



Annual Review of the
NPWS Policy on Flying Fox and Mitigation of
Commercial Crop Damage
for the
1999 - 2000 Fruit Growing Season

Acknowledgments

This report was prepared by Fiona Mandelc and Sarah Carr, Wildlife Management Unit, Biodiversity Research and Management Division, NPWS.

The assistance of Regional NPWS staff from the South Coast, Sydney South, Sydney North, Blue Mountains, Central Coast/Hunter Range, Hunter, Mid North Coast, North Coast, Northern Rivers, Northern Tablelands. Special thanks to Jennifer Pearce, Greg Wallace and Brian McLachlan for their comments on the review.

Contents

1.0 Introduction	1
2.0 Review Summary.....	1
2.1 State-wide.....	2
2.2 Regional.....	3
3.0 Review Discussion.....	6
3.1 Comparison of 1999/00 and previous season	6
3.2 1999/00 Regional Directorate Comparison.....	10
4.0 Management context 1999-2000.....	10
4.1 Population Assessments	11
4.2 Conservation Status Assessment	11
4.3 Legal Action	12
4.4 Crop Damage Mitigation.....	12
5.0 Future Initiatives.....	14
6.0 References	14

1.0 Introduction

It is suggested there has been conflict between flying foxes and fruit growers since Europeans began growing fruit trees in Australia (Tidemann *et al.*, 1997). It has also been noted that since the early years of European settlement mass exterminations of flying foxes have occurred in NSW (Lunney & Moon, 1994). It was not until 1986 when these species became protected, that legal destruction was limited to licensed activities over fruit crops.

In 1997 a temporary suspension of licensing occurred but in October 1998 the Government reinstated the issuing of s121 licences to harm flying foxes where there was a proven significant threat of commercial crop damage. In response to these circumstances the NPWS - *Policy on Flying Fox and Mitigation of Commercial Crop Damage* was developed and implemented in 1998/99. The Policy currently applies to two of the three flying fox species known to occur in NSW, the Grey-headed Flying fox, *Pteropus policephalus* and the Little Red *P. scapulatus*. The third species, the Black Flying fox *P. alecto* is listed as Vulnerable in NSW under the *Threatened Species Conservation Act, 1995* (TSC Act). The Policy states, that a statewide report is to be prepared after the completion of the fruit growing season and that the Policy should be reviewed annually in consultation with key stakeholders.

NPWS recognises this Policy as a component of a proposed broader conservation and management policy on flying foxes which will consider, for example roost site management on and off Service estate, conservation of foraging habitat and the integration of these into environmental planning and assessment processes.

Assessments of the conservation status of bat populations have been hindered in many countries, by a lack of information on species abundance and distribution. Until recently there was no population assessment available for either of the two species currently licensed by NPWS to be harmed over fruit crops. However in July 1998 members of the Australian Bat Society (ABS) coordinated the first attempt to systematically assess the size of the Grey-headed Flying fox population since the 1920's (Eby *et al.*, 1999). The authors concluded that the population has declined substantially since the time of European settlement (Eby *et al.*, 1999). However, even with an apparent decline in the population of one of the species implicated in crop damage, the experience of some fruit growers is that the impacts on crops can be significant in coastal NSW, in some years.

A range of techniques have been used by growers to deter flying foxes over the years, at different localities for a variety of crops and in other circumstances (Hall and Richards 1987, Turner 1994, Oldfield, 1993; Vardon *et al.*, 1997). At this time the only reliable protection for fruit crops from damage by flying foxes is full exclusion netting as recommended by NSW Agriculture.

A review of the implementation of the Policy after the 1998/99 season was prepared (Mandelc, 1999) and a number of recommendations made to clarify the Policy, licences and implementation procedures (see Attachment A). It was determined that before issuing the revised Policy another season should be assessed and further stakeholder consultation undertaken. This report presents a review of the NPWS licensing system implemented in 1999/00, compares the outcomes with the previous season and summarises the main management issues arising during 1999-2000, to date.

2.0 Review Summary

Table 1.0 is a summary of information derived from, s120 licences (General licence, to harm), s121 licence applications, s121 licences (Occupier's licence) and returned Flying Fox Record

Sheets (FFRS) from the 1999/00 fruit growing season. These application and licence forms were developed in conjunction with the implementation of the Policy in 1998/99, to standardise and increase the collection of relevant information from applicants and licensees.

It should be noted that many of the numeric totals presented below are based on incomplete documentation that was hand written, hence these figures should be regarded as indicative only. Caution should also be exercised in interpreting these figures, as they are based on only two fruit growing seasons, and the scale and intensity of damage to fruit crops by flying foxes is characterised by variability within and between years.

2.1 State-wide

2.1.1 Licence numbers

- For the 1999/00 fruit growing season a total of 44 s121 licences were issued to 38 growers. Five growers were issued with second licences. These 44 licences authorised the shooting of a maximum of 1515 FF.
- Of these 44 licences, 41% were issued from Northern Rivers Region in Northern NSW, which represented 52% of the total number of animals authorised to be harmed.
- Documentation indicates 4 applicants were refused a licence in 1999/00.
- Available documentation indicates where a second licence period was authorised joint property inspections were undertaken by NSW Agriculture and NPWS staff to confirm damage by flying foxes.

2.1.2 Affected Crops

- The area of total fruit crop potentially vulnerable to FF damage identified by 30 of the 38 applicants on their 1st licence application forms was 269.5 ha statewide.
- 42% (16) of the 38 applicants had 5 ha or less of fruit crops.
- The total area of crop identified as damaged by 24 of the 38 applicants at the time of their 1st licence application was 115.5 ha statewide.
- 46% (11) of the 24 applicants had crop damage of 2 ha or less at the time of their 1st licence application.
- The fruit crops identified as damaged were: stone fruit (including nectarine and peach), guava, mango, plum, loquat, fig, mulberry, pear, grape, lychee and apple.
- For the 24 licensees that indicated the total area damaged per crop, the area per crop statewide (ha) was approximately: stone fruit=97, guava=8, mango=2, plum=1.75, lychee=7
- The largest area of crop identified as damaged, under a single licence was 20 ha of stone fruit; and the minimum area was 0.10 ha of stone fruit.

2.1.3 Licensees – FF Record Sheet (FFRS)

- 44% (18) of FFRS were returned.

2.1.4 FF harmed

- Under the authority of 44 licences 1515 FF were licensed to be harmed
- This consisted of GHFF=895; LRFF=500 and 120 of either GHFF &/or LRFF
- 373 FF were shot as reported in the 18 FFRS returned
- This consisted of GHFF=202; LRFF=93; unidentified=78

2.1.5 Section 121 Licence Duration

- The maximum duration of a licence was 159 days
- The minimum period was 30 days
- 55% of licences were issued for 2 months (62 days) or less

- The earliest licence issued was on 24/08/99 and latest licence issued was 1/4/00 (both were issued in the Northern Directorate)

2.1.6 Section 120 licences to shoot flying foxes

- 29% (11) of the 1st s121 licences issued (38) were accompanied by s120 licences to shoot flying foxes
- 32 s120 licences were issued to shoot FF on 11 s121 licenced properties
- the number of s120 licences issued per s121 licence ranged from 0-5

2.2 Regional

2.2.1 NPWS Northern Directorate

- 24 licences issued (inc. 5 second licences)
- 14 licensees indicated the total area damaged per crop, the Regional totals (ha) were approximately: stone fruit=36.3, guava=8, mango=2, and lychee=7
- 3 of the 5 (60%) fruit crop categories identified were unique to Northern Directorate.
- The largest area of crop identified as damaged, at the time of a licence application was 15 ha of stone fruit; and the minimum area was 0.1 ha of stone fruit.
- 6 FFRS returned (25%)
- licences issued for 975 FF (i.e. GHFF=515; LRFF=460)
- FFRS indicated 123 shot (13%)
- 6 s121 licensees requested 13 shooters
- 63% (12) of 19 applicants had a total of 5 ha or less of fruit crops
- the average duration of a s121 licence was 46 days
- 32% of s121 licensees had s120 licences issued for use on their properties
- the number of shooters licences issued per s121 licence ranged from 0-3

2.2.2 NPWS Central Directorate

- 18 licences issued (inc. 1 second licence).
- 9 licensees indicated the total area damaged per crop, the Regional totals (ha) were approximately: stone fruit=57.5 and, plum=1.75.
- 1 of the 3 (33%) fruit crop categories identified was unique to Central Directorate.
- The largest area of crop identified as damaged, at the time of a licence application was 20 ha of stone fruit; and the minimum area was 1.5 ha of stone fruit.
- 11 FFRS returned (61%)
- licences issued for 520 FF (i.e. LRFF=40; GHFF=360; Either=120)
- FFRS indicated 230 shot (44%)
- 4 s121 licensees requested 15 shooters
- 27%(3) of 11 applicants had a total of 5 ha or less of fruit crops
- the average duration of a s121 licence was 72 days
- 24% of s121 licences had s120 licences issued for use on their properties
- the number of shooters licences issued per s121 licence ranged from 0-5

2.2.3 NPWS Western Directorate

- 1 licence issued
- the licensee did not indicate the total area (ha) damaged per the 10 ha crop of stone fruit
- FFRS returned
- FFRS indicated 0 shot
- s121 licensee requested 0 shooters

2.2.4 NPWS Southern Directorate

- 1 licence issued

- the licensee indicated the total area (ha) damaged per 3 ha crop was: 3 ha stone fruit
- FFRS returned
- licence issued for 20 (i.e. all GHFF)
- FFRS indicated 20 shot (100%)
- s121 licensee requested 4 shooters
- duration of the s121 licence was 159 days

Table 1.0: State Summary - 1999/00 Fruit Growing Season

Directorate	Region & Area	1st s121 App	1st s121 Lic Issued	FFRS Returned	Max.Nos Licenced to Harm	Total Nos. Shot	GHFF shot (Est)	LHFF shot (Est)	Total Crop Area (ha)	Total Area Damaged (ha) -1st Lic	2nd s121 Lic Issued	FFRS Returned	Max.Nos Licenced to Harm	Total Shot
NORTHERN	Northern Rivers													
	Richmond River Area	17	14	5	650	123	8	45	106.20	48.30	4	0	140	?
	Tweed Area	2	2	0	90	?	?	?	005.00	05.00	1	0	40	?
	North Coast													
	Clarence South Area	1	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Coffs Coast Area	2	2	0	35	?	?	?	?	?	0	n/a	n/a	n/a
	Hunter													
	Barrington Tops Area	1	1	1	20	?	?	?	000.50	?	0	n/a	n/a	n/a
Sub Total		23	19	6	795	123?	8?	45?	111.7?	53.3?	5	0	180	?
CENTRAL	Central Coast-Hunter Range	3	3	2	150	27	27	0	014.00	02.00	0	n/a	n/a	n/a
	Sydney North													
	Lower Hawkesbury Area	6	6	6	210	182	126	56	073.75	45.75	1	0	10	?
	Sydney													
	Cumberland North Area	3	3	3	70	21	21	0	049.00	03.50	0	n/a	n/a	n/a
	Sydney South													
	Nattai/Illawarra Area	4?	4	0	80	?	?	?	?	?	0	n/a	n/a	n/a
	Blue Mountains													
	Hawkesbury Area	1	1	0	0	0	0	0	008.00	08.00	0	n/a	n/a	n/a
Sub Total		17	17	11	510	230	180	56	144.75	59.25	1	0	10	?
WESTERN	Northern Plains													
	Coonabarabran Area	1	1	1	?	0	0	0	010.00	?	0	n/a	n/a	n/a
SOUTHERN	South Coast													
	Ulladulla Area	1	1	1	20	20	20	0	003.00	03.00	0	n/a	n/a	n/a
STATE TOTAL		42	38	19	1325	373	208	101	269.45	115.55	6	0	190	?

Note: n/a = not applicable

3.0 Review Discussion

3.1 Comparison of 1999/00 and previous season

3.1.1 Licence numbers

The above statewide summary suggests that only a small proportion of fruit growers suffered significant damage from flying foxes statewide during 1999/00. That is, while a total of 38 growers were issued with licences by NPWS, the Australian Bureau of Statistics (ABS) 1999 Year Book indicated that in NSW there were 222 pome fruit, 461 stone fruit and 1839 unclassified fruit growing establishments.

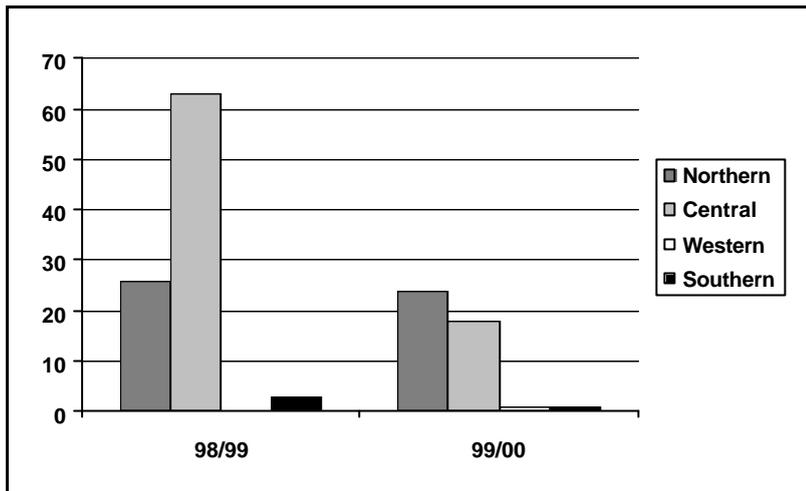
While six second licences were issued, two of these were to the same individual. While this was a procedural anomaly, the total number of FFs to be harmed was less than the maximum limit of 100 per season. The current Policy is very clear, NPWS advocates the use of full exclusion netting to protect crops, and if required using shooting to scare animals away from crops. NPWS views the lethal harm of flying foxes by growers as primarily incidental to shooting to scare. Consequently licences to lethally harm flying foxes are limited to two licences for a commercial fruit crop in a single season, and the maximum number of individual flying foxes that can be harmed per licence is limited to 50.

From the 1998/99 fruit growing season to the 1999/00 season there was a reduction of greater than 50% in the number of s121 licences issued to growers (from 92 to 44). Overall this reduction in demand for s121 licences may be the result of a number of factors such as:

- ongoing implementation of NPWS Policy and the associated requirements for property inspections to confirm damage and licensee requirements to document and return Record Sheets;
- the native food resources of flying foxes flowered well and sequentially, such that animals had access to food through spring and summer (Eby, *pers. comm.* 2000);
- a number of orchardists netted due to the availability of the RAA low interest loans; and/or
- other damage mitigation methods were successfully employed (e.g. phoenix bat wailer).

The reduction in the number of licences issued occurred primarily in Central Directorate (see Figure 1). In 1998/99 the majority (33%) of licences were issued from the North Metropolitan District in Sydney however in 1999/00 the majority (41%) of licences were issued from the Northern Rivers Region in Northern NSW. Figure 1 indicates that there was little change in the number of licences issued in the Northern Directorate between 1998/99 and 1999/00, however in Central Directorate 45 fewer licences were issued in 1999/00 in comparison to 1998/99. In addition to the above factors NPWS Central Directorate staff (Martin, *pers. comm.* 2000) noted that 1999/00 was described as the poorest fruit growing season for many years. Growers reported very poor fruit set and fungal disease due to abnormally high winter temperatures. It was also noted that native food sources were available throughout the stone fruit season.

Figure 1: Total number of s121 licences issued from NPWS Directorates for the 1998/99 and 1999/00 fruit growing seasons.



3.1.2 Licencees - FF record Sheets

Only 44% (18) of growers returned their FFRS for the 1999/00 season and of these approximately 72% (13) completed all entries. This percentage was similar to 1998/99 (i.e.48% (44) of growers).

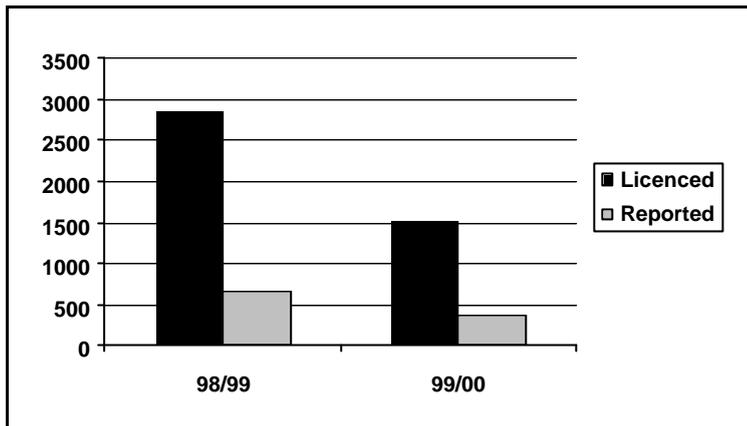
Given the return of FFRS is a licence condition consideration has been given by NPWS to this aspect of non-compliance in the development of the revised Policy and Procedural Guidelines (see Attachment B – Revised Policy). It was noted by staff during the current review that the wording of s121 licence condition No. 5 does not facilitate law enforcement, with respect to lodgement of FFRS, accordingly this condition has been reviewed (see Attachment C – Revised Standard Forms).

3.1.3 FF harmed

Concomitant with the reduced number of licences issued in 1999/00, there was a reduction in the number of GHFF and LRFF licenced to be harmed (from 2859 to 1515) (Figure 2). However with less than half of licensee returning their FFRS, the actual level of harm is unknown. For 1999/00 25% of the animals licensed to be harmed were reported as shot which is similar to 1998/99 when 23% of the licensed number were reported to be harmed.

Based on returned FFRS (18) the majority of flying foxes harmed in 1999/00 were GHFF, although 21% were unidentified. In 1998/99 of the 651 FF reported as shot, the GHFF also represented the majority harmed. No unidentified individuals were recorded in 1998/99. Given that in Northern Directorate there is also the risk of harm to the threatened Black Flying Fox from licensed shooting activities, NPWS has determined that a Grower Information Pamphlet will be prepared (see Attachment A).

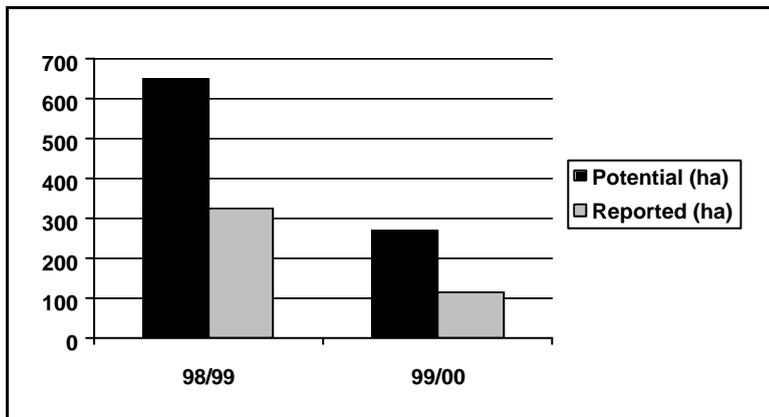
Figure 2: Maximum number of GHFF and LRFF licenced to be harmed and number reported harmed on returned FFRS for the 1998/99 and 1999/00 fruit growing seasons.



3.1.4 Affected Crops

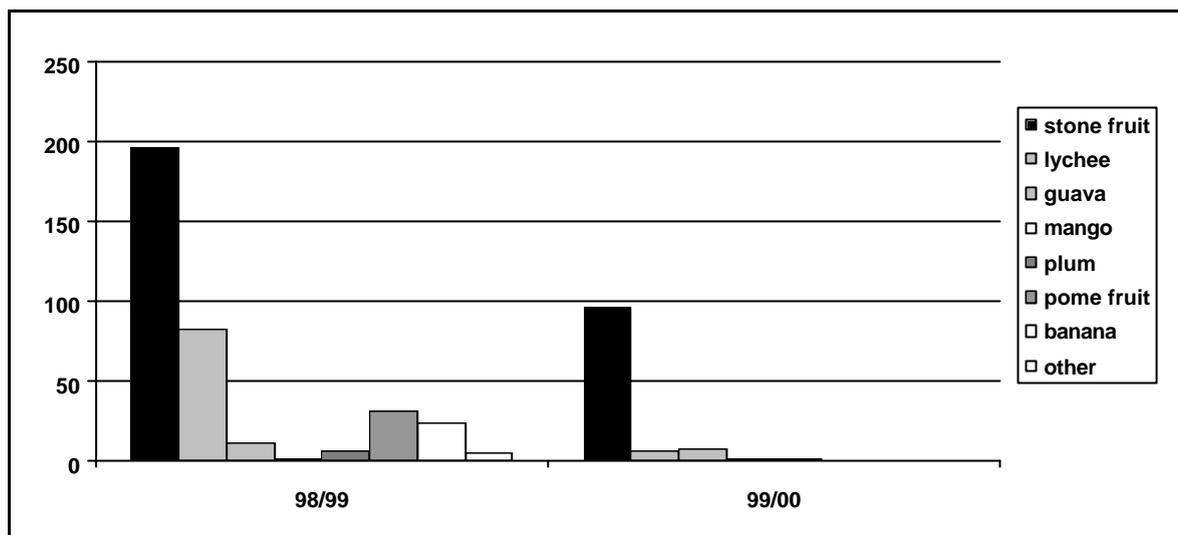
The total area under fruit crop cultivation indicated by applicants in 1999/00, was 269.5 ha and 651 ha in 1998/99. The total area of crop identified as damaged in 1999/00 by 24 of the 38 applicants was 115.5 ha statewide (see Figure 3). These areas are relatively small given there was some 38,000 ha of orchard and tropical fruit statewide in 1994 (McLennan, 1996). Also, as 42% of the 38 applicants had 5 ha or less of fruit crops it is possible the commercial viability of these holdings limits their option to net.

Figure 3: Hectares of crop with the potential to be damaged and reported as damaged 1998/99 and 1999/00 fruit growing seasons, at the time of the first licence application.



Stone fruits (including nectarine and peach) remained the principal crop impacted by FF's (Figure 4). No applicants indicated damage to paw paw, cherry, or banana in 1999/00 unlike the previous season and fig was the only additional crop reported as impacted.

Figure 4: Hectares and type of fruit crop identified as damaged for the 1998/99 and 1999/00 fruit growing seasons.



Given the above, it is difficult not to conclude that while the cost to individual growers can be high, the impacts of flying foxes on the fruit growing industry at a regional and state level are minimal. This may explain the lack of ongoing interest and financial support from agricultural industry bodies for deterrent research beyond netting.

3.1.5 Section 121 Licence Duration

The 1999/00 season was markedly different to the 1998/99 season in the intensity of FF damage statewide. While there was a reduction in the numbers of FF licenced to be harmed, licences were issued for similar durations, but for different periods within the season. For example, in 1998/99, 62% (56) of licences were issued in the month of November while in 1999/00, 80% (32) of licences were issued in the months of October (22.5%), November (35%) and December (22.5%). This suggests that within the Policy framework, licencing is responding to individual orchard management arrangements and localised impact levels.

3.1.6 Section 120 licences

While only 29% of s121 licences issued were accompanied by additional licences to shoot, the number of such licences issued per s121 licence ranged from 0-5.

As in 1989/99 there is no apparent correlation between the number of s120 licences issued per s121 licence and the:

- total area of crop potentially vulnerable to damage;
- total number of flying fox licenced to be harmed; or
- total number of flying fox reported to have been shot.

The Service recognises the number of s120 licences required by some growers may relate to individual orchard operations management. However, the revised Policy and procedures note that where determined appropriate NPWS staff may request written justification from s121 licensees for the proposed number of s120 licensees (see Attachment B).

3.1.7 Random unannounced patrols/property inspections

Based on advice from NPWS officers a minimum estimate of 11 unannounced inspections were undertaken, as well as general orchard area patrols.

Legal Services Division noted that technically a pre-licence property inspection should not be included in the above category as it is not a law enforcement matter but rather a component of the licencing procedures (i.e. assessment of a licence application). The revised Policy has

clarified this by removing the reference to a pre-licence inspection under s3.0 Law Enforcement and retaining it in s2.0 Procedures for licencing.

3.2 1999/00 Regional Directorate Comparison

The Directorate summaries indicate regional differences in the:

- number of licences issued;
- timing of the issue of licences;
- crops affected;
- number of licensees with 5 ha or less of potentially vulnerable crop; and
- species licensed to be harmed;
- FFRS return compliance; and
- number of shooters per s121 licence.

The main NPWS Directorates involved in licensing are Northern and Central. Northern can receive applications some 3 months earlier (August) than Central with the ripening of tropical fruits. Fruit crop damage from flying foxes can extend into March/April in both Directorates, with a second ripening season for different tropical fruits in the North and continuation of stone and pome fruit ripening in Central. The unique crops to Northern Directorate are guava, mango, lychee, (and 0.5 ha total of loquat, fig, grapes and mulberry) and in Central Directorate, plum.

In Northern Directorate 63% of the licenses (24) issued in 1999/00 were to growers with a total of 5ha or less while in 1998/99 only 37% (9) of licenses were for small holdings. This may suggest that larger and/or more commercially viable growers are netting crops in Northern Directorate. In Central Directorate the trend was the opposite with only 27% (11) of licensees having a total of 5 ha or less of fruit crops in 1999/00 but 52% (27) of licenses issued were for small holdings in 1998/99. While reports from Central Directorate support the view of a much lower impact from flying foxes in 1999/00 compared to the previous season why there would be proportionally less smaller growers is not clear.

The majority of licences were issued to harm the GHFF in both Directorates in the last two seasons. Significantly more licences are issued, however, for LRFF in Northern Directorate, this reflects the distribution of Little Reds in NSW.

Only 25% of licensees returned their FFRS in Northern Directorate compared to 61% in Central in 1999/00. In 1998/99 there was a 44% return rate in Central and a 42% return in Northern. That is, within Central Directorate there has been an increase in compliance but a decrease in Northern Directorate. There are probably a number of reasons for this difference such as the number of licensees per NPWS Region and the resources available to undertake liaison.

In the Central Coast/Hunter Range Region in Central Directorate, NPWS holds an annual information day for growers. This regular forum is likely to have assisted in the implementation of the new Policy. Such a forum also provides NPWS with a mechanism to inform growers about the broader conservation management issues associated with flying foxes.

More section 120 licences were issued in Central Directorate for fewer properties, than in Northern in 1999/00, which is similar to the 1998/99 season.

4.0 Management context 1999-2000

Outlined is a summary of the main management issues associated with licensing the harm of flying foxes for agricultural damage mitigation purposes that have developed during 1999 and 2000, to date.

4.1 Population Assessments

Assessments of the conservation status of bat populations have been hindered in many countries, by a lack of information on the abundance and distribution of these mobile animals, and by a lack of standard techniques for measuring these parameters (O'Shea and Bogan 2000). The need to standardise population assessments has received attention in both the U.S. and Great Britain, where various techniques for monitoring populations are being assessed (O'Shea and Bogan 2000).

It is difficult to assess the population size of the two species currently licensed by NPWS to allow limited harm, to mitigate crop damage. Both the GHFF and LRFF have extensive ranges through northern and eastern Australia. For the GHFF, identified as being of conservation concern, its variable pattern of abundance within its range (Queensland, NSW and Victoria) has made population assessment particularly difficult. In order to estimate population size, attempts have been made to conduct synchronised counts of animals throughout their range.

In July 1998 members of the Australian Bat Society (ABS) coordinated the first attempt to systematically assess the size of the GHFF population since the 1920's. The total abundance of GHFF in NSW was estimated at 85,400, which varied substantially from recent estimates of the NSW population, of one million animals (Eby *et al.* 1999). Eby *et al.* (1999) also estimated the species abundance to be 390,400 based on estimates from QLD and Victoria undertaken at a similar time. While Eby *et al.* (1999) noted that counting methods used in these states differed from NSW and therefore the population estimate could only be considered indicative, the authors concluded that the population has declined substantially since the time of European settlement (Ratcliffe, 1932).

This assessment (Eby *et al.* 1999) highlighted the GHFF dependence during winter on coastal forests and woodlands in northern NSW and southern Queensland. The animals were highly concentrated, for example, approximately 72% occupied 18 colonies between Maroochydore and Ballina and over 99% of the NSW population occurred in 9 camps, at this time. These animals were feeding primarily on flowering Forest Red Gum, *Eucalyptus tereticornis*, Swamp mahogany, *E. robusta* and melaleuca *Melaleuca quinquenervia*. This remnant lowland vegetation is predominantly privately owned and being cleared rapidly (Catterall *et al.*, 1997 and 1998, Sattler and Williams 1999).

Since July 1998 the ABS has coordinated another four synchronous assessments of the abundance and distribution of GHFF in NSW, Queensland and Victoria: September 1998, April and July 1999 and April 2000. These assessments have compared the results of the July 1998 assessment with results from other seasons, documented the extent of movement between New South Wales and Queensland and documented changes between years in distribution during autumn. These assessments estimate the current abundance of GHFF is between 350,000 and 400,000. This is considered a benchmark by the ABS for future counts that will allow the population to be monitored in the future (Eby, *pers. comm.* 2000)

4.2 Conservation Status Assessment

The Action Plan for Australian Bats (1999) identified 90 species of Australian bats, of these one taxa was listed as extinct and 9 were identified as either Critically Endangered,

Endangered or Vulnerable. The GHFF was listed as Vulnerable and the LRFF as lower risk, least concern.

The NSW Scientific Committee received a nomination to have the GHFF listed as Vulnerable in NSW in 1999 and it is expected that a preliminary determination under the *Threatened Species Conservation Act, 1995* will be made in the near future.

4.3 Legal Action

In 1999 the Humane Society International (HSI) took legal action against the NPWS in the Administrative Decisions Tribunal. HSI requested that the Tribunal provide them with access, under the *Freedom of Information Act 1989*, to the names and addresses of persons licensed by NPWS to harm flying foxes to prevent fruit crop damage in October and November 1998. HSI indicated that they wanted the information for the purpose of conducting research on flying foxes. The NPWS opposed access and argued that: the information provided as part of the licence application process was related to the personal and business affairs of orchardists and was provided to the Service in-confidence; the identity of people having access to the information and the use of the information could not be controlled; and the disclosure of the information may discourage land holders to apply for licences in future, which would limit the capacity of the Service to monitor the number of flying foxes harmed by those land holders in New South Wales. The Tribunal is yet to give its decision.

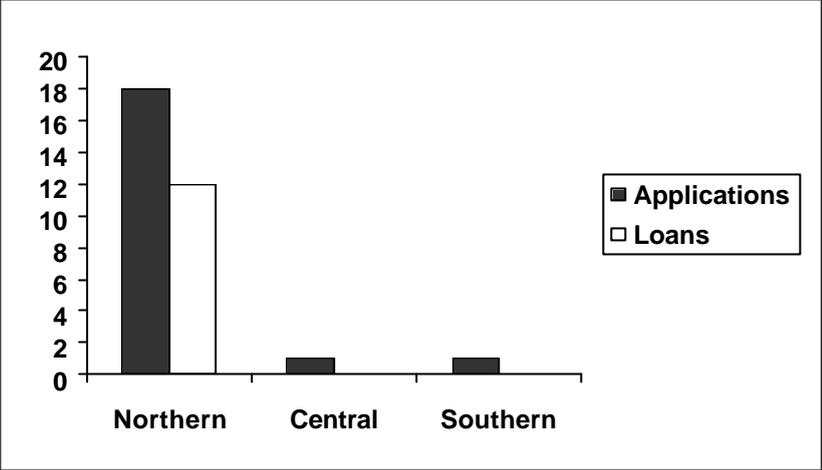
4.4 Crop Damage Mitigation

4.4.1 Exclusion Netting

The only reliable protection for fruit crops from damage by flying foxes at this time, is full exclusion netting as recommended by NSW Agriculture. This also prevents significant damage caused by birds and hail storms. Two primary reasons stated by growers for not using netting is cost and in some instances topography. Quotes on the cost per hectare vary from \$16,000 (Slack & Reilly, 1994) to \$30,000 (NSW Farmers, 1998). More recently there are reports from northern NSW that suggest access to netting contractors is limiting the rate of installation of netting, NPWS has sought clarification on this matter from NSW Agriculture (Williams *pers. comm.* 2000).

Since April 1999 growers can take out a low interest loan for netting to prevent crop damage from flying foxes. The NSW Rural Assistance Authority (RAA) administers the scheme and a number of conditions apply. The availability of the RAA low interest loans now allows for eligible growers to borrow up to \$100,000 for exclusion netting at a 4.5% interest rate approximately. The criteria for these loans include: the farming enterprise must provide at least 51% of total gross income of the applicants; and the applicant must be in working occupation of the farm and be of moderate means (net assets of up to \$1.2 million). The Service is advised that the RAA have received 20 applications since April 1999. All of these applications have been processed and 13 loans approved. Eighteen of the loans were applied for and 12 granted in the NPWS Northern Directorate. One application was received from Central Directorate and one from Southern Directorate. Only one of these loans was granted but information provided by RAA does not indicate which NPWS Directorate (see Figure 5).

Figure 5: Geographical distribution and number of applications received and loans approved by the RAA since April 1999.



4.4.2 Other Non-lethal Deterrents

The Service is aware that some growers trialed different deterrent mechanisms during the 1999/00 season but is not aware of any systematic deterrent studies for flying foxes being undertaken over the last year. NSW Agriculture have advised that they will pursue opportunities to evaluate new technology wherever there is funding support from affected industries to do so.

5.0 Future Initiatives

As a result of the 1998/99 and 1999/00 reviews a range of minor amendments have been made to the NPWS *Policy on Flying Fox and Mitigation of Commercial Crop Damage* (see Attachment B). It is proposed that the revised Policy and procedures be available for implementation for the 2000/01 fruit growing season.

The 1998/99 review recommended the establishment of a NSW Flying Fox Consultative forum, similar to the QLD group. NSW Agriculture have indicated support for an initial meeting to explore the proposal.

A Growers Information Pamphlet to assist in the completion of Flying Fox Record Sheets is to be prepared. These pamphlets are to assist in the identification of the 3 different species, provide advice on welfare and carcass disposal matters, acknowledge the contribution such information can make to understanding the impact if accurately completed; and to promote recognition that obtaining a licence to harm native wildlife necessitates certain responsibilities.

A standard report form for NSW Agriculture District Horticultural staff undertaking joint property inspections with NPWS, to assess second licence applications to harm flying foxes within a season, has been finalised and is included for staff information (see Attachment C).

In addition to the Policy and standard application, licence and reporting forms, staff information sheets will be distributed. This material provides a summary of general information on FF biology, ecology, threatening processes and health risks; as well as current information on a number of roost sites throughout the State. This information is not for public distribution but is aimed at providing staff with accessible, accurate and current information that may assist them in responding to community concerns about flying foxes.

An initiative to map all known roost sites statewide, in order to identify opportunities for their consideration by relevant Government agencies in environmental planning and assessment processes is also being investigated.

At this time, the impact of lethal harm for fruit crop damage mitigation purposes, on the abundance of Grey-headed and Little Red flying foxes is unknown. The NPWS will investigate opportunities for research in collaboration with fruit growers on the impact of current lethal harm strategies on flying fox populations. The Service will also support wherever possible abundance assessment surveys and continue to implement and review the NPWS Policy on Flying Fox and Mitigation of Commercial Crop Damage.

6.0 References

1. Catterall, C., Storey, R. and Kingston, M. B., (1997). Reality versus rhetoric: a case study monitoring regional deforestation. Pp. 367-377. In: *Conservation outside nature reserves*. ed by P. Hale and D. Lamb, Centre for Conservation Biology, University of Queensland: Brisbane.
2. Catterall, C. P., Kingston, M. B., Park, K. and Sewell, S., (1998). Deforestation, urbanisation and seasonality: interacting effects on a regional bird assemblage. *Biological Conservation* **84**: 65-81.
3. Duncan, A., Baker, G.B., and Montgomery, N. (1999). *The Action Plan for Australian Bats*. Environment Australia: Canberra
4. Eby P, Richard, G, Collins L and Parry-Jones, K (1999). The distribution, abundance and vulnerability to population reduction of a nomadic nectarivore, the Grey-headed Flying-fox *Pteropus poliocephalus* in New South Wales, during a period of resource concentration. *Australian Zoologist* **31**: 240-253.
5. Hall, L.S. and Richards, G.C. (1987). Crop Protection and Management of Flying-Foxes (Chiroptera:Pteropodidae). *Australian Mammalogy*.

6. Lunney, D and Moon, C. (1994). Flying foxes and their camps in the rainforest remnants of north-east NSW. Pp.247-277 In: *Australia's Ever-Changing Forests III* ed by J. Dargavel. Centre for Resource and Environmental Studies, ANU: Canberra
7. Mandelc, F (1999). Review of the implementation of the *NPWS Policy on Flying Fox and Mitigation of Commercial Crop Damage*, 1998-99 fruit growing season. NSW NPWS
8. McLennan, W. (1996). *Australian Agriculture and the Environment*. Australian Bureau of Statistics: Canberra.
9. NSW Farmers' Association. (1998). *Submission on Flying Foxes in NSW*. Sydney.
10. Oldfield, A.C. (1993). Flying-foxes sense of smell and their feeding behaviour: some implications for future crop protection In: (Ed) Slack, J.M., *National Low-chill Stonefruit...Update 1993*. NSW Agriculture & North Coast Low-Chill Stonefruit Growers Assoc. Inc.
11. O'Shea, T.J. and Bogan, M.A. (eds), (2000). *Interim Report of the Workshop on Monitoring trends in U.S. bat populations: problems and prospects*. [On-line Interim Report]. U.S. Geological Survey, Midcontinent Ecological Science Center, Fort Collins, Colorado. <http://www.mesc.usgs.gov/BPD/ireport.htm>.
12. Ratcliffe, F.N. (1932). Notes on the fruit bats (*Pteropus* spp.) of Australia. *Journal of Animal Ecology* **1**:32-57.
13. Sattler, P. and Williams, R. (eds), (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*, Environmental Protection Agency, Brisbane.
14. Slack J.M. 1990 Flying fox damage in low-chill stonefruit orchards in J.M. Slack (Ed) *Flying fox Workshop Proceedings*. NSW Agriculture and Fisheries, Lismore, NSW.
15. Slack, J.M. and Reilly, T. 1994. The Economics of Orchard Netting. In: *Bird & Bat Control Seminar Proceedings*. DPI, QLD, Sunshine coast Subtropical Fruits Association Inc. and DEH, QLD.
16. Tidemann, R., Kelson, S.I. and Jamieson, G. (1997). Flying-fox damage to orchard fruit in Australia - incidence, extent and economic impact. *Australian Biologist* **10**:179-186.
17. Turner, R. (1994). Management of Birds and Flying Foxes; An Overview of Present and Future Options. In: *Bird & Bat Control for Horticulture and Aquaculture – Seminar Proceedings*. DPI, QLD, Sunshine coast Subtropical Fruits Association Inc. and DEH, QLD.
18. Vardon, M.J, Simpson, B.K., Sherwell, D., & Tidemann, C.R. (1997). Flying-foxes and tourists: a conservation dilemma in the Northern Territory. *Australian Zoologist* **30(3)**.