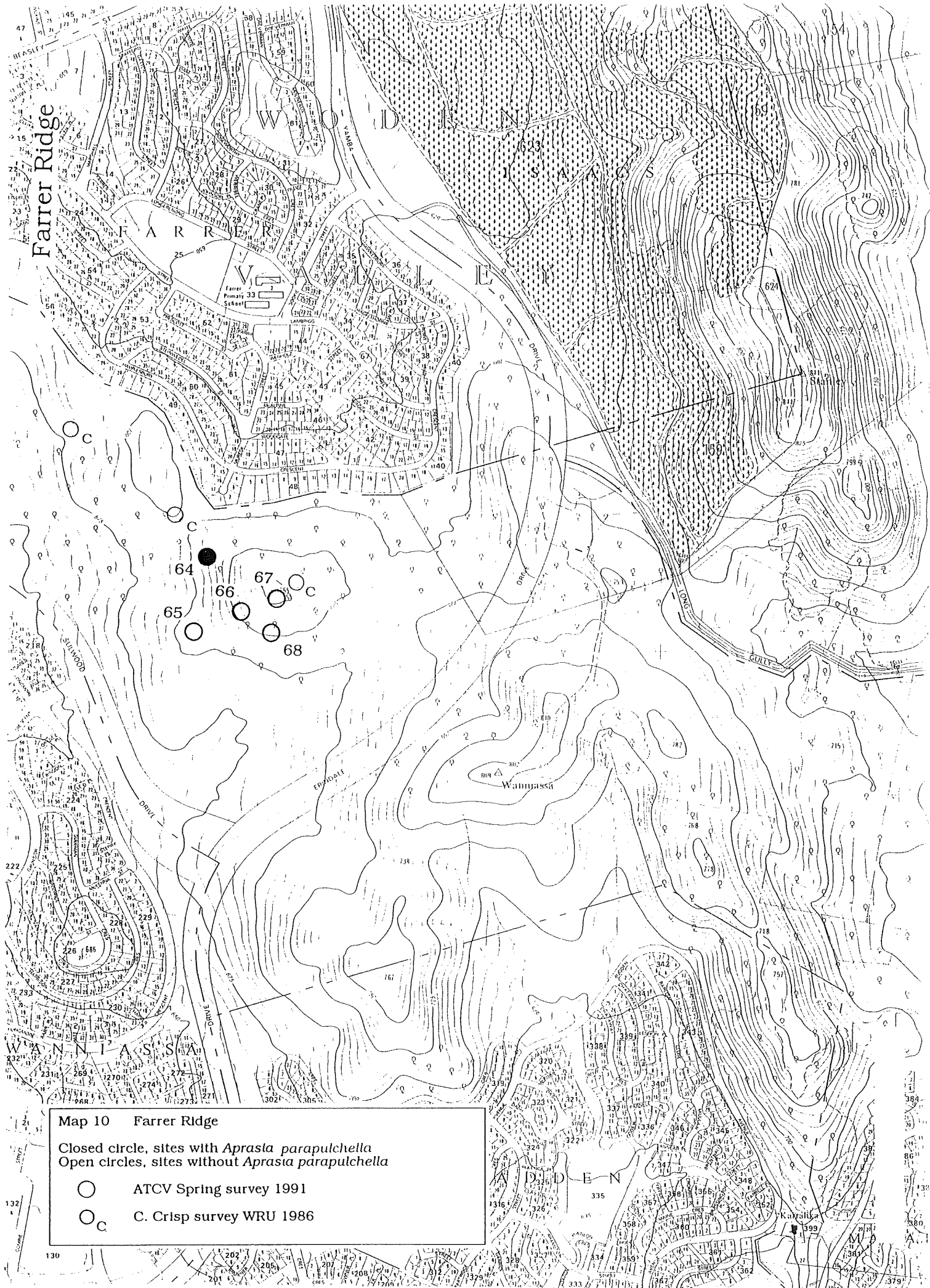
Wanniassa Hills



Map 9 Wanniassa Hills

Closed circle, sites with *Aprasia paraputichella*
Open circles, sites without *Aprasia paraputichella*

- ATCV Spring survey 1991
- C. Crisp survey WRU 1986



Urambi Hills

Map 11 Urambi Hills

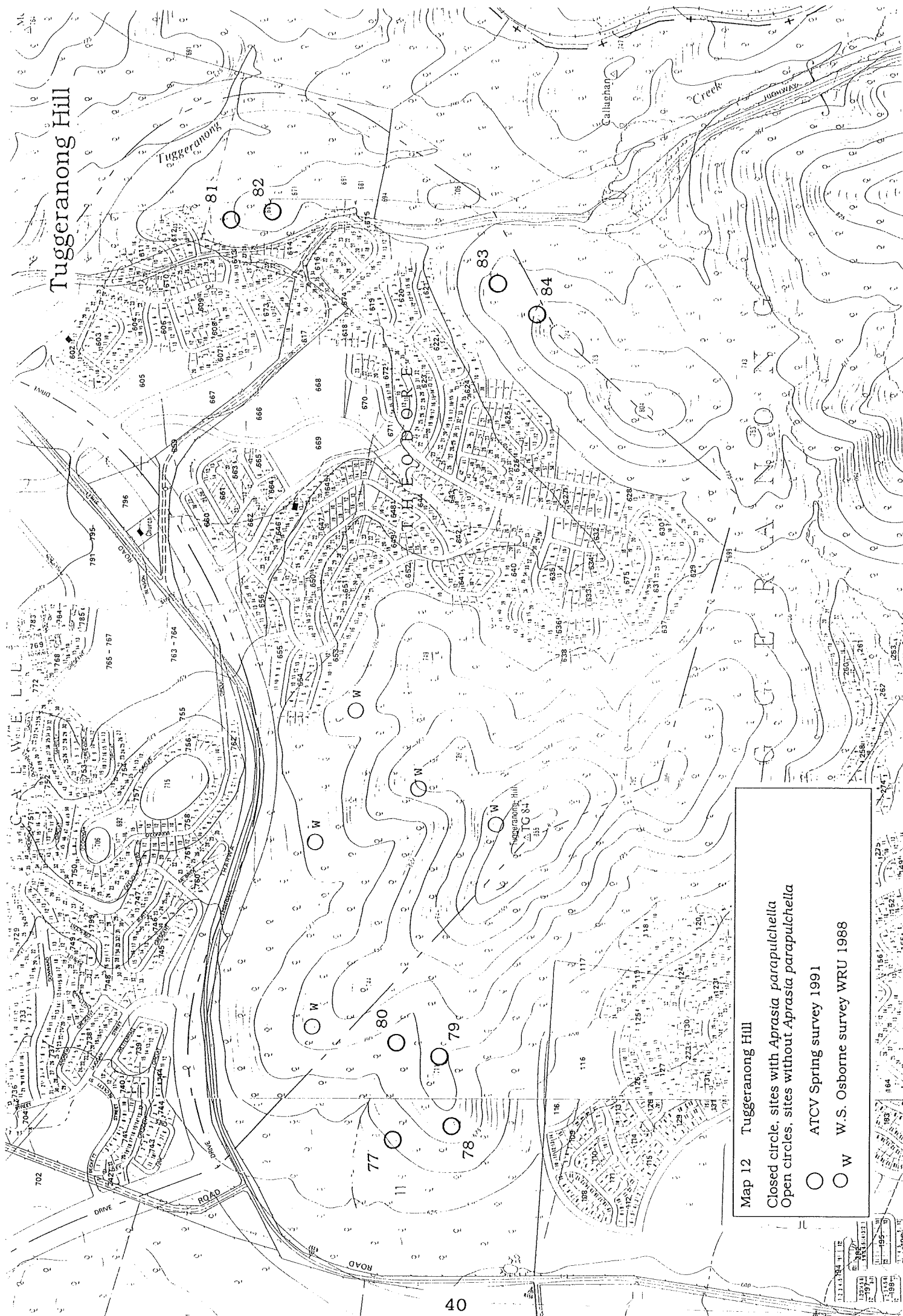
Closed circle, sites with *Aprasia parapulchella*
 Open circles, sites without *Aprasia parapulchella*

○ ATCV Spring survey 1991
 ○ C Crisp survey WRU 1986

Map 11 Urambi Hills

Closed circle, sites with *Aprasia parapulchella*
Open circles, sites without *Aprasia parapulchella*

○ ATCV Spring survey 1991
○ C. Crisp survey WRU 1986
○



Map 12 Tuggeranong Hill

Closed circle, sites with *Aprasia parapulchella*
 Open circles, sites without *Aprasia parapulchella*

○ ATCV Spring survey 1991
 ○ W.S. Osborne survey WRU 1988

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