

Flying-fox management in Queensland: is it any different?

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ABSTRACT

Management of Grey-headed Flying-foxes in Queensland faces similar challenges to those faced in other states, although there are some specific Qld issues. Loss of habitat is a major threatening process; with loss of habitat comes increasing interaction with humans and the consequent “turf wars”; there is a need to both protect flying-fox populations and the crops of fruit growers; and the emergence of Australian Bat Lyssavirus and other viruses has made handling bats a risk. The conservation status of the Grey-headed Flying-fox and the Spectacled Flying-fox is currently being reviewed by the Scientific Advisory Committee under the Qld *Nature Conservation Act 1992*. Counts of these two species have indicated a decline in numbers over the last few years. There also has been an observed decline in both the area of occupancy and the extent of occurrence of the Grey-headed Flying-fox. The issuing of damage mitigation permits for the electrocution of flying-foxes on crops has been challenged in court and is rapidly becoming untenable for QPWS. Complaints regarding flying-fox camps in urban areas are primarily dealt with through public education and consultation. The movement of a flying-fox colony is only permissible in exceptional circumstances.

Introduction

There is considerable overlap between flying-fox management in Queensland and New South Wales. However, differences do exist. Flying-fox management is different in Queensland because we have four species: Black flying-foxes, Little Red Flying-foxes, Grey-headed Flying-foxes and Spectacled Flying-foxes. The Spectacled flying-fox is distributed only in far northern Queensland, from Ingham to Cairns, inland to the Atherton Tablelands and north through the wet forests of eastern Cape York Peninsula. This species is affected by paralysis ticks which do not affect flying-foxes in NSW.

Queensland also contains substantial areas of tropical habitat that differ in some management issues from sub-tropical and temperate habitats. There are significant areas of World Heritage Rain Forest in the tropics that are used by flying-foxes. Tropical fruits are grown on a larger scale than fruit crops further south and flying-foxes find them particularly palatable. Electric grids have been used to reduce the impact of flying-foxes on tropical fruit crops. The North Queensland Conservation Council has taken a lychee grower to the Federal court in an attempt to stop him using lethal electric grids to kill flying-foxes.

Flying-fox management in Queensland is similar to NSW in that loss of habitat is a major threatening process; the numbers of Grey-headed flying-foxes are declining; with loss of habitat comes increasing interaction with humans and the consequent “turf wars”; there is a need to both protect flying-fox populations and the crops of fruit growers; and the emergence of Australian Bat Lyssavirus and other viruses has made handling bats a risk.

The conservation status of flying-foxes in Queensland

The following describes the conservation status review process for Spectacled and Grey-headed Flying-foxes as currently being conducted by the Queensland Parks and Wildlife Service (QPWS).

Background and Process

The *Nature Conservation Act 1992* is the principal Act in Queensland by which nature and biological diversity is conserved. Schedules to the *Nature Conservation (Wildlife) Regulation 1994* list plants and animals in one of 5 categories: presumed extinct, endangered, vulnerable, rare or common. All native birds, reptiles, amphibians and

mammals are listed in one of these categories. Listing species according to their conservation status helps to prioritise management action and resource allocation. “Threatened species” is the term used to describe all species listed as endangered or vulnerable.

The responsibility for listing and de-listing animals rests with the Minister responsible for the *Nature Conservation Act*. The Minister is advised by an independent Scientific Advisory Committee (SAC) established under the Act. The SAC meets to review recommendations by the QPWS to amend the classification status of species. Members of the public, landholders, scientists and other interest groups can nominate amendments directly to the Minister or QPWS. Before recommendations are made to the SAC, the written views of scientific experts, preferably with direct research experience on the species concerned, are sought.

While species are assessed according to their conservation status in Queensland, appropriate consideration is given to their abundance and distribution in other States or Territories or internationally. The ultimate goal of threatened species management is to remove species gradually from lists once protective measures are in place. De-listing is an indication of successful management intervention.

In assessing the conservation status of a species, species are classified into categories based partly on an internationally accepted system of classification developed by the IUCN, the World Conservation Union.

The Spectacled Flying-fox is confined to Northern Queensland whereas the Grey-headed Flying-fox occurs in SE Queensland, coastal NSW and eastern Victoria. The Grey-headed Flying-fox has already been listed as vulnerable in NSW and its status is being reviewed in Victoria. Both species have also been listed as vulnerable under Commonwealth legislation.

Counts for these two species in Queensland have indicated a decline in numbers over the last few years. Because of concern regarding this decline, the QPWS has sought opinion from a number of scientists who have a special expertise with flying-foxes.

QPWS is currently collecting the information which will be provided to the Scientific Advisory Committee (SAC) for consideration. Once the SAC has assessed the information, it will then make a recommendation to the Minister.

Grey-headed Flying-foxes

Survey Results from Patrina Birt

Patrina Birt from the University of Queensland has conducted research on Grey-headed Flying-foxes in Queensland over several years (Birt 2000; Birt unpublished a and b; Birt and Hall unpublished). Various conclusions from her work are salient to the assessment of the conservation status of the species.

Birt found the northern range of the Grey-headed Flying-fox has contracted by more than 300km since 1930, with no concurrent extension in their southern range. The relative abundance of the Grey-headed Flying-fox in Queensland has decreased since at least 1996, with no concurrent increase in their population in New South Wales or Victoria. Large numbers of Grey-headed Flying-foxes are killed on orchards. There has been extensive loss of critical flying-fox habitat in Queensland. Grey-headed Flying-foxes do not compete successfully with either the Black or Little Red Flying-fox when there is a shortage of food resources. Grey-headed Flying-foxes are a keystone species due to their importance in the pollination and seed dispersal of native Australian forest trees.

Decline in area of occupancy and extent of occurrence

There has been an observed decline in both the area of occupancy and the extent of occurrence of the Grey-headed Flying-fox in Queensland. It is thought that this is due primarily to loss of critical habitat (Birt & Hall, unpublished manuscript).

Known flying-fox campsites between Broadbeach and Rockhampton in Queensland were monitored once a month for three years between September 1996 and 1999 (Birt 2000; Birt & Hall, unpublished manuscript). These sites were monitored for changes in the relative number of flying-foxes present, species and gender composition and also the quantity and quality of native food sources. Please note that this study was likely to have only inspected 80% of campsites currently occupied by Grey-headed Flying-foxes. It is important to note though, that inspections of sites during the flowering of certain tree species place the majority of Grey-headed Flying-foxes on the coastal strip. Thus it is highly likely that the majority of campsites containing Grey-headed Flying-foxes were inspected during these times.

Data suggest that not only has there been a notable

decrease in the relative abundance of Grey-headed flying-foxes over the study period, but there had also been an evident decrease in the number of pregnant and lactating females (Birt & Hall, unpublished manuscript). Collaboration with researchers conducting counts in Victoria and New South Wales indicated that there had not been a concurrent increase in the abundance of Grey-headed flying-foxes in either of these states. This supported the belief that there had been a dramatic reduction in the national population of Grey-headed Flying-foxes during the study period.

Despite inspecting numerous flying-fox campsites in Queensland between the Gold Coast and Mackay between September 1996 and 1999, no Grey-headed Flying-foxes were observed north of Bundaberg.

There has clearly been a contraction of the northern range of the Grey-headed Flying-fox. Ratcliffe determined that the Grey-headed flying-fox was distributed as far north as Rockhampton in 1931 (Ratcliffe 1931). It was thought during that time it probably extended into Mackay. During this period, Black Flying-foxes were not found south of Maryborough and campsites between Rockhampton and Maryborough were dominated by Grey-headed Flying-foxes.

In 1965, Nelson found that Grey-headed Flying-foxes could still be observed in Rockhampton, but Black Flying-foxes had extended their southern range to Murwillumbah, New South Wales (Nelson 1965). Campsites between Rockhampton and Maryborough were now dominated by Black Flying-foxes and those sites south of Maryborough were dominated by Grey-headed Flying-foxes.

The current study (1996-1999) found that the majority of campsites between Maryborough and Brisbane were dominated by Black Flying-foxes (Birt & Hall, unpublished manuscript). Two sites, Queensland State Forest Number 38 and Bli Bli, were dominated by Grey-headed Flying-foxes. Within the Brisbane region, while the Grey-headed Flying-fox was the dominant species in the area, it was not the dominant species in all campsites, with 6 out of 12 permanently occupied sites being dominated by Black flying-foxes. In 1965, few blacks could be found in the Brisbane region.

In essence, the northern range of the Grey-headed Flying-fox has contracted over 300km since 1930. Considering the extensive losses of habitat it is not surprising to find that Grey-headed Flying-foxes are no longer observed in areas where they were once common. Maryborough should be considered the Grey-headed Flying-fox's most northerly range.

Management issues for Queensland

Damage Mitigation Permits and Electric Grids

The issuing of damage mitigation permits is addressed under Section 112 of the *Nature Conservation Regulation 1994*. A copy of this section is included below:

112 Restrictions on grant of damage mitigation permit

1. The chief executive may grant a damage mitigation permit for protected wildlife only if the chief executive is satisfied -
 - (a) the land-holder has unsuccessfully taken action to prevent damage or loss caused by the wildlife and action is necessary to minimise -
 - (i) damage to nature, crops, stock or other property; or
 - (ii) significant economic loss to individuals; or
 - (b) the wildlife is a threat, or potential threat, to human wellbeing.
2. The chief executive may grant a damage mitigation permit for damage caused, or likely to be caused, by protected wildlife only if the chief executive is satisfied -
 - (a) common wildlife is causing, or may cause the damage; and
 - (b) if the damage is unchecked -
 - (i) individuals may suffer significant economic loss; or
 - (ii) the ecological sustainability of nature is likely to be harmed; and
 - (c) action under a permit will not detrimentally affect the survival in the wild of the wildlife; and
 - (d) the taking of the wildlife is ecologically sustainable; and
 - (e) the proposed way of taking the wildlife is humane and not likely to cause unnecessary suffering to the wildlife.
3. The chief executive may grant a damage mitigation permit for a threat to human wellbeing only if the chief executive is satisfied -
 - (a) there is, or may be, a threat to human wellbeing through personal harm caused by protected wildlife; and
 - (b) action under a permit will not detrimentally affect the survival of the wildlife in the wild; and

- (c) the taking of the wildlife is ecologically sustainable; and
- (d) the proposed way of taking the wildlife is humane and not likely to cause unnecessary suffering to the wildlife; and
- (e) if the wildlife is a protected reptile, the reptile is to be released into the wild or may be kept under a conservation plan for the reptile.

With regard to assessing humaneness there seems to have been no scientific investigation into the physiological effects of electric grids on flying-foxes. There is however one reference which can be used for guidance - "The Report of the American Veterinary Medical Association Panel on Euthanasia, 1993" (Andrews *et al.* 1993).

The report specifically addresses electrocution. The following is an extract from the report:

"Electrocution, using alternating current, as a form of euthanasia has been used in such species as dogs, cattle, sheep, swine, foxes and mink. Electrocution induces death by cardiac fibrillation which causes cerebral anoxia. (The shock stops the heart and death is caused by lack of oxygen to the brain).

However, animals do not lose consciousness for 10 to 30 seconds, or more after the onset of cardiac fibrillation. It is imperative that animals be unconscious before being electrocuted. Therefore, euthanasia must be a two-step process.

The disadvantages of electrocution are:

- (i) *It is aesthetically objectionable because of violent extension and stiffening of the limbs, head and neck.*
- (ii) *It may not result in death in small animals (weighing less than 5kg) because ventricular fibrillation and circulatory collapse do not always persist after cessation of current flow".*

A further consideration is that the peak birth period for flying-foxes is October and females usually lactate for the subsequent 4-5 months. Unfortunately this period overlaps with the peak production period for lychees and rambutans in North Queensland. Consequently, the killing of any lactating females will in turn lead to the death of any dependent young from dehydration and starvation.

With regard to assessing the sustainability of damage mitigation, it is widely believed that the use of lethal electric grids is having a significant impact on Grey-headed and Spectacled flying-fox populations in Queensland. QPWS is currently reviewing their conservation status and eleven flying-fox specialists (six for Grey-headed, seven for Spectacled) have been asked to submit an expert opinion on the size and trends in the flying-fox

populations. Currently three responses have been received for both species. All submissions to date, for both species, recommend reclassifying the species from common to vulnerable or endangered. All submissions report declines of between 20-80% within the last 10 years for both species.

Management of Urban Camps

QPWS has recently released a draft policy for managing flying-fox camps in urban areas (Appendix 1). Complaints regarding flying-fox camps in urban areas are primarily dealt with through public education and consultation. The movement of a flying-fox colony is only permissible in exceptional circumstances. All movement requests are to be assessed on a case-by-case basis and after completion of a comprehensive situation assessment report. All proposed movement attempts must be approved by the Regional Service Director, QPWS.

Flying-foxes in Rainforests

The Grey-headed Flying-fox is a valuable pollinator and seed disperser of native Australian forest trees (Eby 1996), particularly those that are commercially valuable. In addition, the reproductive biology of many commercially valuable forest trees has been found to favour nocturnal pollination (Birt, unpublished manuscript a). Nocturnal pollinators can include a variety of vertebrates and invertebrates, however, due to their ability to forage over extensive distances and modified habitats, flying-foxes are thought to be the most valuable (Parry-Jones and Augee 1991a,b; Eby 1996; Birt unpublished manuscript b).

Injunction Sought in Federal Court to Stop Use of Electric Grids

North Queensland Conservation Council's conservationist, Carol Booth, has taken action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC)* to prevent the killing of Spectacled flying-foxes on a North Queensland lychee farm. The action was taken because of the number of animals being killed on electric grids set up within the orchard. The case was heard in the Brisbane Federal Court 18 -20 July 2001. Justice Branson has reserved her decision.

The essence of the case was whether or not the action of the farmer:

- (a) has or will have a significant impact on world heritage values of a declared World Heritage property; or

(b) is likely to have a significant impact on world heritage values of a declared World Heritage property.

We do not wish to discuss the details of the case, but note that the reason the action was taken under the EPBC Act is because there is no third party standing under the Queensland *Nature Conservation Act 1992*. The implication for the Queensland Parks and Wildlife Service is that a Federal court decision could directly affect the management of flying-foxes in the near future.

Summary and Conclusions

Although there are some specific Queensland issues, overall the situation for the Grey-headed flying-fox is similar to that in other states.

Their range has contracted, their relative abundance has decreased since at least 1996, large numbers are killed on orchards, there has been extensive loss of critical flying-fox habitat, they do not compete successfully with either the Black or Little Red Flying-fox when there is a shortage of food resources, and they are a keystone species due to their importance in the pollination and seed dispersal of native Australian forest trees. Given the current concern with trends in the population of Grey-headed Flying-foxes the Queensland Scientific Advisory Committee will make a recommendation regarding their conservation status.

The issuing of damage mitigation permits for the electrocution of flying-foxes is rapidly becoming untenable for QPWS.

References

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APPENDIX

Appendix I. Draft QPWS policy: - Managing Flying Fox Colonies in Urban Areas

Background

Flying foxes are subject to a number of threatening processes, such as the loss of foraging and roosting habitat through large scale clearing of native vegetation. This shift in the availability of these resources is thought to have brought many flying fox colonies closer to urban areas where there seems to be an increasing number of conflicts between humans and flying fox colonies utilising resources either for food or camp sites.

The majority of conflicts arise when flying foxes select a camp site in or near residential areas. The recurring public complaints of noise and smell from flying

fox colonies has been exacerbated with the discovery of the Australian Bat Lyssavirus. Although scientific evidence suggests that the risk of infection is low, there has been wide spread community concern of increased disease risk. The virus can only be transmitted by direct contact (through a skin penetrating bite or scratch) and even if an individual is bitten or scratched by a flying-fox the post-exposure vaccination is readily available.

It is anticipated that with the continuing loss of traditional flying fox habitat and food resources the establishment of flying fox camps in close proximity to residential areas will increase.

Policies

- Complaints regarding flying fox camps in urban areas are primarily dealt with through public education and consultation.
- The movement of a flying fox colony is only permissible in exceptional circumstances. All movement requests are to be assessed on a case by case basis and after completion of a comprehensive situation assessment report.
- All proposed movement attempts must be approved by the Regional Service Director, QPWS.

Guidelines and procedures

Definitions

Common Wildlife - native wildlife that is prescribed under the Wildlife Regulation as common wildlife.

Take - in relation to an animal includes an act or attempt to hunt, shoot, wound, kill, skin, poison, net, snare, spear, trap, catch, dredge for, bring ashore or aboard a boat, pursue, lure, injure or harm an animal.

Legislation

- *Nature Conservation Act 1992* (referred to as 'the Act');
- *Nature Conservation Regulation 1994* (referred to as 'the Regulation');
- *Nature Conservation (Wildlife) Regulation 1994*; (referred to as 'the Wildlife Regulation');
- *Weapons Act 1994 and Regulations*;
- QPWS procedure *WL19 Relocation of native animals*; and
- QPWS procedure *WL06 Permit Issue - All Damage Mitigation Permits*

As the Nature Conservation Regulation 1994 is amended frequently and sections may be re-numbered, section numbers are not given in this document when referring to the Regulation.

Authority

The Regional Service Director, QPWS is responsible for approving an attempt to move a flying fox colony. However, the QPWS officer in charge of the operation has the power to abort the operation any time he considers that the movement attempt is unsuccessful or causes undue stress to the colony.

Guidelines

General Guidelines

It is not feasible to provide uniform directions for deciding when to move a flying fox camp. Each occurrence has to be assessed on its merit following

set guidelines and procedures. Manipulating animal populations should be considered carefully as such intervention can have unforeseen consequences. Native animal populations maintain a delicate balance with their environmental controlling factors. These interactions are often poorly understood and interventions may disrupt normal population processes.

Various aspects of flying fox population dynamics dictate that attempts to disperse or move a colony may be difficult if not impossible. Successful translocations have been rare in the past and should therefore be regarded as a last resort option for the management of a particular local problem.

Education

Upon receipt of a complaint regarding the location/presence of a flying fox colony near or within a residential area all reasonable efforts should be made to deal with the situation through education. Details of population numbers, species, duration the colony remained in that particular area and exact location of the colony should be recorded for future reference.

If all other avenues to deal with the complaint have failed and further action by the Service is warranted the relevant QPWS officer should conduct a situation assessment. For this purpose officers should complete the relevant Assessment Report during a site inspection (refer to Attachment I of the Wildlife Procedure Notice No.000).

Complaints regarding the presence of flying foxes in urban areas are often made by a small but vocal part of the community. In addressing these issues, QPWS staff should consider community opinion as a whole via the establishment of local consultative committees that involve a variety of stakeholders.

Consultative Committees

To assist in the management of local flying fox issues that involve a variety of stakeholders it is recommended to establish a consultative committee. The committee should include representatives from QPWS, local government, conservation groups and effected residents. The committee's functions should aim to introduce a balanced approach to resolve controversial issues or to provide for ongoing management options for camps in the vicinity of residential areas. The committee may address a range of issue, such as public education, to compilation of a situation assessment and the development of management strategies on a local scale.

Should the committee recommend that an attempt to move a flying fox camp is warranted, QPWS, as the final decision maker in this process, will attempt to move the colony or consider issuing a damage mitigation permit to the relevant council for dispersal action. Although damage mitigation permits are issued in accordance with s112 of the Regulation any movement attempt has to be monitored by a suitably qualified QPWS officer.

Procedures

Movement/translocation of flying fox camps

Every possible attempt should be made to resolve complaints through mediation and public education. If all avenues to handle a complaint about the location/presence of a flying fox colony near or within a residential areas have failed, a situation assessment, using the provided proforma (Appendix I), has to be conducted to establish the following:

1. the species of flying foxes subject to the complaint;
2. the current status of the population. This includes a general assessment of the animals health and condition, breeding activity, presence or absence of immature flying foxes and their stage of development
3. the history of colonies using this site as camps in the past (ie. is it a traditional or transitional camp site)
4. interviews with affected residents/community
5. what is the actual impact on residents (for example, noise, smell, presence of the colony).

Reason for movement

The movement of colonies is permissible only in exceptional circumstances. The presence of a colony within the vicinity of residential areas or minor impact from noise or smell are no justification for moving a colony. In general, attempts to move a colony can only be considered where the newly selected roost site causes a direct negative impact on residents and where alternative sites, that would not cause additional management problems, are available.

After completion of the assessment form the following principles apply:

1. Flying fox camps should not be disturbed:
 - where a history of occupation can be established (traditional camps);
 - when there is clear evidence that flying foxes only occupy this area for a short period of time;
 - where females are in a late stage of pregnancy;
 - where juvenile flying foxes are present that are not capable of independent flight;
 - for campsites that are located within a protected area or have been identified as critical habitat;
 - where the attempts to move a flying fox camp (ie. the generation of noise and smoke) has more negative impact on local residents and the community than the (often temporary) presence of the colony;
 - where there is no reasonable guarantee that there is a suitable alternative available.
2. Disturbance / Relocation of camps may be considered:
 - where camps are transitory in nature;
 - it has been clearly demonstrated that the presence causes significant economic loss or problems to the community and the complaint is not merely one of inconvenience by the presence of the wildlife (assessment criteria for the issue of damage mitigation permits under s112 of the *Nature Conservation Regulation 1994*).
3. Movement of species listed as vulnerable or rare under the schedules of the *Nature Conservation (Wildlife) Regulations 1994* may only be attempted under the provisions of a conservation plan. Any disturbance of species listed as presumed extinct or endangered is not permitted without prior approval of the Chief Executive. All management action for presumed extinct or endangered species is to be carried out by suitably qualified QPWS staff.

4. Alternative management options

Alternative management options can include but are not necessarily limited to the options listed below:

- a. the creation of buffer zones by habitat manipulation/modification for the roost site or parts thereof (eg. tree lopping, clearing of understorey vegetation);
- b. use of chemical deterrents to prevent animals roosting in certain trees (need to conduct trials);
- c. inclusion of the roost site in town planning / local government planning schemes to allow for adequate protection of the site (for camp sites in local conservation areas, parks, etc);
- d. land acquisition (critical habitat under NCA).

Alternative management options should be considered:

- a. in cases where the education program is ineffective;
- b. before a movement attempt is considered;
- c. where movement of a colony is not warranted or possible due to the conservation status of the species, or the nature of the camp site;
- d. where a movement attempt has been unsuccessful.

Movement of colonies

Attempts to move a flying fox colony can only be carried out either by QPWS staff, or through the issue of a damage mitigation permit that authorises the attempt to translocate a colony. For species other than common wildlife, movement attempts may only be sanctioned under a conservation plan for the species (see 5.3.3 for details).

After approval to disperse/move a colony by other than QPWS staff a damage mitigation permit has to be issued according to section 112 (1) of the *Nature Conservation Regulations 1994*. The permit must be endorsed with the following conditions:

- a. Any action to disperse the colony can only be undertaken under supervision of a QPWS officer.
- b. Only non-lethal dispersal methods are to be used.
- c. Dispersal methods authorised under this permit include:
 - The use of birdfrite;
 - The use of an aerosol horn;
 - The use of smoke (use of smoke generators, lighting controlled fires);
 - The use of spotlights;
 - The use of noise (use of metallic material).

Selection of alternative sites

Before attempting to move a flying fox colony it is imperative to identify potential alternative roost sites for the colony. These sites should be at a reasonable distance and be of equally suitable habitat as the site where the animals are situated.

Dispersal of camps:

The overall success of a movement attempt is dependent on the local situation and despite best efforts moving a colony may not be successful. Dispersal teams and equipment have to be in place before the colony returns from their nightly foraging activity. Disturbance of the colony once flying foxes have settled in the trees will have no effect other than harassing and stressing the animals unnecessarily. If this occurs dispersal action should be stopped and repeated for the next 2-3 mornings.

Prior to dispersal the following steps should be implemented:

- Affected residents and the local media should be informed several days prior to the dispersal attempt to minimise complaints from the community (eg. pamphlet drops, notice to residents, notification in newspaper radio announcement).
- All persons involved in the operation must be briefed about their role and responsibility during the operation. This includes instructions in Workplace Health and Safety requirements.
- Tasks should be delegated to personnel according to their experience.
- If QPWS staff participate in the activities, firearms (for the use of birdfrite) can only be used by accredited QPWS staff. The Service's firearms policy must be adhered to.
- All persons participating must be made aware that all activities will be disbanded if the animals are subjected to an unacceptable level of disturbance.

It is crucial that the above preparations are finalised by the time the first flying foxes return to the roost site. As soon as the first animals return smoke, noise and birdfrite have to act simultaneously to prevent the animals from landing on their roost site.

Depending on the size of the colony and the initial success of the movement attempt, dispersal efforts might have to be repeated for several successive mornings as parts of the colony may attempt to return to the site. If only a few animals attempt to return the use of smoke and noise might be sufficient to prevent animals from settling back on to the site. The essential elements for success include sustained and managed disturbance that is timed to confront flying foxes attempting to return to their roost.

Dispersal methods

The following techniques have been used successfully in the past to disperse camps:

- Smoke generators, (or drums filled with ...) should be placed along and/or beneath the colony at a distance that ensures adequate fog cover over the entire site.
- The dispersal team should be placed to cover the entire camp site. People should ultimately be placed directly beneath roost trees and produce a loud metallic noise when the animals return.
- Personal staff using firearms and birdfrite should be placed at an adequate distance to other team members to allow safe operation of firearms.
- Intense light (ie. 100W spotlights) directed towards the incoming animals.
- Creating a noise disturbance by using aerosol horns and/or using metal parts to create a loud metallic noise.

