

NEIGHBOURS OF KU-RING-GAI FLYING-FOX RESERVE: COMMUNITY ATTITUDES SURVEY 2001

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ABSTRACT

There is little information available on which to base strategies for managing colonies of Grey-headed Flying-foxes *Pteropus poliocephalus* in urban areas. Since 1985, the Ku-ring-gai Bat Conservation Society (KBCS) has managed a program of habitat restoration in the flying-fox camp at Ku-ring-gai Flying-fox Reserve (the Reserve) in suburban Sydney, and conducted an ongoing program of public education on the role of flying-foxes in the ecosystem. In 2001, the KBCS conducted a survey of households neighbouring the Reserve to examine the attitudes of the local residents to the flying-fox colony, to identify some of the factors that influence residents' attitudes to flying-foxes, and to gain an understanding of the effectiveness of the KBCS's public education program. Surveys were distributed to 129 households, 101 completed surveys were returned. 56% of respondents stated a strongly positive or positive overall attitude to 'living near the Flying-fox colony' while 11% stated a negative attitude. Attitudes were influenced by the distance from the colony, with those living near the edge of the colony reporting the most negative attitudes to the flying-foxes. 88% of respondents had heard of the KBCS, however, only 17% had participated in activities run by the group. The survey indicated that people with a good understanding of flying-fox ecology were more likely to have a positive attitude to the colony. An apparent lack of awareness among respondents of basic flying-fox ecology, methods of viral disease transmission, the Management Plan for the Reserve and the Habitat Restoration Project, indicated that the KBCS education program had not reached the local community as effectively as expected.

It is recommended: 1) that managers of the Reserve continue to distribute information on flying-foxes to local residents and explore methods to reach those who do not actively seek information; 2) that a buffer zone of at least 50 metres between the colony in the Reserve and houses should be introduced into the Ku-ring-gai Local Environment Plan, and no dwelling should be permitted within the buffer zone; 3) that the authorities responsible for managing other flying-fox colonies undertake ongoing programs of community education and consultation; 4) that other Local Government Authorities conduct community surveys to establish the distance needed for buffer zones around flying-fox camps and that this information be incorporated into their Local Environment Plans; and 5) that searches of historical records be undertaken to establish the locations of flying-fox camps so that forward planning can be undertaken.

INTRODUCTION

The Grey-headed Flying-fox (*Pteropus poliocephalus*) was listed in May 2001 as Vulnerable under the *NSW Threatened Species Conservation Act 1995*. Over the last century and a half, a significant proportion of the habitat of the Grey-headed Flying-fox has been destroyed or modified; initially for farmland and more recently for urban expansion. Once remote campsites are now being encroached on by residential development and becoming increasingly vulnerable to disturbance. However, there is little information available on which to base management strategies to ameliorate the problems facing flying-fox camps in urban areas, for example guidance in estimating sufficient separation between camps and residential housing or advice on how to provide effective community education programs.

To assist in the formulation of such management strategies, the Ku-ring-gai Bat Conservation Society Inc. (KBCS), with professional assistance, conducted a community attitudes survey in November 2001 of households neighbouring the Ku-ring-gai Flying-fox Reserve (the Reserve) in Gordon, a northern suburb of Sydney. Since 1985, KBCS has managed a program of habitat restoration the Reserve and conducted an ongoing program of public education on flying-foxes. Gordon is a rare example of an area where humans and flying-foxes live together in relative harmony, although this was not always the case.

The main aims of the survey were to:

1. examine the attitudes of the Gordon residents to the flying-fox colony;
2. identify some of the factors that influence residents' attitudes to flying-foxes; and to
3. gain an understanding of the effectiveness of the KBCS's public education program.

KU-RING-GAI FLYING-FOX RESERVE

Ku-ring gai Council (KC) holds the Title to the Land of the Reserve.

Description of the Reserve

The 14.6 ha Reserve covers the steep slopes and floor of a bushland valley at the interface of Hawkesbury sandstone and the shale soils typical of the ridgetops of the North Shore terrain (KC 1999). Residential housing covers the ridgetops on both sides of the valley. The boundaries of most properties adjoining the Reserve are ill-defined, some being bordered by sandstone cliffs. A permanent creek, Stoney Creek, flows through the Reserve from north-west to the south-east. This creek is a tributary of Rocky Creek, which flows into Middle Harbour. A sewer pipe runs beside the creek and its numbered inspection chambers are used as permanent markers in keeping records. The area recorded as having been occupied by the camp to date covers a distance of 566metres from the north-west boundary to sewer chamber 6 where the valleys bends more to the south. The Reserve measures from 128m to 249m in width. The northern face is the steepest slope of the valley, with a fall of 29m over 153m (gradient approximately 1:5) (see **Figure 1**).

Grey-headed Flying-foxes have been known to roost in the valley since the mid-1960s. The colony was located at the western end of the Reserve until spring 1991, when the flying-foxes moved south-east and further downstream to the present location in the central section of the Reserve.

The flying-foxes roost in the canopies of turpentines, coachwood, lilly pilly and pittosporum (KC 1999, Pallin 2000). Blackbutts, blue gums and angophoras emerge above this canopy and provide additional roosting sites when high numbers of flying-foxes are in residence or when animals move to absorb early morning or late afternoon sun, particularly in winter. During seasonal peaks, the flying-foxes will roost closer than 50m to some houses in the southern and

north-eastern sections of the Reserve. However, most houses are located more than 50m away from the current boundaries of the colony.

Flying-foxes have been recorded using the camp in all months of the year. However, the numbers in residence changes frequently as the animals move through their wide range (ie. up to 1,000km) in response to the availability of food resources. If food is plentiful in the Sydney region, numbers in the Reserve remain high, but the population fluctuates irregularly as has been shown by flyout counts and radio telemetry studies (Eby 1995; Augee and Ford 1999). The numbers usually increase in response to the spring flowering in August. From September–October, the turpentines flower regularly in the northern suburbs, ensuring food availability for females with young. Depending on food resources, numbers remain high until after mating in autumn. The population is at its lowest in June–July and in some years the camp is empty for a few weeks during this time (Eby 1995). KBCS has kept records of the areas used by the flying-foxes, mapping the summer expansion (maximum >75,000) and winter contraction (see **Figure 1**). Flyout counts are also conducted regularly and posted on the KBCS website.

The vegetation in the Reserve has been exposed to a program of restoration since 1987. Weeds and vines such as morning glory and madeira vine continue to threaten the canopy trees in parts of the Reserve where bush regeneration has not been undertaken. It is necessary to remove all weeds in an area to enable new canopy trees to grow. The Habitat Restoration Project has concentrated on the previously occupied western section of the Reserve, resulting in recovery of a canopy of turpentines and bluegums.

INSERT **Figure 1**. Map of the Ku-ring-gai Flying-fox Reserve

Brief history of the Reserve

In 1983, there was public outcry both for and against flying-foxes in the bushland reserve, when a land sub-division on the edge of the Grey-headed Flying-fox colony was approved by Ku-ring-gai Council (KC) (KC 1999). An Interim Conservation Order was placed on the development to allow the NSW National Parks & Wildlife Service (NPWS) to prepare a report on the status of the animals. The report highlighted the importance of the colony, particularly in the movement of flying-foxes along the east coast, and recommended its protection. The outcome was the joint purchase of the two undeveloped blocks of the sub-division by the NSW Government and KC.

The Mayor of Ku-ring-gai invited people who supported the land purchase to form the Ku-ring-gai Bat Colony Committee (later re-constituted as the KBCS Inc.) in 1985. The status of this community group was defined by a mayoral minute, which established an avenue for ongoing consultation between the community and KC. KBCS continues to have a wide community membership - drawn not only from the Ku-ring-gai area of Sydney – and receives support with donations and from voluntary workers to allow its activities to continue. KBCS currently has a membership of 240.

A Voluntary Conservation Agreement to protect the Reserve was entered into between the NSW Minister for the Environment and KC in 1991; the first such agreement between a Local Government Area and NPWS. The name “Ku-ring-gai Flying-fox Reserve” was adopted by the Geographical Names Board. This identified the site as a flying-fox colony for subsequent purchasers of adjoining property.

In 1995, a Management Plan for the Reserve was adopted by KC. The Management Plan was revised in 1999 by NPWS, KC and KBCS and endorsed by Council and the NSW Minister for the Environment after public exhibition.

To direct the pressure of public visitation away from the colony, information signs were

erected on the Rosedale Road Bridge, at the Edward Street entrance to the Reserve and at the Kukundi Wildlife Shelter, Lane Cove National Park, where, by joint arrangement with NPWS, unreleasable hand-reared orphaned flying-foxes are housed as important members of the KBCS flying-fox education program.

KBCS involvement

KBCS recognised early that two issues needed to be addressed to ensure the ongoing protection of the Reserve; firstly, habitat restoration of the badly degraded bushland where the canopy trees were dying and the density of weed infestation was preventing the germination of native trees; and secondly, public education on the role of flying-foxes in the ecosystem. The Habitat Restoration Project commenced in 1987 and is managed by KBCS and carried out by volunteer bush regenerators and contract teams, financed by a series of State and Commonwealth Grants and the ongoing financial support from KC (Pallin 2000).

Since 1985, KBCS has regularly conducted flying-fox education programs throughout the Sydney region for pre-schools, schools and community groups. An average of 55 talks/activities have been undertaken by KBCS each year from 1998-2001. Presentations are usually given by a speaker accompanied by a hand-reared flying-fox. A display presentation is also available for 'open day' community events. 'Bat Walks' to watch the evening flyout from the camp over Rosedale Road Bridge are conducted in conjunction with NPWS's Chase Alive program.

The quarterly KBCS "Friends of Bats" newsletter is circulated to all KBCS member and information pamphlets are prepared for distribution at all events attended by KBCS. Flying-fox information is also posted on the KBCS's website (www.sydneybats.org.au).

Demographics of the Ku-ring-gai Municipality

The Ku-ring-gai area of Sydney can be best described as an affluent. In the 1996 Australian census, 57% of the homes were owned outright and 19.9% were still being purchased. 50% of residents identified themselves as "Managers and Administrators" or "Professionals" (KC 2000).

The smallest residential blocks adjoining the Reserve are 983.2 square metres on the south side and 912.8 square metres on the north side (KC 2001). Many blocks are larger, up to 3692 square metres.

The responses to the survey indicate that this is a family orientated neighbourhood, with households ranging from families with young children to senior residents still occupying a family home. The respondents of the survey showed no difficulties in understanding English. KBCS are unable to ascertain whether the residents who did not respond did so from a lack of understanding of the survey.

SURVEY METHOD

129 houses were targeted in the survey, including all properties bordering the Reserve and 25 houses following the two main flyout paths (Rosedale Road Bridge and Maytone Avenue). The survey was carried out over the weekend of 10-11 November 2001. Self-completion questionnaires were distributed to the doors by senior volunteers with basic knowledge of bats and the aims of the project. If the residents were not home, survey forms were left in the letterbox and collected later.

The survey consisted of 36 questions and took about 15 minutes to complete. A short introductory section (Questions 1, 2, 3 and 5) sampled demographic data to shed light on

factors that might influence residents' attitudes. The remainder of the survey examined personal opinions and awareness of flying-foxes, perceptions of their disease threats, management of the Reserve and KBCS activities. The form had ample scope for comments, allowing us to identify concerns not addressed in the survey. A total of 101 completed survey forms were returned (78% response rate).

SUMMARY OF FINDINGS

- The 101 households surveyed had a occupancy turnover of 27% over the last 5 years (1997-2001) and 53% over the last 15 years (1987-2001). 3% of the respondents had been residents in the area for more than 50 years.
- 47% had children in the household at the time of the survey. Of these, 12 % had children in pre-school, 18% children in primary school and 30% children in secondary school.
- Respondents were asked to estimate the distance from their house to the edge of the flying-fox colony. When later checked on Council maps, only a few of these estimates were found to be inaccurate (the corrected distances will be used in the further analysis). The response rates for survey households grouped according to the estimated average distance from the house to the edge of the colony (<50m, 50m-100m and >100m), are given in **Table 1**. The distances are measured from the average summer occupancy of flying-foxes and not from the maximum extent which has occurred only in 1998 when >72000 animals were present for a month.

Table 1. Response rates for households targeted in survey, grouped according to distance from house to edge of flying-fox colony (estimated average)

Distance to colony	N households	N respondents	Response rate (%)*
Less than 50 m	12	7	58.3
50 m – 100 m	26	16	61.5
More than 100 m	91	76	83.5
Total	129	101	78.2

* % of households returning the survey form

In the following summary of findings, representative examples of comments from respondents are given in *italics*.

Attitude to flying-foxes (Questions 8, 33, 34)

- 56% of the respondents stated a strongly positive or positive overall attitude to 'living near the Flying-fox colony'. Only 11% stated a negative attitude, with as many as 32% being neutral.
- 74% of the respondents indicated that they 'would choose to live as near to the colony again' (15% 'disagree', 11% 'do not know').
- 71% agreed to the statement 'Living near the colony is a source of interest and enjoyment to me' (43% 'strongly agree', 28% 'agree'). Only 8% disagreed (5% 'disagree', 3% 'strongly disagree').

"Have always felt privileged to have such a colony so close in a metropolitan area"

"We had some trepidation when we moved in, but we now love them as part of the unique bushland"

“It is a great delight to see the arriving home. At the first streak of light on the horizon, they are all back. What a great feat when they have traveled so far”

“I wish no harm to the bats – I simply wish they would move further away from houses”

Attitude change (Questions 9, 10, 11, 12)

- 82 % of the respondents had not experienced any attitude change since moving in to the area.
- Of the 18% who did experience an attitude change, a majority had changed their attitude for the negative (65%).
- Smell (35%) and noise (30%) were the main reasons given for attitude change. Those who had experienced a positive attitude change pointed to ‘the value of the flying-fox colony as a unique feature of the community’, and ‘the pleasure of living near native wildlife’.

“Bats smell and drop droppings - every morning on our house, car, paths, etc, and I have to hose the poo away everyday”

“Bat droppings – patio, path etc. Noise – not only from the colony, but from bats squabbling for periods in trees nearby, especially during mating season. The smell has seemed greater in recent years, perhaps because the colony is moving closer or because of increased bat numbers”

“Noise – both during day and pre-dawn on their return flight. The tree vegetation behind my house has been destroyed by bats”

“Wish they could wear nappies”

Causes to lodge complaint (Questions 13, 14, 15, 16)

- 93% had not lodged a complaint about flying-foxes. The nature of the few complaints lodged were “smell” (1) , “a resident who was deliberately making a noise to disturb the bats by banging drums and tin cans” (2) “bats coming closer to our house than previously” (1) and “bamboo [infestation] in the Reserve” (1).

Participation in KBCS Activities (Questions 17, 18, 19)

- 88% of the respondents had heard of the KBCS. However, only 17% had participated in activities offered by the KBCS. The respondents who had participated in KBCS activities commonly took part in community talks and school presentations, ranking these activities as ‘very interesting’ or ‘interesting’. None of the KBCS activities were ranked as ‘uninteresting’ by participants.

“These activities are a tremendous way to raise awareness about these unique creatures”

“I am completely uninterested in bats. If there is any reason why I should take an interest perhaps the KBCS should embark on a more effective public relations program to convince people like me to take an interest”

Awareness of Habitat Restoration Project (Questions 20, 21, 22)

- 50% of respondents were aware of the Habitat Restoration Project and an additional 13% ‘knew that something was going on in the Reserve’.
- 49% of the respondents noted that they had ‘observed changes in the plant of animal life in or near the Reserve over the last few years’. The following main changes were reported: ‘less weeds’ (18), ‘more weeds’ (6), ‘damage to trees’ (6) ‘more native animals’

(5), 'less bat activity' (5), 'more bat activity' (4), 'less native animals' (3), 'more introduced animals' (2)". Many observations could be related to the property position. For example, all of the respondents who reported less bat activity lived adjacent to the north-western end of the Reserve.

"Much less weeds due to hard work of bush regeneration crew"

"Native birdlife has re-emerged after a long absence, eg. King Parrots"

"Increase in bat colony has definitely degraded the valley bushland over the last 30 years."

Awareness of flying-fox diseases and disease transmission (Questions 28, 29)

- Approximately two thirds (65%) knew that flying-foxes can carry diseases dangerous to humans, but more than half of the respondents answered incorrectly about the methods of disease transmission as detailed by Field (1998). Of the incorrect responses, the majority believed that the disease could be contracted from droppings or by touching bats (no mention of bites and scratches).

"Lung disease from inhaled droppings – or dust thereof"

"Feel I must take precautions when picking fruit because of the disease"

"Foxes carry flying-foxes off to surrounding bushland through my property. This could enable transmission of infection etc. to domestic animals"

Awareness of flying-fox ecology and ecosystem roles (Questions 30, 31, 32)

- When asked to name ecosystem roles performed by flying-foxes, a slight majority (51%) demonstrated awareness of the seed dispersal and pollination roles.
- 80% of respondents were unaware of the causes for fluctuations in bat numbers in the colony.

Property values (Questions 23, 24)

- 62% of the respondents agreed that 'healthy, native bushland enhances property values'. **Table 2** shows the respondents' views on the effect on property values of the presence of the flying-fox colony.

Table 2. The influence of flying-fox colony on property values

Answer	N (%) respondents
No effect	58 (59.8)
Do not know	20 (20.6)
Decrease value	16 (16.5)
Increase value	3 (3.1)
Total	97 (100)

"We love having the bats close to the property, but we put the house on the market this year and got a lot of negative comments from prospective buyers"

"I'm sure it could be off-putting for some people if they view our property on a warm, wet day when the bats are nearby and smelling a lot."

Awareness of Management Plan for the Reserve (Questions 25, 26, 27)

- 82% were not aware of the 1999 Management Plan for the Reserve. 62% supported plans for restricted access to the colony and 51% supported controlled eco-tourism in the

Reserve. However, many respondents expressed reservation in their comments.

“It really depends on whether the animals would be adversely affected. If tourism does not harm the animals then ecotourism would be ok”

“...minimal, regulated and supervised access only”

“Could result in more assistance and maintenance [of the Reserve]”

WHAT AFFECTS ATTITUDES?

To gain a better understanding of the factors that affect people’s attitudes to the flying-fox colony, some of the attributes quantified in the survey (‘children in household’, ‘years lived in area’, ‘distance from house to colony’, and ‘awareness of flying-fox ecology’) were compared with the attitude response (‘overall attitude to the flying-fox colony’). It must be noted that due to small sample groups (only 10.8% stated negative attitudes (n=11)), it was unlikely that any results of statistical significance would be identified. However, some interesting trends were detected.

Children in household

The belief that awareness begins with children has been a guiding principle for the KBCS’s education strategy and it was expected that households with children would have more positive attitudes towards the flying-fox colony. A trend was detected to confirm this hypothesis, but no statistically significant difference was found (Mann-Whitney test: $Z=-1.44$, $p\text{-value}=0.15$, $\alpha=0.05$)

“Three children reared in the house, six grandchildren still coming – they all love bats”

“My children were very interested to go and see them fly over the bridge at night (Rosedale Road) and they are keen to learn more”

Years lived in area

A majority of the respondents (54%) reported that they knew about the colony prior to moving in, from general knowledge of the area, previous neighbors, real estate agents and media reports. 10% lived in the area before the colony established in the 1960’s. Against this background, it was assumed that newcomers in the area would be more likely to have a positive attitude towards the flying-fox colony. Again, a non-significant trend was found (Pearson Chi-square: 2.84, $p\text{-value}=0.242$, $\alpha=0.05$).

“Any prospective land purchasers must be informed of the bat colony so that they are not misled [...] so they are friendly to the bat colony”

Distance from house to edge of colony

Households located more than 100m in distance from the flying-fox colony contained the largest group of neutral respondents, indicating that the colony impinges very little on these residents, insufficient to raise much interest. A comparison of attitude with the distance to edge of the colony also revealed a tendency to more positive attitudes with increasing distance, although the difference was not statistically significant (Kruskal-Wallis test: $\chi^2=1.51$, $p\text{-value}=0.47$, $\alpha=0.05$) (**Table 3**). However, the small number of residents living closer than 50 meters from the colony and the slightly lower response rate from this group may have caused a bias in the data (see **Table 1**). The reasons for not responding to the survey questionnaire were not identified in the survey.

Table 3. Attitude to flying-fox colony in relation to distance to edge of colony

Distance	N (%) respondents			Total
	Positive	Neutral	Negative	
<100 meters	12 (52.1)	5 (21.7)	6 (26.0)	23 (100)
>100 meters	44 (57.8)	27 (35.5)	5 (6.5)	76 (100)
Total	56 (56.5)	32 (32.3)	11 (11.1)	99 (100)

Awareness of flying-fox ecology and ecosystem roles

As a measure of awareness of flying-fox ecology, respondents were asked to explain the flying-foxes ecosystem roles and the reasons for the strongly fluctuating numbers in the colony. When comparing this response with attitudes, a statistical significant difference was found, indicating that a better understanding of flying-foxes positively affects the attitudes of those living near the colony (Mann-Whitney test: Z: -2.11, p-value: 0.034, $\alpha=0.05$).

“They are part of the important, rich environmental diversity that is vitally important to maintain ecological balance. This diversity and balance is already being destroyed”

“They are an integral part of the eco-system in this area”

“[We need] more information about the unique value of these creatures”

DISCUSSION

The results from this survey confirms the impression of a neighbourhood that by and large tolerates the presence of the flying-foxes. Although a relatively large group of respondents considered themselves ‘neutral’, a distinct majority expressed positive attitudes towards ‘living near the flying-fox colony’. In fact, the flying-foxes appear to be perceived by many respondents as inherent to the areas’ much appreciated bushland and wildlife values. The fact that the majority of respondents were aware of the colony before moving into the area also indicates a prior decision to accept its presence. Furthermore, the many expressions of affection and reverence towards flying-foxes given by respondents in the survey indicate a feeling of ‘ownership’ or a sense of pride in living close to the colony among some of the residents in the Gordon neighbourhood.

The survey demonstrates that people with a good understanding of flying-fox ecology are more likely to have a positive attitude to the colony. A strong trend also suggests that distance from the houses to the flying-fox colony may be an indicator for attitudes. Respondents living more than 100 m from the edge of the colony were shown to have predominantly positive attitudes to the colony and by far the biggest group of neutrals. Those living closer than 50m to the edge of the colony reported the most negative attitudes. However, the lower response rate and small number of households belonging to this group may have biased the overall survey results towards positive attitudes.

It must be emphasized that the findings from this survey are unique to the Gordon neighborhood and may not be applicable to other colony sites. The fact that the flying-foxes in Gordon roost below the level of housing, on the steep slopes and valley floor of the Reserve, is a distinct feature of this colony and likely to cause less impact on human neighbors compared with other campsites. Daytime disturbance, causing flying-foxes to circle above the canopy, results in little excreta falling on private property. Also, the flyout paths at evening and dawn are well defined, following the creek and bushland for some distance, and the animals have usually gained relatively high altitude before passing over houses. Around other colony sites, where the flying-fox camp is higher than the houses or at the same level, the unpleasant impacts may extend for greater distances.

Educate residents!

While recognising the limitations of this survey, the apparent lack of awareness among respondents of basic flying-fox ecology, methods of viral disease transmission, the Management Plan 1999 and the Habitat Restoration Project, indicates that the KBCS education program has not reached the local community as effectively as had been expected.

Given the high activity level of KBCS in the local community, particularly over the last two years, these results were surprising and disappointing. For many years, letters from KBCS have been published in local newspapers when unusual activity is occurring in the Reserve eg. noticeable population increases. Letterbox drops have been carried out when the juvenile hand-reared orphans are released in February. KBCS bat speakers accompanied by flying-foxes have also regularly attended Ku-ring-gai community events at the Wildflower Garden, Bicentennial Park and St. Ives Show. A Flying-fox Display on a Saturday in February 2001 with photographs and flying-foxes present, was held in the Gordon Centre shopping mall. In July 2001, an Information Day was held locally at the Ravenswood School. Guest speakers included a National Parks Manager, flying-fox researchers and a medico who spoke about disease transmission. The event was publicized in the local press and invitations were distributed to 450 houses in the colony area. However, of the 78 people who attended, less than 10 were local residents.

How can KBCS's education program be redesigned to better reach the local community? The importance of the provision of updated flying-fox information to the neighbours of the colony on an ongoing basis is obvious given the continual overturn of household ownership (27% in 1997-2001). Indeed, many residents welcomed the survey and expressed gratitude for the opportunity to be consulted. Respondents' suggestions for a better education strategy are grouped in **Table 4**.

Table 4. Respondents' suggestions for better education strategy

Suggestions	N
More information ¹	15
More education ²	12
Increased habitat restoration	7
No changes necessary	5
More intervention ³	4

¹ Incl. 'general info' (5), 'eco-tourism' (3), 'information in media' (4), 'more scientific research' (1), 'workshops' (1), 'organise Bat Day' (1).

² Incl. 'public education' (10), 'education in schools' (2).

³ Incl. 'control bat numbers' (2), 'decrease smell' (1), 'move colony' (1).

"Publicise the benefits resulting from the presence and activities of flying-foxes"

"More excellent workshops like the recent one held at Ravenswood School"

"More information outlining the unique value of these creatures"

"Continue education and use documentaries wherever possible. What about an annual bat day?"

"Adequate and ready availability of 'bat' information for the media so that misinformation does not scare the broader, ignorant, population"

"As we, the people of Ku-ring-gai, are the custodians [of the flying-foxes] through Ku-ring-gai Council - more information could be distributed by Council"

RECOMMENDATIONS

Recommendations Nos. 1. and 2. are pertinent and specific to the management of the Ku-ring-gai Flying-fox Reserve, whilst Nos. 3., 4. and 5. are applicable to the management of all flying-fox camps with an interface or a potential interface with urban development.

The findings of this survey will be presented to KC, the NPWS, the NSW Flying-fox Consultative Committee, and Planning NSW.

Recommendation 1: Continuing community education in Ku-ring-gai

The positive response to the survey and the various comments offered indicate that the local community wants to be better informed of activities in the Reserve eg. flying-fox movements and habitat restoration. The challenge for the managers of the Reserve will be to find ways to better reach those in the local community who do not actively seek information.

It is recommended that the managers of the Reserve continue to distribute information to residents by mail-outs (letterbox drops are often ignored), by arranging street meetings in conjunction with KC Bushcare and by providing financial assistance to mount a display of the results from this survey at Ku-ring-gai Library, Gordon.

Recommendation 2: Establishment of buffer zone in Ku-ring-gai Council LEP

Residents living within 50m of the edge of the colony are negatively impacted by the smell and noise of the flying-foxes. These impacts were also noted by residents living further from the flying-fox colony who had more positive attitudes overall. It is recommended that a buffer zone of at least 50m from the outer edge of the colony should be introduced into the Ku-ring-gai Local Environment Plan (LEP) to safeguard any proposed new residential development adjacent to the Reserve. No dwelling should be permitted within the buffer zone; the land tenure could be Reserve or private property.

Recommendation 3: Ongoing community education for communities near all colonies

Information gained from this survey demonstrates that an increased knowledge of flying-foxes generates positive attitudes. It is recommended that ongoing community education and consultation programs are undertaken by the relevant authorities responsible for managing flying-fox colonies.

Recommendation 4: Establishment of buffer zones around flying-fox colonies

Noise and smell are daily problems for residents living close to flying-fox colonies. It is recommended that Local Government Authorities in other areas conduct similar surveys to establish the distance needed for buffer zones around colony sites/reserves in their area and include this in their Local Environment Plans.

Recommendation 5: Mapping of historical colony sites

It is recommended that historical records be searched to establish the locations of previously identified flying-fox camps to facilitate forward planning on these sites to avoid conflict between residents and flying-foxes.

REFERENCES

Augee, M.L. and Ford, D. 1999 Radio-Tracking Studies of Grey-headed Flying-foxes, *Pteropus poliocephalus*, from the Gordon colony, Sydney. Ed. J.R. Merrick. Proceedings Linnean Society NSW, 121, pp 61-70.

Eby, P. 1995 The biology and management of flying-foxes in NSW. Species Management Report No. 18. National Parks and Wildlife Service of NSW, Hurstville.

Field, H. 1998 Equine morbillivirus (EMV) and Australian Bat Lyssavirus (ABL) research undertaken by the Queensland Department of Primary Industries Animal Research Institute The Australasian Bat Society Newsletter, 11, pp 15-16.

Pallin, N. 2000 Ku-ring-gai Flying-fox Reserve: habitat restoration project, 15 years on. Ecological Management and Restoration 1, pp10-20. Ed. T. McDonald for Ecological Society of Australia.

Ku-ring-gai Municipal Council 1999 Ku-ring-gai Flying-fox Reserve Management Plan. Ku-ring-gai Council Gordon NSW.

Ku-ring-gai Municipal Council 2000 Draft Social Plan June 2000. Community Services Department. Ku-ring-gai Council Gordon.

Ku-ring-gai Municipal Council 2001 Ku-ring-gai Planning Scheme Ordinance. Zoning Map 23. Property records. Ku-ring-gai Council Gordon NSW.

ACKNOWLEDGEMENTS

The authors wish to thank the Ku-ring-gai residents who completed the community survey; the survey collectors: Joan Morris, Harry Morris, Lyn Burns, Chris Sheard, Stuart Robertson, Rolf Beck and Nancy Pallin; Margaret Creenaune (Michael Creenaune & Associates) for assisting with the design of the survey; David Wilks, Bushland Technical Officer, Ku-ring-gai Council, for help with the design of maps, and Dr Alan Taylor, Macquarie University, for help with the statistical analysis.

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Appendix 1. Survey Questionnaire and accompanying letter to Residents