2 METHODS

2.1 EXISTING FAUNA DATA

The Atlas of NSW Wildlife (DEC 2004aA) was the primary resource used to access existing data on the fauna of the park, and compile a species list. The majority of records within the Atlas prior to the summer of 2004 derive from the licensed data sets of the Royal Australian Ornithologists Union and Birds Australia (Blakers *et al.* 1984 and Barrett *et al*. 2003) and the specimen register of the Australian Museum. A large amount of this data, however, has inaccurate temporal and spatial referencing, including species that have never been recorded within the study area itself or are considered to be locally extinct. To increase the accuracy of the fauna species list for the park, and avoid misinterpretation of data, a number of records were excluded, as follows:

- All records collected prior to 1950 were removed due to low spatial and temporal accuracy.
- All records from the Royal Australian Ornithologists Union prior to 1984 (Blakers *et al.* 1984) were removed due to the very low spatial accuracy.

Remaining records within the Atlas of NSW Wildlife derive from observations made by: park rangers and field officers; bushwalkers and naturalists; scientific researchers working in the area; environmental consultants; neighbours and other visitors to the park. These records have various levels of reliability depending on the type of observation, as well as the certainty and identification experience of the observer.

2.2 SURVEY STRATIFICATION AND SITE SELECTION

The primary stratum used for site selection was vegetation type, using the digital vegetation map produced by UBM Consultants (2001). The preferable sampling strategy would have aimed to sample the mapped vegetation communities proportionately according to the mapped area of each community within the reserves and have included enough repeat sampling within each vegetation community to provide reasonable reliability that potential variations within widespread stratum were captured. Such replication of sites serves to strengthen the reliability of patterns derived from collected data. The pre-trip site selection process aimed to fulfil this goal as much as possible. However, due to temporal and spatial constraints, replicated sampling could only be undertaken within the most extensive vegetation communities. At least one site was placed in each vegetation type, with the exception of Swamp Oak Forest, Rushland, Grey Mangrove Low Closed Forest and Cleared Land. The first three of these vegetation communities were targeted for opportunistic surveys, where possible.

Sites were initially selected using a Geographic Information System (ArcView 3.2) with information gained from topographic maps, vegetation maps, access trails, and knowledge held by Lane Cove NP staff. Wherever possible sites were placed a minimum of one kilometre apart from each other, however due to the size and shape of the study area this was not always achievable. Owl call playback sites were spaced two kilometres apart to avoid double counting of responses. Sites were positioned primarily on or close to access trails to facilitate conduct of spotlighting and harp trapping surveys and to maximise the number of sites that could be accessed during the limited survey period. In the field, the proposed site locations were ground-truthed to ensure that they were representative of the mapped vegetation community, had suffered a minimum amount of disturbance and comprised a single vegetation community. If these criteria were not met, an alternative location was selected for the site. Systematic survey sites were 100 metres by 200 metres (two hectares) in area.

The placing of sites for some survey techniques also aimed to sample potential habitat for target species, such as Bandicoots, small mammals and bats. For example, cage traps were placed in areas where rangers and field officers had recently sighted Bandicoot diggings. The placement of harp traps to capture microbats was limited by the availability of suitable fly-ways, such as vegetation constrictions along roads and creeklines.

Maps 2a and 2b show the location of fauna survey sites and the distribution of vegetation communities within the study area. Appendix A provides the specific AMG, vegetation type and survey techniques completed at each systematic survey site.

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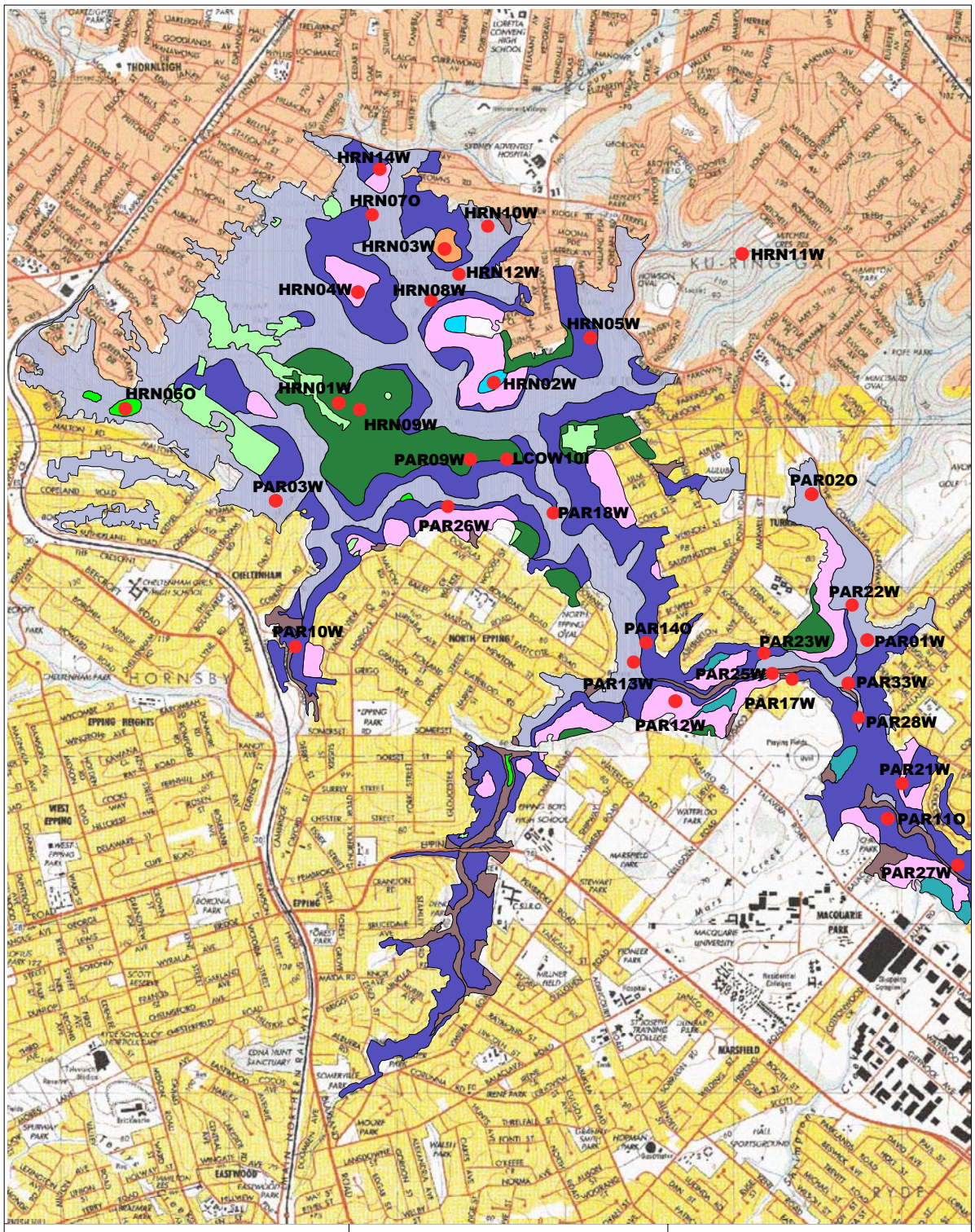
Table 1: Vegetation communities within Lane Cove National Park and surrounding public lands and corresponding allocation of systematic fauna survey methods. Vegetation communities are listed in descending order of the area they cover within the study area.

Vegetation type (UBM Consultants 2001)	No. of diurnal bird surveys	No. of diurnal reptile surveys	No. of site spotlight surveys	No. of harp trapping bat sites	No. of ultrasonic bat detector sites	No. of owl call broadcast sites	No. of Elliott trap sites	No. of cage trap sites
Sydney Peppermint - Smooth-barked Apple Tall Forest / Forest / Open Forest	3	3	3	3	5	1	1	2
Blackbutt - Smooth-barked Apple Tall Forest / Forest / Open Forest	3	2	3	5	4	3	3	2
Sydney Peppermint Woodland / Open Woodland / Mallee Open Woodland	3	3	3	1	2	1	1	0
Scribbly Gum Woodland / Open Woodland / Low Open Woodland	3	2	3	1	0	1	1	0
Cleared	0	0	0	0	0	0	0	0
Weed Dominated Community	1	0	0	0	0	0	0	0
Grey Mangrove Low Closed Forest	0	0	0	0	0	0	0	0
Closed Shrubland / Shrubland	1	0	0	0	0	0	0	0
Scribbly Gum Open Forest	1	1	1	0	0	0	0	0
Rushland	0	0	0	0	0	0	0	0
Coachwood Simple Rainforest	0	1	0	0	0	1	0	0
Red Bloodwood Low Open Forest	2	2	2	0	0	1	1	0
Silvertop Ash Low Woodland / Low Open Woodland	1	1	1	0	0	0	0	0
Swamp Oak Forest	0	0	0	0	0	0	0	0
Unmapped land. Red Bloodwood canopy with dense and diverse shrub storey.	0	0	0	1	0	1	0	0
Total	18	15	16	11	11	9	7	4



Vegetation Communities

- Blackbutt - Smooth-barked Apple Tall Forest / Forest / Open Forest
- Cleared
- Closed Shrubland / Shrubland
- Coachwood Simple Rainforest
- Eucalyptus sieberi Low Woodland / Low Open Woodland
- Grey Mangrove Low Closed Forest
- Red Bloodwood Low Open Forest
- Rushland
- Scribbly Gum Open Forest
- Scribbly Gum Woodland / Open Woodland / Low Open Woodland
- Swamp Oak Forest
- Sydney Peppermint - Smooth-barked Apple Tall Forest / Forest / Open Forest
- Sydney Peppermint Woodland / Open Woodland / Mallee Open Woodland
- Weed Dominated Community

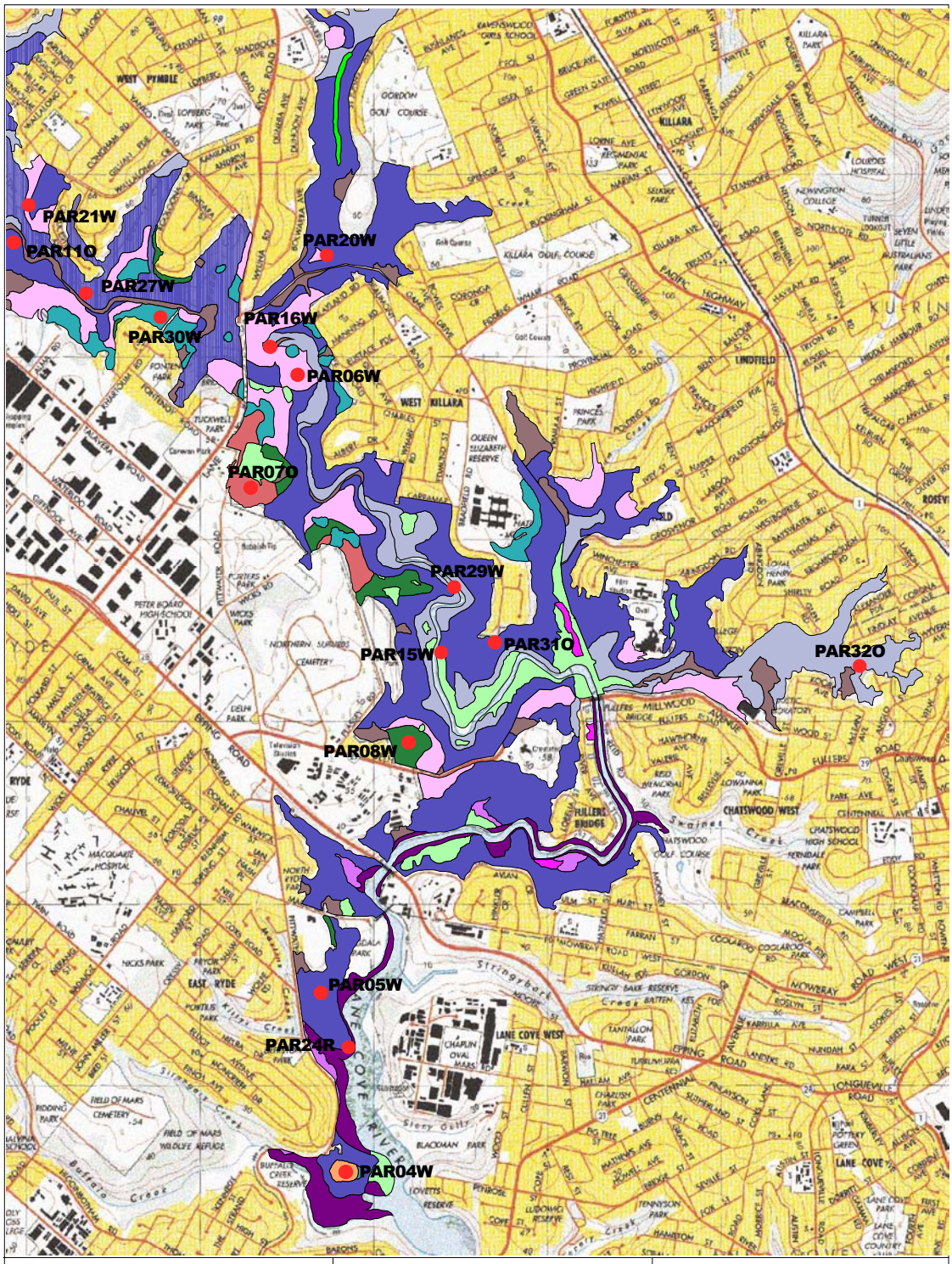
Map 2a: Vegetation communities and location of systematic survey sites in and around north Lane Cove National Park

200 0 200 400 Metres

Vegetation Map By:
UBM Consultants 2001

Compiled by CADU,
Metropolitan Branch

June 2004



Vegetation Communities

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- Red Bloodwood Low Open Forest
- Rushland
- Scribbly Gum Open Forest
- Scribbly Gum Woodland / Open Woodland / Low Open Woodland
- Swamp Oak Forest
- Sydney Peppermint - Smooth-barked Apple Tall Forest / Forest / Open Forest
- Sydney Peppermint Woodland / Open Woodland / Mallee Open Woodland
- Weed Dominated Community

Map 2b: Vegetation communities and location of systematic survey sites in and around south Lane Cove National Park

200 0 200 400 Metres

Vegetation Mapping By: UBM Consultants 2001

Map Compiled by CADU, Metropolitan Branch

June 2004

2.3 SURVEY METHODS

The systematic fauna survey methods used were based on those developed by the NPWS Biodiversity Survey Coordination Unit (NPWS 1997). The systematic techniques described below were used to sample the following vertebrate fauna groups: diurnal and nocturnal birds, reptiles, bats, arboreal and terrestrial mammals. Frogs were surveyed on a targeted and opportunistic basis, as described below, as weather conditions at the time of survey prevented the use of systematic techniques. Consistency in the use of the systematic techniques allows a comparison between fauna species detected across different vegetation types and environments within the park. Furthermore, it will allow future comparisons with consistent surveys of environments elsewhere.

The field survey team were supplied with field proformas to facilitate comprehensive, consistent recording of field data and to increase accuracy and efficiency of data entry into the DEC Biodiversity Sub-system (BSS) of the Atlas of NSW Wildlife computer database. The names of observers and recorders were noted on every data sheet to aid data verification and entry.

2.3.1 Systematic site-based methods

Diurnal bird survey

Diurnal bird censuses comprised a twenty minute observation and listening search within a two hectare (100 by 200 metre) area, conducted by an experienced bird surveyor. Censuses were conducted only during periods of relatively high bird activity (in the early morning) and reasonable detectability (eg. low wind and cicada activity). All bird species and abundance of individuals seen or heard were recorded. Individuals were scored as on-site if they were detected within the two hectare plot. Individuals recorded outside the plot, in adjacent vegetation types or flying overhead were recorded as off-site.

Diurnal herpetofauna search

A standard half-hectare area subplot (50 by 100 metres) within a two hectare standard site was searched for one person-hour (standardised regardless of the number of people searching). Censuses were restricted to the period between mid-morning to late afternoon, when temperature and insolation are sufficient to ensure maximum reptile activity. Surveying was not conducted on overcast or rainy days.

This census technique entailed active searching of potential reptile and frog microhabitats within the half-hectare area. Active or basking reptiles were identified by sight or captured and identified by the use of keys. Sheltering or cryptic species were detected by searching around, under and within fallen logs, litter, decorticating and fallen bark, rock outcrops and other likely shelter sites. Incidental observations of other fauna were also recorded.

Nocturnal site spotlighting survey

This census comprised searching for arboreal mammals along a 200 metre transect within a site for half a person hour. Fifty-watt spotlights were used to scan the vegetation for animals and enable detection of reflected eye shine. Surveyors also listen intently for fauna calls during the survey period. All fauna observed within the census period were recorded, noting whether they were on or off site.

Harp trapping

While ultrasonic recorders were used principally to detect high flying bat species, collapsible bat traps, known as harp traps (Tidemann and Woodside 1978), captured low flying species. Two nights of trapping were conducted at each bat trap site. Sites were selected for their perceived potential to interrupt bats along their flight paths, and were usually along tracks or in gaps between trees where adjacent vegetation might force bats to fly.

Traps were checked each morning. Captured bats were identified by external morphology, forearm measurement and body weight, and keyed out where necessary using Parnaby (1992a) and Churchill (1998). Animals were released on the following night at the point of capture.

Bat ultrasonic ('Anabat') call recording

Ultrasonic recorders (Corben 1989) are particularly useful for detection of high-flying species, which often comprise more than one third of an area's bat species (Parnaby 1992b), yet are under sampled by harp trapping (Richards 1992). The method requires the recording and identification of high

frequency, echolocation "calls" made by bats, which, except for one or two species, are ultrasonic, that is, inaudible to humans.

The recording equipment for the surveys consisted of an Anabat II® detector and digital flash card recorder, housed within a tupperware box for weather protection. The box was set up in locations where bats were expected to fly, such as over water bodies, at cave entrances and along tracks. The Anabat was set to commence detection at dusk and turn off at dawn. During the night, a delay switch operated to turn on the recording device when bat activity was detected and then de-activate the device while no bat activity was occurring. The equipment was left in each location for one night only, then moved elsewhere.

Anabat recordings were transferred onto computer and analysed by Narawan Williams, a recognised expert in this field. Identification was designated as either definite, probable or possible, following the methodology of Parnaby (1992b). Calls that proved difficult to identify were also assessed by Michael Pennay (DEC Western Regional Assessments Unit) using the techniques described in Pennay *et al.* (2004).

Nocturnal call playback

Nocturnal birds and mammals are often detected only when they vocalise for territory or social contact, behaviour which can be elicited by broadcasting specific calls. A standard survey census involved broadcasting the calls of each of the four large forest owls - Powerful (*Ninox strenua*), Masked (*Tyto novaehollandiae*), Sooty (*T. tenebricosa*) and Barking (*N. connivens*) - from the centre of a site. Prior to call broadcasts, on arrival at the site, the surrounding area was searched by spotlight for five minutes to detect any fauna in the immediate vicinity and then a ten-minute period of listening was undertaken.

A pre-recorded compact disc of each species' call series was played, amplified through a megaphone. Calls of each species were played for five minutes, followed by a five minute listening period. The surrounding area was again searched by spotlight after a final ten minute listening period. After the census, the response or presence of any fauna, date and time that response occurred, and weather details such as amount of cloud cover was recorded. Very windy and rainy periods were avoided. Call playback surveys were undertaken in autumn, as previous DEC surveys in the Sydney Basin have indicated that owls are most likely to respond to the playback between April and August (DEC unpublished data).

Elliott trapping

This technique involved setting ten Elliott B traps at twenty metre intervals along a 200 metre transect through a site. This technique is designed to target small ground mammals. Traps were baited with a mixture of peanut butter, oats and honey. Traps were left in place for four nights, checked and emptied every morning soon after dawn. Any animals captured within the traps were identified, sexed if possible, and released.

Cage trapping

This technique involved setting ten large cage traps at 20 metre intervals along a 200 metre transect through a site. The technique is designed to target medium-sized ground mammals, particularly Bandicoots (*Isoodon* spp. and *Parameles* spp.) and Spotted-tailed Quolls (*Dasyurus maculatus*). Traps were baited with a mixture of rolled oats, peanut butter, honey and tuna fish. Traps were left in place for four nights, checked and emptied every morning soon after dawn. Any animals captured within the traps were identified, sexed if possible, and released.

2.3.2 Targeted survey for Red-crowned Toadlet

Heavy rainfalls during the first week of survey provided an ideal opportunity to undertake targeted surveys for Red-crowned Toadlet (*Pseudophryne australis*). Initially, a recognised expert on the species (Dr. Arthur White) examined topographic and vegetation maps to identify sites that held potential as high quality habitat. These sites were then visited during the day, after the heaviest rain periods had ceased. Intermittent falls continued during the day, keeping conditions moist and humid. On arrival at a site, further assessment of habitat quality was made, followed by the emission of loud (verbal) noises to provoke a calling response from any frogs present. This is a recognised technique for detecting frogs of this species (Wells 2002).

2.3.3 Opportunistic methods

Predator and herbivore scat collection

The large numbers of hairs, and occasionally skeletal remains, in predator scats and pellets results in a high level of confidence in identifications of prey species and is hence an efficient sampling technique for prey animals. In addition, the recording of predator or non-predator scats constitutes records for the species that deposits the scat, providing locality records for species such as the Spotted-tailed Quoll, Fox (*Vulpes vulpes*), Dingo (*Canis lupus dingo*), Dog (*Canis lupus familiaris*) and Pig (*Sus scrofa*). Due to the unknown time delay between prey ingestion and defecation, the location in which the prey animals lived cannot be accurately known, so this technique is useful only for detecting the species presence within a general area. Lunney *et al.* (2002) showed that on average Dogs and Foxes defecate within a two kilometre radius of the site of prey ingestion.

Predator scats were collected, placed in paper envelopes, labelled and sent to specialist Barbara Triggs for analysis. Hair samples were identified using the techniques described by Brunner and Coman (1974). Identifications were classified into three levels of reliability: definite, probable and possible.

The location of herbivore scats was also noted on an opportunistic basis to indicate the presence of an animal. If there was any doubt in herbivore scat identification in the field, samples were brought back for identification by an expert.

Incidental records

Surveyors driving or walking through the park recorded the location of interesting fauna when it was seen or heard. Particular animals targeted by this technique were those undersampled by systematic surveys, including frogs, large ground mammals, non-vocalising birds, and secretive, shy and/or rare animals. The date, time, map grid location (usually obtained from a GPS) and microhabitat of the animal were recorded on a data sheet.

2.4 SURVEY TIMING

Systematic surveys were undertaken between the 17th February and 14th May 2004. Table 2 summarises the timing of each survey technique and the prevailing weather conditions over this period.

Table 2: Timing of DEC systematic fauna surveys within Lane Cove National Park and surrounds

Timing	Techniques employed	Notes on prevailing weather conditions
17 – 18 Feb	Site selection and opportunistic methods	Sunny and warm
23 – 24 Feb	Diurnal bird census, spotlighting, anabat, opportunistic methods	Overcast with rain (light showers to heavy falls)
26 Feb	Targeted Red-crowned Toadlet surveys	Warm and humid with intermittent showers and sunshine
27 Feb – 4 Mar	Diurnal herpetofauna census	Warm and sunny
8 – 12 Mar	Diurnal bird census, diurnal herpetofauna census, spotlighting, anabat, harp trapping, elliott trapping, cage trapping, opportunistic methods	Warm to hot. Sunny to overcast.
28 April and 13 May	Nocturnal call playback, opportunistic methods	Cool and overcast.