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Rudder Park Flying-fox Camp Management Plan

September 2017

Kempsey Shire Council

ecology / vegetation / wildlife / aquatic ecology / GIS

Acknowledgements

Kempsey Shire Council would like to thank everyone who provided feedback during community consultation, with all comments considered in the development of this plan and incorporated where possible.

Funding assistance from Local Government NSW (Flying-fox Grants Program) to develop this Plan is gratefully acknowledged. Council also recognises input by the NSW Office of Environment and Heritage to the draft Plan, in developing the template on which this Camp Management Plan was based, and Dr Peggy Eby who provided advice which was included in the template.

Acronyms and abbreviations

ABLV	Australian bat lyssavirus
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BFF	Black flying-fox (*Pteropus alecto*)
DoEE	Department of the Environment (Commonwealth)
DPI	Department of Primary Industries (NSW)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA	Environment Protection Authority (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
GHFF	Grey-headed flying-fox (*Pteropus poliocephalus*)
the Guideline	Referral guideline for management actions in grey-headed and spectacled flying-fox camps 2015 (Commonwealth)
HeV	Hendra virus
LGA	Local government area
LGNSW	Local Government NSW
LRFF	Little red flying-fox (*Pteropus scapulatus*)
MNES	Matters of national environmental significance
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPWS	National Parks and Wildlife Service (NSW)
OEH	Office of Environment and Heritage (NSW)
PEPs	Protection of the environment policies
the Plan	Camp management plan
PMST	Protected matters search tool
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
the Policy	Flying-fox camp management policy 2015 (NSW)
SEPPs	State environmental planning policies
SIS	Species impact statement
TEC	Threatened ecological community

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1. Overview

The Rudder Park flying-fox camp is located across three mixed-tenure land parcels in East Kempsey. It was first officially recorded in 2011, although anecdotal records suggest it was used sporadically for many years prior. The camp has been the source of complaints from nearby residents, mainly relating to noise, odour and health concerns.

Three species of flying-foxes occur in New South Wales (NSW): the grey-headed flying-fox (GHFF; *Pteropus poliocephalus*), black flying-fox (BFF; *P. alecto*) and little red flying-fox (LRFF; *P. scapulatus*). The Rudder Park camp is fairly consistently occupied by GHFF and BFF, with one record of a small number of LRFF.

All three species of flying-foxes, and their habitats, are protected under NSW legislation. The GHFF is also listed as Vulnerable under Commonwealth legislation, affording it additional protection.

The aim of this Camp Management Plan (the Plan) is to provide Kempsey Shire Council (Council) with a framework to manage community impacts associated with the camp, while also ensuring flying-foxes and their important ecological services are conserved.

1.1 Objectives

The objectives of this Camp Management Plan (the Plan) are to:

- manage community impacts and concerns associated with the Rudder Park camp
- ensure management activities are consistent with legislative responsibilities, including the NSW Flying-fox Camp Management Policy (OEH 2015)
- facilitate licence approval for actions at the camp
- ensure the conservation of flying-foxes in appropriate locations
- ensure flying-fox welfare during works
- effectively communicate with stakeholders during planning and implementation of management activities.

2. Context

2.1 Regional context and camp history

There are three known camp sites in East Kempsey: Rudder Park, Colin Dickson Street and Crescent Head Road (see Figure 1).

The Rudder Park camp, which is the focus of this Plan, is located in Rudder Park on the right bank of the Macleay River, between Lord St and Gabriel Ave, East Kempsey (31° 5'2.05"S, 152°50'34.46"E) (see Figure 1).

The camp was first officially recorded in 2011, however residents in the area suggest flying-foxes roosted at the site for many years prior.

The core camp area is a large stand of tropical bamboo (Figures 2-4) across Council, Crown and private land (Section 2.2). A generally smaller number of flying-foxes also utilise adjacent vegetation in private residences to the south, and less commonly to the north.

The camp extent as at 29 March 2017 (0.63 hectares) is shown in Figure 1.

Regular quarterly monitoring began at all known camps in NSW in 2012 as part of the National Flying-fox Monitoring Program (NFFMP). Since this time the Rudder Park camp has been fairly consistently occupied by between approximately 1,000 and 5,000 flying-foxes, with a peak count of 5,736 in May 2016 (Figure 5). The camp is dominated by GHFF flying-foxes (on average 86% GHFF), with the remainder comprising BFF. The highly transient LRFF was recorded on one occasion, with 110 counted in May 2016. Since 2012 the Rudder Park camp has emptied twice; firstly early in 2014, remaining empty for most of the year, and again in spring 2015. There is no clear seasonal pattern of occupation. For example, the camp is often empty or very small in February, however the third highest count of 4,375 also occurred in February (2015). It is a confirmed GHFF maternity site.

The Crescent Head Road camp was the main historic camp site in East Kempsey. This camp was the focus of environmental impact mitigation leading up to construction of the Kempsey Bypass. It has been unoccupied in all quarterly counts since the NFFMP began, with the most recent confirmed record being in 2010. Anecdotal reports suggest the camp was abandoned during construction of the Kempsey Bypass (June 2010-March 2013), thought to be due to associated disturbance, and that the Rudder Park camp increased around the same time.

The Colin Dickson St camp was first recorded through the NFFMP in November 2015, and was occupied during the next quarterly count (February 2016) (Figure 6). Numbers were much higher than have ever been recorded at Rudder Park, totalling 28,845 (72% GHFF, 28% BFF) and 37,540 (88% GHFF, 12% BFF) respectively. At the same time, the Rudder Park camp emptied. Rudder Park would not have been able to support this number of animals, and it appears flying-foxes abandoned Rudder Park to form a single large camp. It is assumed that flying-foxes remained at the Colin Dickson St camp for the period between the November and February counts, and likely reared young at the site. The camp was next occupied during quarterly counts in May 2017, although residents report it has been occupied at times between this period (including early May 2017).

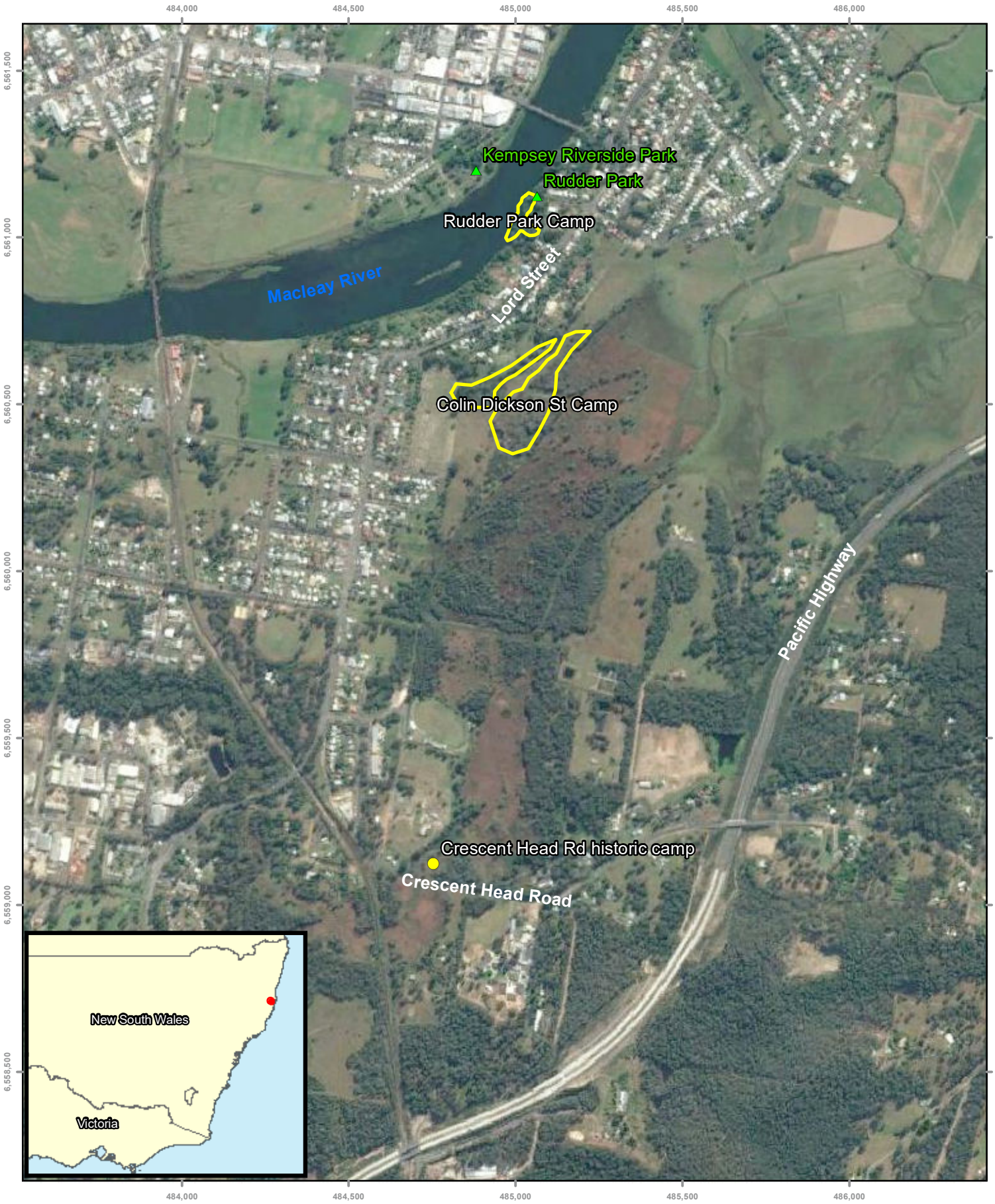

Figure 1: Local context

Kempsey Shire Council

Rudder Park CMP

- Surrounding feature
- Camp location
- Flying Fox camp extent

ecosure

Job number: PR2399
Revision: 0
Author: ALM
Date: 12/06/2017

0 50 100 200
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

Figure 2: Rudder Park Camp

Kempsey Shire Council

Rudder Park CMP

Flying Fox camp extent as at March 2017

Extent of bamboo

ecosure

Job number: PR2399
Revision: 0
Author: ALM
Date: 22/05/2017

0 7.5 15 30
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

PR2399_MP2_RudderPkCamp
A4

Figure 3 View of Rudder Park camp from Riverside Park

Figure 4 One stand of exotic bamboo monoculture used by roosting flying-foxes

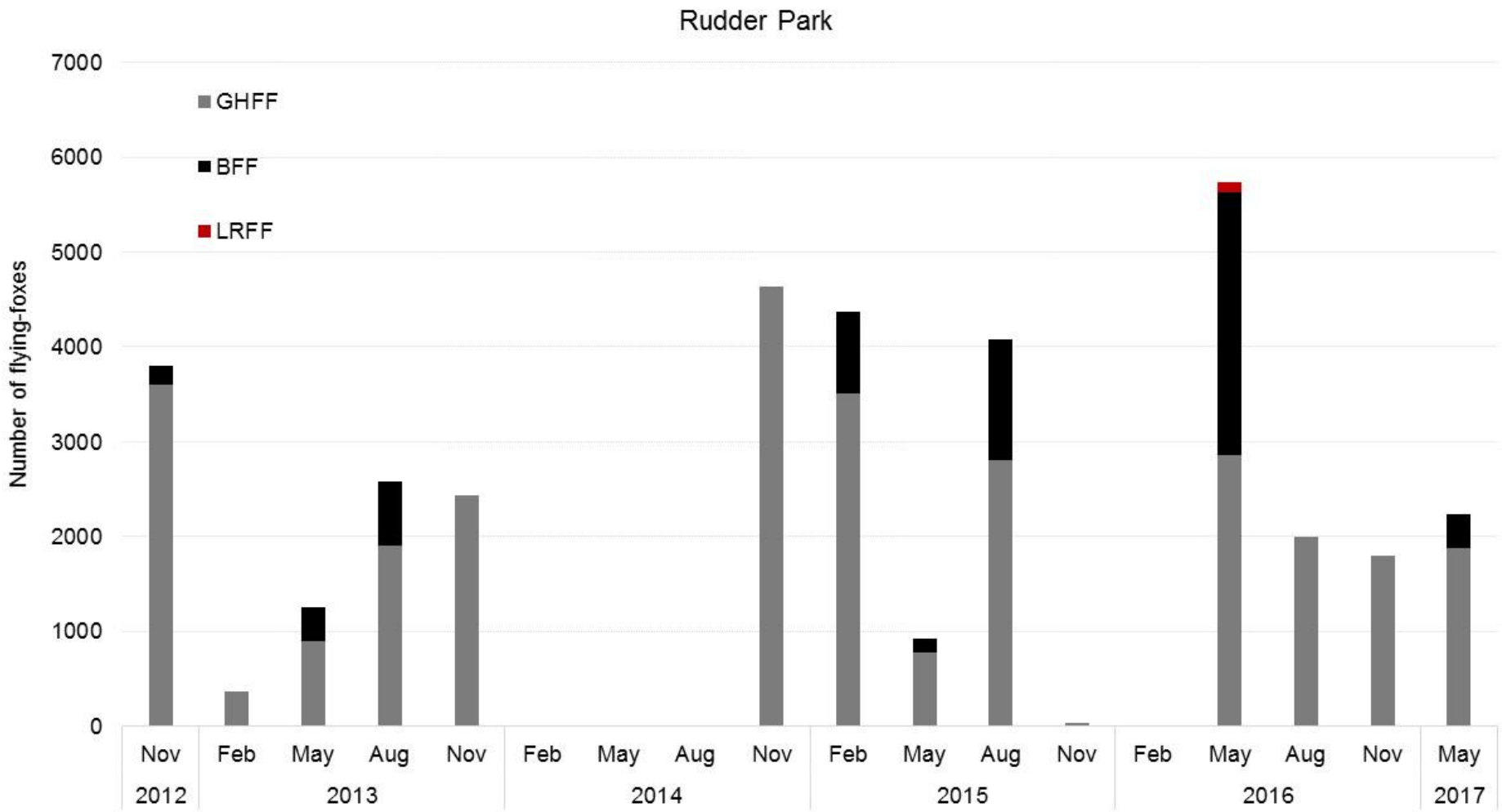

Figure 5 Rudder Park camp historic occupation during quarterly counts Nov 2012 - May 2017 (data source: NFFMP)

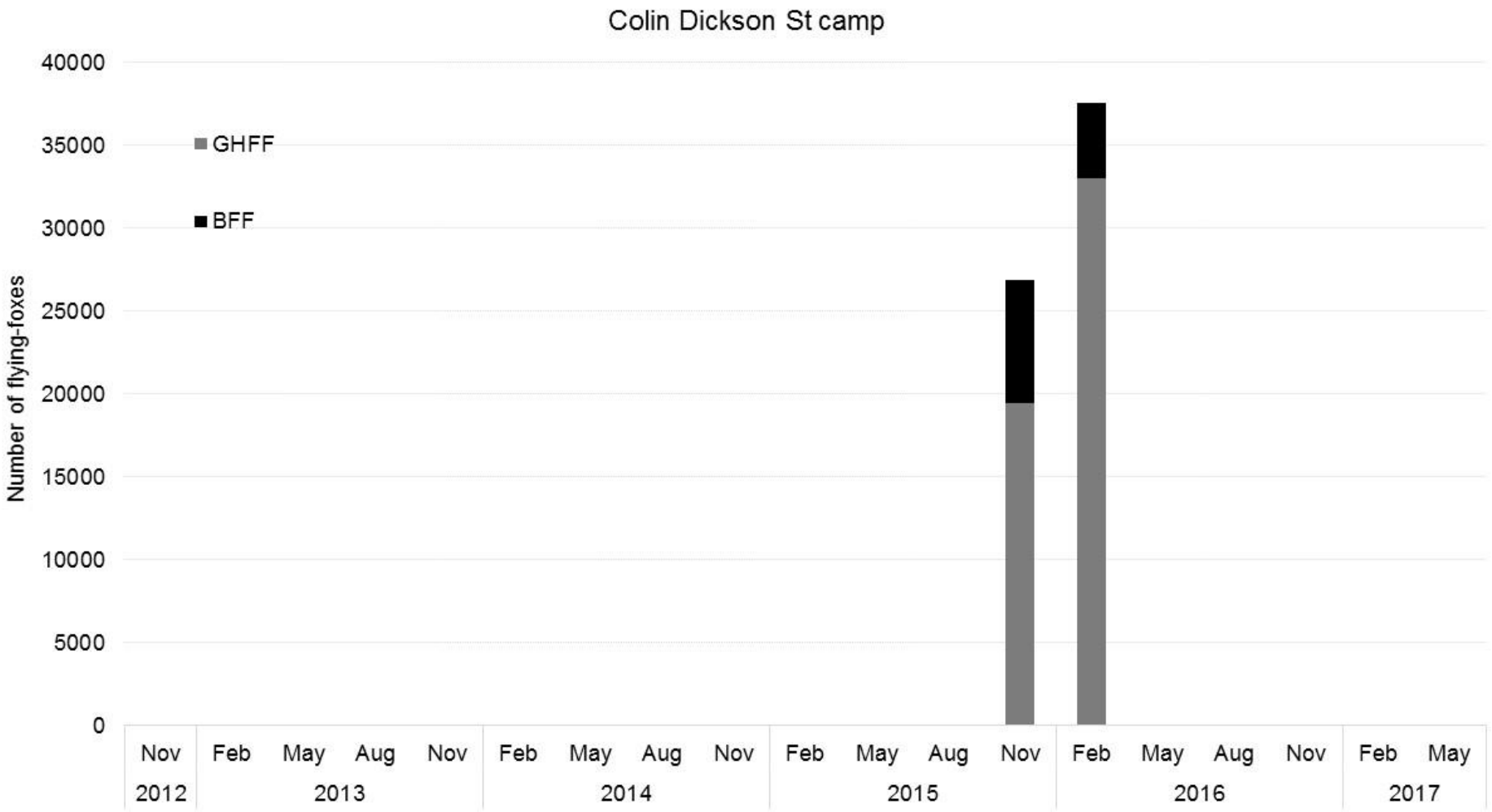

Figure 6 Colin Dickson St camp historic occupation during quarterly counts Nov 2012 - May 2017 (data source: NFFMP)

2.2 Land tenure

The Rudder Park camp spans over multiple land parcels, including public and private land. The core camp is located across one Council-managed Crown Land parcel, one Council freehold parcel and one Crown Land parcel managed by the NSW Department of Industry - Lands. At times flying-foxes also roost in adjacent private properties. Figure 7 shows the camp extent and land tenure, and identifies public land (with lot and plan numbers) which is the subject of this Plan.

Council will liaise with all relevant landholders prior to any on-ground works.

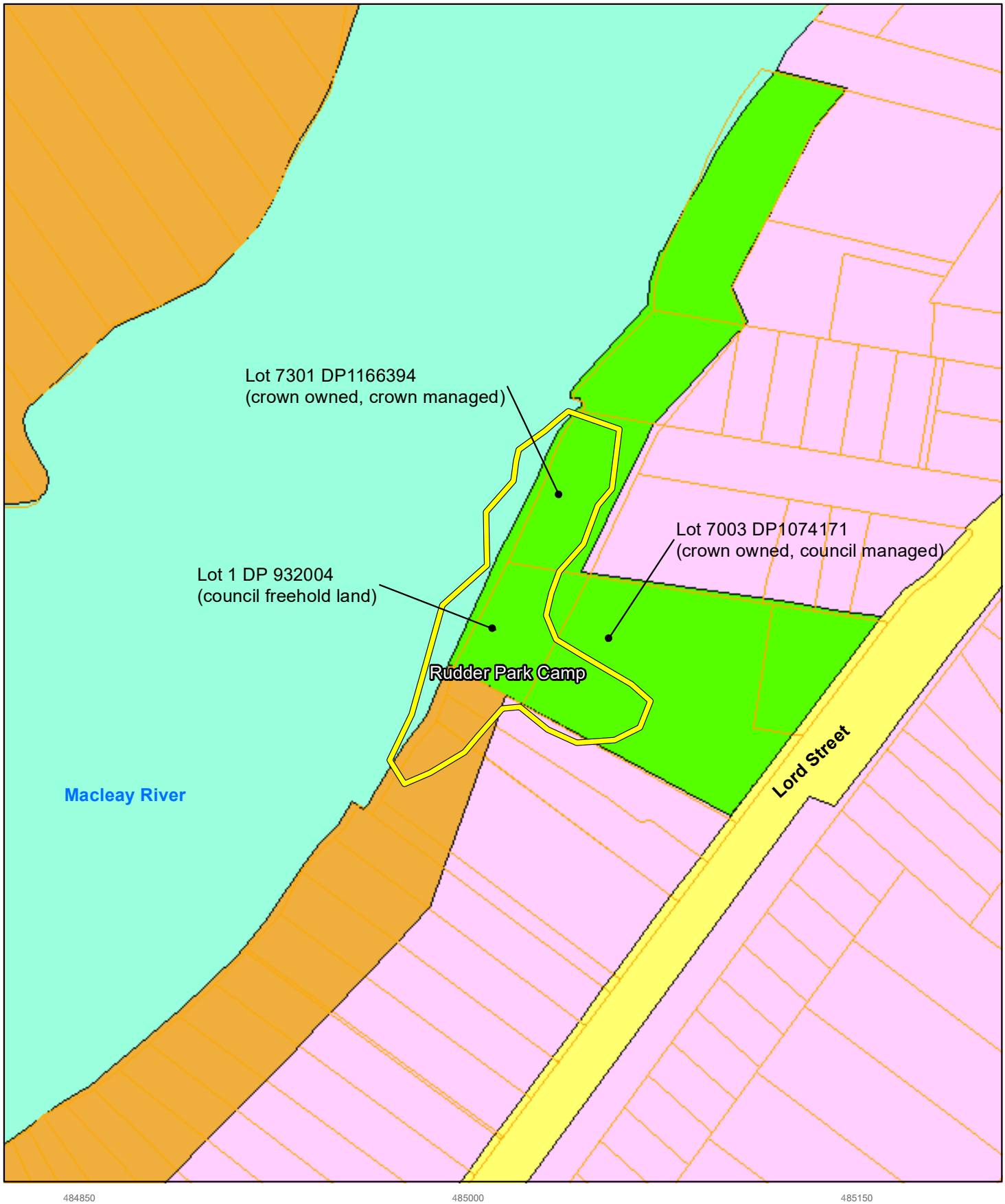

Figure 7: Land tenure of Rudder Park and surrounds

Kempsey Shire Council

Rudder Park CMP

Flying Fox camp extent as at March 2017

Land use zoning

- E2 Environmental Conservation
- R1 General Residential
- RE1 Public Recreation
- SP2 Infrastructure
- W2 Recreational Waterways

ecosure

Job number: PR2399
Revision: 0
Author: ALM, KF
Date: 12/06/2017

0 7.5 15 30
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

2.3 Reported issues related to the camp

The following list is a collation of issues related to the camp that have been reported by the community. The list has been compiled from information collected via Council records and consultation during development of the Plan.

Reported issues include:

- noise as flying-foxes depart or return to the camp
- noise from the camp during the day, particularly when the camp is disturbed
- faecal drop on outdoor areas, cars, boats and clothes lines, along with time and expenditure associated with cleaning
- smell
- flying-foxes roosting in residential properties, particularly on hot days
- fear of disease, including perceived risk to domestic pets
- dead flying-foxes in resident's yards
- concern about damage to vegetation in residential properties
- health and/or wellbeing impacts (e.g. associated with lack of sleep, anxiety)
- reduced general amenity
- damage to vegetation
- spreading noxious weeds (e.g. camphor laurel)
- impacts on businesses.

These impacts are reportedly exacerbated by regular illegal disturbance of the camp by residents in the area.

Flying-fox mortality associated with summer heat stress events also temporarily increase smell and disease fears.

It is likely that faecal drop impacts increase when the nearby Colin Dickson St camp is occupied.

The Colin Dickson St camp is also reportedly the subject of illegal dispersal attempts, which increase impacts to residents close to that camp, and are also thought to increase numbers at the Rudder Park camp and exacerbate impacts there.

Just over half of all respondents (51%) provided positive feedback on the flying-foxes. This feedback stems from people who:

- recognise the landscape-scale benefits flying-foxes provide through seed dispersal and pollination
- enjoy watching and/or listening to the flying-foxes

- appreciate the beauty of the flying foxes
- acknowledge that the flying-foxes are an essential part of our ecosystem
- feel the need to protect the flying-foxes and their camps
- believe that issues are arising from camps being displaced elsewhere
- have a greater appreciation for them after seeing them up close
- feel there should be more community education about the positive effects the flying-foxes have on the natural environment.

Further discussion on outcomes of community engagement during development of the Plan can be found in Section 3.

2.4 Management response to date

Council has regularly consulted with affected residents over a period of several years.

In response to community concerns, Council have in the past liaised with OEH regarding potential management options. The advice provided was that OEH were unlikely to support dispersal from the Rudder Park site, and that other management options should be investigated. The reasons that dispersal is not generally supported, particularly before other management options are exhausted, are detailed in Section 8.3.2.

Council have investigated potential management options, including buffers, and these have been considered in the development of this Plan.

3. Community engagement

3.1 Stakeholders

There are a range of stakeholders who are directly or indirectly affected by the flying-foxes in East Kempsey, or who are interested in its management. Stakeholders include those shown in Table 1.

Table 1 Stakeholders in the camp and Plan

Stakeholder group	Stakeholder	Interest/reported impacts
Community	Residents and business owners	Residents and business owners near the Rudder Park camp are primary stakeholder to the Plan, and both negative and positive impacts linked to the Rudder Park camp are discussed in detail in the Plan.
	Indigenous community	Traditional owners have a general interest in flying-foxes, including the ecological services they provide and the potential for sustainable harvesting for food or medicinal purposes.
	Horse owners and managers	Horse owners, equine facility managers and local vets should be aware that Hendra virus risk is associated with foraging flying-foxes (e.g. risk is present across the entire flying-fox range), and appropriate mitigation measures.
	Orchardists and fruit growers	Fruit growers may be impacted by flying-foxes raiding orchards, and should have access to wildlife friendly netting information.
	Hospitals	Any helicopter operator associated with Kempsey hospitals should be made aware of flying-foxes in the area, and follow risk mitigation measures (especially during dusk or dawn operations).
	Kempsey Airport	Airport managers have a responsibility to reduce the risk of wildlife-aircraft strike. Kempsey Airport is located 6.9km to the north east of the Rudder Park camp, and should be consulted regarding any management that may influence flying-fox movements or behaviour.
Government	Kempsey Shire Council	Council is responsible for administering local laws, plans and policies, and appropriately managing assets (including land) for which it is responsible.
	Department of Industry – Lands	The Crown Lands division of Department of Industry is the custodian of two of the land parcels at the Rudder Park camp site.
	OEH	OEH is responsible for administering legislation relating to (among other matters) the conservation and management of native plants and animals, including threatened species and ecological communities.
	Commonwealth Department of the Environment and Energy (DoEE)	DoEE is responsible for administering federal legislation relating to matters of national environmental significance, such as the grey-headed flying-fox which roosts at Rudder Park.
	Local Government NSW (LGNSW)	LGNSW is an industry association that represents the interests of councils in NSW. LGNSW also administered funds under the NSW Flying-fox Grants Program.
Non-government organisations	Wildlife carers and conservation organisations	Wildlife carers and conservation organisations have an interest in flying-fox welfare and conservation of flying-foxes and their habitat.
	Researchers/universities/ CSIRO	Researchers have an interest in flying-fox behaviour, biology and conservation.

3.2 Community consultation

Extensive effort has been made to engage with the community regarding the Rudder Park flying-fox camp, which was guided by a specific community engagement plan. The aim of engagement was to:

- understand the issues directly and indirectly affecting the community
- raise awareness within the community about flying-foxes
- correct misinformation and allay fears
- share information and invite feedback about management responses to date
- seek ideas and feedback about possible future management options.

The types of engagement that have been undertaken include:

- promotion of Plan development and opportunities for feedback through media releases, Council interviews on radio and local television news, Council website, social media platforms and a letterbox drop to all properties within 200 m of the Rudder Park camp
- face-to-face meetings and telephone calls with interested members of the community
- community survey, available in hard copy and online via the 'Have Your Say Macleay' website
- presentation of the draft Plan and Q&A session via a public information session
- public exhibition of the draft Plan with open submission period.

3.2.1 Consultation outcomes

A community survey was developed to seek feedback on the Rudder Park camp and preferred management options. The survey was available as hard copy and online from May 1st to 17th, 2017. A total of 38 responses were received. Results for all survey questions are provided graphically in Appendix 1.

Nearly all respondents were aware that flying-foxes are a protected native species (95%) and that they are critical to long-distance seed dispersal and pollination (95%). The remaining respondents answered that they did not care/didn't understand the question (5%). The majority of respondents also knew that diseases from flying-foxes can be prevented by not handling animals, and appropriate horse husbandry (89%).

From the community survey, the majority of respondents were positive in their feelings about flying-foxes (55%) with the remaining feeling negative (42%) or neutral (3%). As per Section 2.3, the common themes in the positive feedback were:

- flying-foxes provide landscape-scale benefits through seed dispersal and pollination
- respondents enjoy watching and/or listening to the flying-foxes
- flying-foxes are an essential part of our ecosystem

- there is the need to protect the flying-foxes and their camps
- issues are arising from camps being displaced elsewhere
- flying foxes are beautiful animals
- there is a greater appreciation for flying-foxes after seeing them up close
- there should be more community education about the positive effects the flying-foxes have on the natural environment.

Those that responded with negative feelings towards flying-foxes, the main issues were:

- noise as flying-foxes depart or return to the camp
- noise from the camp during the day, particularly when the camp is disturbed
- faecal drop on outdoor areas, cars, boats and clothes lines, along with time and expenditure associated with cleaning
- smell
- damage to vegetation
- fear of disease, including perceived risk to domestic pets
- spreading noxious weeds (e.g. camphor laurel).

When asked to assess what the main concerns were, respondents identified that damage to vegetation was the most important (34%), followed by excrement (26%) and then smell (11%), fear of disease (11%), noise (10%) and visual amenity (8%) (Figure 8).

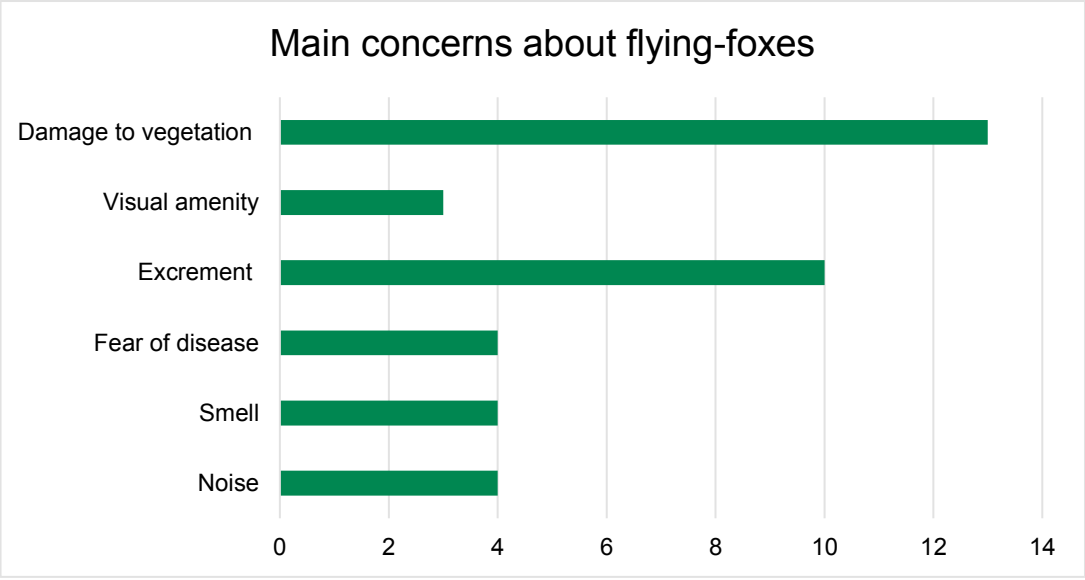

Figure 8 Main concerns about flying-foxes, identified as being the most important, in response in Question 8 (based on what was ranked as number 1)

Out of the 38 survey responses, 21% had incurred financial expenses directly related to flying-foxes. These costs were attributed to cleaning expenses (including electricity and water), loss of fruit from fruit trees, car and boat paint damage, installation of filters on rainwater tanks, discarded washing stained by excrement and vaccinations.

Survey respondents identified that to reduce faecal drop impacts at their location was the most important statement in response to Question 10 (31%), followed by reducing smell and protecting flying-foxes (23% respectively), reducing noise (15%) and then providing flying-fox related education/tourism opportunities (Figure 9).

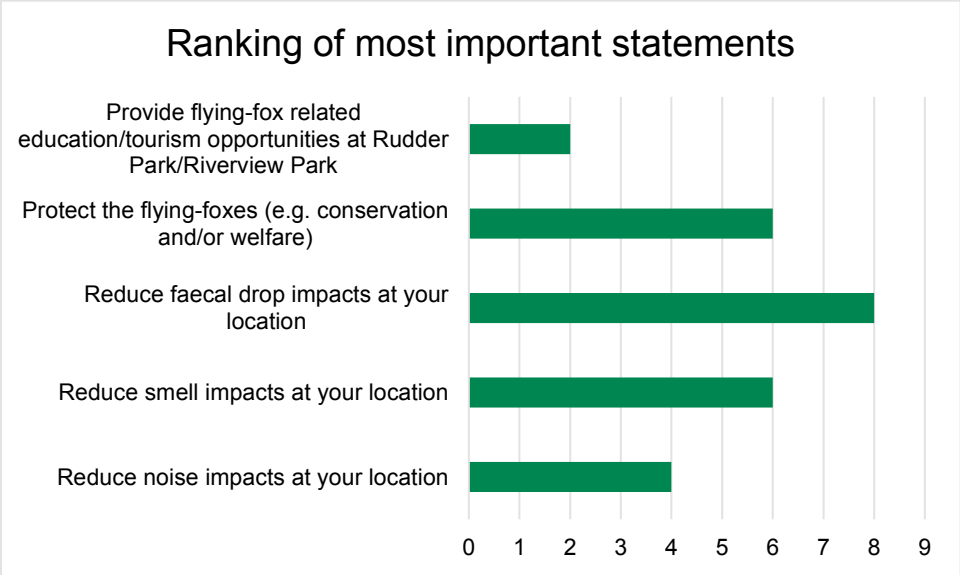

Figure 9 Survey respondents identified these statements as the most important in response to Question 10 (based on what was ranked as number 1)

In response to Question 11, how important is it that potential management has a low financial cost to ratepayers, 29% considered it to be extremely or very important, 53% considered it to be moderately or slightly important and 18% considered it to be not at all important (Figure 10). In comparison, in the response to the importance of a low financial cost to residents living near the flying-fox camp (Question 12), 42% considered it extremely or very important, 42% considered it to be moderately or slightly important and 16% considered it to be not at all important (Figure 11).

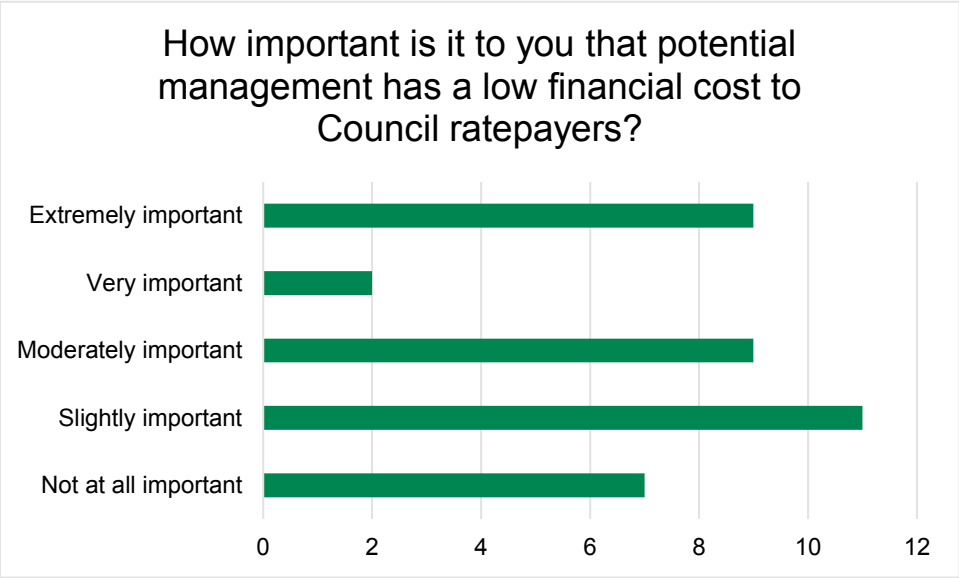

Figure 10 Importance of potential management having a low financial cost to Council ratepayers in response to Question 11

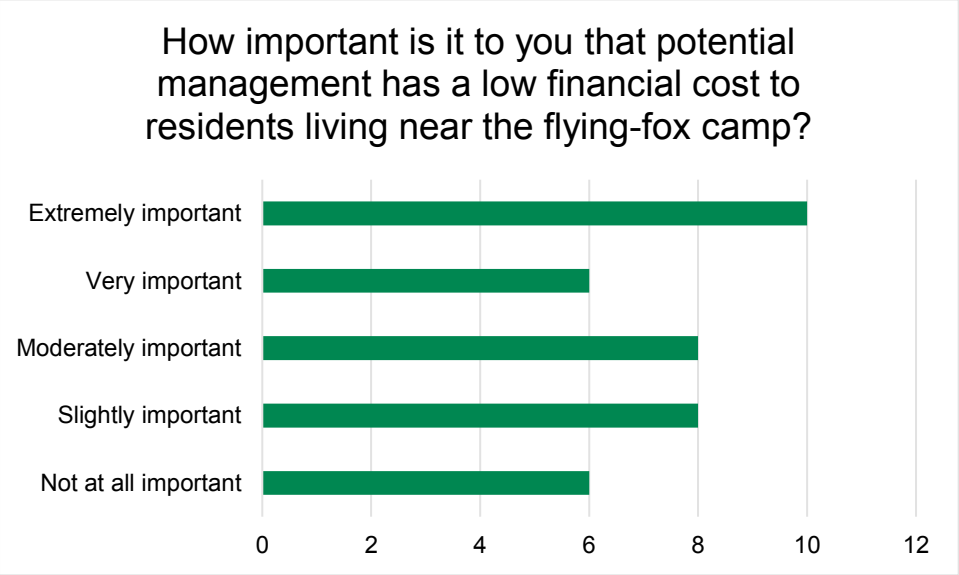

Figure 11 Importance of potential management having a low financial cost to residents living near the flying-fox camp in response to Question 12

In response to Question 14, how important is it to you that management does not disrupt residents and businesses during implementation, 21% considered it to be extremely or very important, 37% considered it to be moderately or slightly important and 42% considered it to be not at all important (Appendix 1).

In response to Question 15, how important is it to you that management does not move the flying-fox camp to other areas that may also be near residents or businesses, 74% considered it to be extremely or very important, 18% considered it to be moderately or slightly important and 8% considered it to be not at all important (Appendix 1).

Respondents were given an opportunity to suggest options for flying–fox management in the area (Question 16). These responses are summarised below:

- provide education for the community
- vegetation management to deter the flying-foxes from the Rudder Park area
- consult with experts who have worked with communities in respect to flying-fox conflicts
- relocate them away from residents
- use sprinklers to deter them
- provide more protection for the flying-foxes and leave them where they are
- council support for residents and businesses near the camp would also be of great benefit
- flying-fox camps could provide an educational and tourist attraction.

In 'other comments' that respondents could provide, some replies related to the colony moving from the Crescent Head Rd site. Many people want flying-foxes moved 'back' to Crescent Head Rd. There is not any current disturbance near the site, however for some reason flying-foxes now prefer Rudder Park, and to a lesser extent Colin Dickson St. This may be associated with some undetectable and more permanent change at the Crescent Head Rd site, or reasons thought to explain the urbanising trend seen across Australia (see Section 6.2). Given they are well established at Rudder Park and Colin Dickson St, dispersal is likely to be difficult and have unpredictable results. It would also be extremely costly, and require ongoing effort as flying-foxes attempt to return to these sites (see Section 8.3.2).

Direct consultation with most affected residents

Some residents were contacted directly via the telephone (four local residents living in close proximity to the flying-fox camp). Some of the key issues raised during these telephone conservations are summarised below:

- problems with excrement, including needing to get a boat cover after paint was damaged
- neighbouring resident regularly disturbs the camp creating further issues
- noise
- the backyard is no longer able to be used in the same way
- fear of potential disease with children and animals
- dead bats in their backyard
- smell, including unable to use air-conditioner as brings the smell into the house
- concerned about the health of their vegetation, especially if the flying-foxes are relocated/harasses at Rudder Park.

4. Legislation and policy

Section 4 details legislation specifically related to flying-foxes and their habitat.

A thorough review of requirements under other legislation, including at a minimum that outlined in Appendix 2 and with respect to results in Section 5, should also be done prior to any on-ground works.

4.1 State

Note that at the time of Plan development a reform to conservation and land management legislation in NSW was underway. This includes planned repeal of the *Threatened Species Conservation Act 1995* and *National Parks and Wildlife Act 1974*, which will be replaced by the consolidated *Biosecurity Conservation Act 2016*.

4.1.1 Flying-fox Camp Management Policy 2015

The Flying-fox Camp Management Policy 2015 (the Policy) has been developed to empower land managers, primarily local councils, to work with their communities to manage flying-fox camps effectively. It provides the framework within which OEH will make regulatory decisions. In particular, the Policy strongly encourages local councils and other land managers to prepare Camp Management Plans for sites where the local community is affected.

4.1.2 *Biodiversity Conservation Act 2016*

The purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development including conserving biodiversity, maintaining the diversity and quality of ecosystems, regulating human interactions with wildlife, and supporting conservation and threat abatement action to slow the rate of biodiversity loss and conserve threatened species and ecological communities in nature.

The Grey-headed Flying-fox is listed as a threatened species under the BC Act.

Part 2 Division 3 of the BC Act provides for the issuing of Biodiversity Conservation Licences to authorise the doing of an act likely to result in one or more of the following:

a. harm or attempted harm to any animal that is of a threatened species or is part of threatened ecological community

b. harm or attempted harm, dealing in, or liberating a protected animal

c. the picking of any plant that is of a threatened species or is part of threatened ecological community

d. picking or dealing in protected plants

e. damage to declared areas of outstanding biodiversity value

f. damage to any habitat of a threatened species or threatened ecological community.

Part 7 of the BC Act provides for the biodiversity assessment and approvals required under the Environmental Planning and Assessment Act 1979 for development other than complying development, activities and state significant development and infrastructure.

An assessment of impacts is required for any threatened species or threatened ecological community, or their habitats, that are likely to be harmed by the doing of an act proposed in the Plan.

Note: that the definition of 'harm' includes kill, injure or capture the animal, but does not include harm by changing the habitat of the animal, and attempt to harm an animal includes hunting or pursuing, or using anything, for the purpose of harming the animal. The definition of 'pick' includes to gather, take, cut, remove from the ground, destroy, poison, crush or injure the plant or any part of the plant. The definition of habitat includes an area periodically or occasionally occupied by a species or ecological community and the biotic and abiotic components of an area.

4.1.3 *National Parks and Wildlife Act 1974*

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the conservation of nature, objects, places or features of cultural value and the management of land reserved under this Act. The Act protects Aboriginal objects and declared Aboriginal Places. An Aboriginal Heritage Impact Permit may be required under this Act to authorise camp management actions that may harm Aboriginal objects a declared Aboriginal Places.

4.1.4 *Prevention of Cruelty to Animals Act 1979*

It may be an offence under this Act if there is evidence of unreasonable/unnecessary torment associated with management activities. Adhering to welfare and conservation measures provided in Section 10.3 will ensure compliance with this Act.

4.1.5 *Environmental Planning and Assessment Act 1979*

The objects of the *Environmental Planning and Assessment Act 1979* (EP&A Act) are to encourage proper management, development and conservation of resources, for the purposes of the social and economic welfare of the community and a better environment. It also aims to share responsibility for environmental planning between different levels of government and promote public participation in environmental planning and assessment.

The EP&A Act is administered by the NSW Department of Planning and Environment.

Development control plans under the EP&A Act should consider flying-fox camps so that planning, design and construction of future developments is appropriate to avoid future conflict.

Development given consent under Part 4 or activities assessed under Part 5 of the EP&A Act do not require licensing under the BC Act. Consent and determining authorities are required

to consider the impacts of such proposals on threatened species, threatened ecological communities, and their habitats in accordance with Part 7 of the BC Act.

Where development consent under Part 4 or assessment under Part 5 of the EP&A Act is not required, a licence under the BC Act may be required to authorise the doing of an act that harms protected animals, threatened species, or threatened ecological community, or which damages the habitat of a threatened species or ecological community. This includes the doing of an act likely to harm any flying fox, or damaging the habitat of grey-headed flying-foxes.

Where a proposal to manage a flying-fox camp involves the cutting down, destruction, lopping or removal of a substantial part of a tree or other vegetation that is not covered by a development consent or assessment under Part 5 it may still require authorisation. Depending on the land on which the vegetation occurs and the character of the vegetation, it may require an approval or a permit under the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017* or an approval under the *Local Land Services Act 2013*.

Where flying-fox camps occur or impact on private land, private land owners are advised to contact their local council to explore management options and the appropriate approval processes for addressing arising issues.

4.2 Commonwealth

4.2.1 *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides protection for the environment, specifically matters of national environmental significance (MNES). A referral to the Commonwealth DoEE is required under the EPBC Act for any action that is likely to significantly impact on an MNES.

MNES under the EPBC Act that relate to flying-foxes include:

- world heritage sites (where those sites contain flying-fox camps or foraging habitat)
- wetlands of international importance (where those wetlands contain flying-fox camps or foraging habitat)
- nationally threatened species and ecological communities.

The GHFF is listed as a vulnerable species under the EPBC Act, meaning it is an MNES. It is also considered to have a single national population. DoEE has developed the Referral guideline for management actions in GHFF and SFF[1] camps (DoE 2015) (the Guideline) to guide whether referral is required for actions pertaining to the GHFF.

The Guideline defines a nationally important GHFF camp as one that has either:

- contained ≥10,000 GHFF in more than one year in the last 10 years, or

[1] spectacled flying-fox (*P. conspicillatus*)

- been occupied by more than 2500 GHFF permanently or seasonally every year for the last 10 years.

Provided that management at nationally important camps follows the mitigation standards below, DoEE has determined that a significant impact to the population is unlikely, and referral is not likely to be required.

Referral will be required if a significant impact to any other MNES is considered likely as a result of management actions outlined in the Plan. Self-assessable criteria are available in the Significant Impact Guidelines 1.1 (DoE 2013) to assist in determining whether a significant impact is likely; otherwise consultation with DoEE will be required.

Mitigation standards

- The action must not occur if the camp contains females that are in the late stages of pregnancy or have dependent young that cannot fly on their own.
- The action must not occur during or immediately after climatic extremes (heat stress event[2], cyclone event[3]), or during a period of significant food stress[4].
- Disturbance must be carried out using non-lethal means, such as acoustic, visual and/or physical disturbance or use of smoke.
- Disturbance activities must be limited to a maximum of 2.5 hours in any 12 hour period, preferably at or before sunrise or at sunset.
- Trees are not felled, lopped or have large branches removed when flying-foxes are in or near to a tree and likely to be harmed.
- The action must be supervised by a person with knowledge and experience relevant to the management of flying-foxes and their habitat, who can identify dependent young and is aware of climatic extremes and food stress events. This person must make an assessment of the relevant conditions and advise the proponent whether the activity can go ahead consistent with these standards.
- The action must not involve the clearing of all vegetation supporting a nationally-important flying-fox camp. Sufficient vegetation must be retained to support the maximum number of flying-foxes ever recorded in the camp of interest.

These standards have been incorporated into mitigation measures detailed in Section 10.3. If actions cannot comply with these mitigation measures, referral for activities at nationally important camps is likely to be required.

[2] A 'heat stress event' is defined for the purposes of the Australian Government's Referral guideline for management actions in GHFF and SFF camps as a day on which the maximum temperature does (or is predicted to) meet or exceed 38° C.

[3] A 'cyclone event' is defined as a cyclone that is identified by the Australian Bureau of Meteorology (www.bom.gov.au/cyclone/index.shtml).

[4] Food stress events may be apparent if large numbers of low body weight animals are being reported by wildlife carers in the region.

5. Other ecological values of the site

The camp is located within a tall, dense stand of tropical bamboo (Bambusa spp.), which has outcompeted native vegetation that previously occurred. There are some eucalypts at the periphery of the camp, however these are not normally used for roosting.

Vegetation has been mapped as camphor laurel and cleared or partly cleared by the DoEE (NVIS 2016).

A search of the Protected Matters Search Tool (PMST) and Bionet databases found a total of 39 threatened fauna species and two threatened flora species recorded within 10 km (Bionet database) and 52 threatened species (42 fauna and 10 flora species) from the PMST search (Appendix 3). Due to the disturbed nature of the area and minimal potential impact of camp management, the search area was reduced to 1 km. Table 2 provides a detailed analysis of the threatened entities that may occur and be impacted by management of the camp (13 fauna species and six flora species).

Table 2 Threatened species and ecological communities that may occur at the site (1 km buffer). Shorebirds, sea birds and fish have been omitted as there is no suitable habitat for these species.

CE = Critically Endangered; E = Endangered; V = Vulnerable.

Species name	Common name	Status		Habitat description	Likelihood of occurrence/impact.
		EPBC Act	BC Act		
Fauna					
Anthochaera phrygia	Regent honeyeater	CE	CE	Box-Ironbark eucalypt woodland and dry sclerophyll forest associations in areas of low to moderate relief.	Unlikely. Good quality box gum/ironbark woodland is not present with the site or surrounds
Botaurus poiciloptilus	Australasian bittern	E	E	Terrestrial wetlands with tall, dense vegetation and occasionally estuarine habitats. Favours permanent shallow waters, edges of pools and waterways	Possible occurrence along the Macleay River on the edge of the site. However, removal of bamboo and installation of sprinklers would not negatively impact habitat for this species.
Chalinolobus dwyeri	Large-eared pied bat	V	V	Dry forests and woodlands, moist eucalypt forests, caves and mines	Unlikely. Minimal suitable habitat and no negative impact.
Dasyornis brachypterus	Eastern bristlebird	E	E	Coastal woodlands, dense shrubland and heathlands, especially where low heathland borders taller woodland or dense tall tea-tree.	Unlikely. Suitable habitat is not present within the site or surrounds.
Dasyurus maculatus maculatus	Spotted-tail quoll	E	V	Wide range of habitats including temperate and subtropical rainforests, wet sclerophyll forest, lowland forests, eucalypt woodlands, riparian woodlands, sub-alpine woodlands, coastal heathlands and, occasionally, open country and grazing lands.	Unlikely. Small patches of suitable habitat occur within the site and surrounds, however much of the larger area is urbanised and habitat is highly fragmented. Quolls require large areas (at least 4 ha per quoll) of suitable habitat as a home range. This is not available within this area.
Erythrotriorchis radiatus	Red goshawk	V	CE	Tropical grassy woodlands mostly in undulating stony lands	Unlikely. Suitable habitat is not within the site and surrounds.

Species name	Common name	Status		Habitat description	Likelihood of occurrence/impact.
		EPBC Act	BC Act		
Lathamus discolor	Swift parrot	CE	E	Dry sclerophyll eucalypt forests and woodlands. Occasionally wet sclerophyll forests. Feeds mostly on nectar, mainly from eucalypts, but also eats psyllid insects and lerps, seeds and fruit	Unlikely. Minimal suitable habitat is present, and will not be negatively impacted by the removal of bamboo.
Litoria aurea	Green and golden bell frog	V	E	Inhabits marshes, dams and stream-sides, particularly those containing bulrushes or spikerushes.	Unlikely. Suitable habitat is not present within the site and surrounds.
Mixophyes iteratus	Giant barred frog	E	E	Found along freshwater streams with permanent or semi-permanent water. Can also be found in moist riparian habitats such as rainforest or wet sclerophyll forest.	Very unlikely. Suitable habitat is not present within the site and surrounds.
Petauroides volans	Greater glider	V	E	Nest in hollows of tall trees, emerging at night to feed on eucalypt leaves and flower buds.	Unlikely. Minimal suitable habitat is present, and will not be negatively impacted by the removal of bamboo.
Phascolarctos cinereus	Koala	V	V	A range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species – (food and shelter trees)	Unlikely. Minimal suitable habitat is present, and will not be negatively impacted by the removal of bamboo.
Pseudomys novaehollandiae	New Holland mouse	V	Not listed	Open heathland, open woodland with a heathland understorey or vegetated sand dunes on sandy loose soil.	Unlikely. Minimal suitable habitat is present, and will not be negatively impacted by the removal of bamboo.
Pteropus poliocephalus	Grey-headed flying-fox	V	V	Sub-tropical and temperate rainforest, tall open forest, swamps, heaths and urban areas. Roosting sites usually in dense forest adjacent to waterbodies. Forages within 50	Roosting known to occur within area. This management plan is focussed on this species. Therefore no further assessment is included in this section.

Species name	Common name	Status		Habitat description	Likelihood of occurrence/impact.
		EPBC Act	BC Act		
				km of camp in flowering trees or rainforests, eucalypts, paperbarks and banksias	
Flora					
Allocasuarina defungens	Dwarf heath casuarina	E	E	Grows mainly in tall heath on sand, but can also occur on clay soils and sandstone.	Very unlikely. Suitable habitat is not present within the site and surrounds.
Cryptostylis hunteriana	Leafless tongue-orchid	V	V	Does not have a well-defined habitat preference – can be found in a range of communities including swamp-heath and woodland.	Unlikely. Minimal suitable habitat is present, and will not be negatively impacted by the removal of bamboo
Cynanchum elegans	White-flowered wax plant	E	E	Usually found on the edge of dry rainforest vegetation.	Very unlikely. Suitable habitat is not present within the site and surrounds
Macadamia integrifolia	Macadamia nut	V	Not listed	Remnant rainforest, including complex mixed notophyll forest, and prefers partially open areas such as rainforest edges	Very unlikely. Suitable habitat is not present within the site and surrounds
Phaius australis	Lesser swamp-orchid	E	E	Found in swampy grassland or swampy forest including rainforest, eucalypt or paperback forest, mostly in coastal areas.	Very unlikely. Suitable habitat is not present within the site and surrounds
Thesium australe	Austral toadflax	V	V	Shrubland, grassland or woodland, often on damp sites. Vegetation types include open grassy heath dominated by Swamp Myrtle (*Leptospermum myrtifolium*), Small-fruit Hakea (*Hakea microcarpa*), Alpine Bottlebrush (*Callistemon sieberi*), Woolly Grevillea (*Grevillea lanigera*), Coral Heath (*Epacris microphylla*) and Poa spp; Kangaroo Grass grassland surrounded by Eucalyptus	Very unlikely. Suitable habitat is not present within the site and surrounds

Species name	Common name	Status		Habitat description	Likelihood of occurrence/impact.
		EPBC Act	BC Act		
				woodland; and grassland dominated by Barbed-wire Grass (*Cymbopogon refractus*)	
Threatened ecological communities					
Lowland rainforest of subtropical Australia		CE		.	Community does not occur within the site or immediate surrounds.

6. Flying-fox ecology and behaviour

6.1 Ecological role

Flying-foxes, along with some birds, make a unique contribution to ecosystem health through their ability to move seeds and pollen over long distances (Southerton et al. 2004). This contributes directly to the reproduction, regeneration and viability of forest ecosystems (DoE 2016a).

It is estimated that a single flying-fox can disperse up to 60,000 seeds in one night (ELW&P 2015). Some plants, particularly Corymbia spp., have adaptations suggesting they rely more heavily on nocturnal visitors such as bats for pollination than daytime pollinators (Southerton et al. 2004).

Grey-headed flying-foxes may travel 100 km in a single night with a foraging radius of up to 50 km from their camp (McConkey et al. 2012), and have been recorded travelling over 500 km in two days between camps (Roberts et al. 2012). In comparison bees, another important pollinator, move much shorter foraging distances of generally less than one kilometre (Zurbuchen et al. 2010).

Long-distance seed dispersal and pollination makes flying-foxes critical to the long-term persistence of many plant communities (Westcott et al. 2008; McConkey et al. 2012), including eucalypt forests, rainforests, woodlands and wetlands (Roberts et al. 2006). Seeds that are able to germinate away from their parent plant have a greater chance of growing into a mature plant (EHP 2012). Long-distance dispersal also allows genetic material to be spread between forest patches that would normally be geographically isolated (Parry-Jones & Augee 1992; Eby 1991; Roberts 2006). This genetic diversity allows species to adapt to environmental change and respond to disease pathogens. Transfer of genetic material between forest patches is particularly important in the context of contemporary fragmented landscapes.

Flying-foxes are considered ‘keystone’ species given their contribution to the health, longevity and diversity among and between vegetation communities. These ecological services ultimately protect the long-term health and biodiversity of Australia’s bushland and wetlands. In turn, native forests act as carbon sinks, provide habitat for other fauna and flora, stabilise river systems and catchments, add value to production of hardwood timber, honey and fruit (e.g. bananas and mangoes; Fujita 1991), and provide recreational and tourism opportunities worth millions of dollars each year (EHP 2012; ELW&P 2015).

6.2 Flying-foxes in urban areas

Flying-foxes appear to be roosting and foraging in urban areas more frequently. There are many possible drivers for this, as summarised by Tait et al. (2014):

- loss of native habitat and urban expansion
- opportunities presented by year-round food availability from native and exotic species found in expanding urban areas

- disturbance events such as drought, fires, cyclones
- human disturbance or culling at non-urban roosts or orchards
- urban effects on local climate
- refuge from predation
- movement advantages, e.g. ease of manoeuvring in flight due to the open nature of the habitat or ease of navigation due to landmarks and lighting.

6.3 Under threat

Flying-foxes roosting and foraging in urban areas more frequently can give the impression that their populations are increasing; however, the grey-headed flying-fox is in decline across its range and in 2001 was listed as vulnerable by the NSW Government through the BC Act.

At the time of listing, the species was considered eligible for listing as vulnerable as counts of flying-foxes over the previous decade suggested that the national population may have declined by up to 30%. It was also estimated that the population would continue to decrease by at least 20% in the next three generations given the continuation of the current rate of habitat loss and culling.

The main threat to grey-headed flying-foxes in NSW is clearing or modification of native vegetation. This threatening process removes appropriate roosting and breeding sites and limits the availability of natural food resources, particularly winter–spring feeding habitat in north-eastern NSW. The urbanisation of the coastal plains of south-eastern Queensland and northern NSW has seen the removal of annually-reliable winter feeding sites, and this threatening process continues.

There is a wide range of ongoing threats to the survival of the GHFF, including:

- habitat loss and degradation
- conflict with humans (including culling at orchards)
- infrastructure-related mortality (e.g. entanglement in barbed wire fencing and fruit netting, power line electrocution, etc.)
- predation by native and introduced animals
- exposure to extreme natural events such as cyclones, drought and heat waves.

Flying-foxes have limited capacity to respond to these threats and recover from large population losses due to their slow sexual maturation, small litter size, long gestation and extended maternal dependence (McIlwee & Martin 2002).

6.4 Camp characteristics

All flying-foxes are nocturnal, roosting during the day in communal camps. These camps may range in number from a few to hundreds of thousands, with individual animals frequently moving between camps within their range. Typically, the abundance of resources within a 20–

50 kilometre radius of a camp site will be a key determinant of the size of a camp (SEQ Catchments 2012). Therefore, flying-fox camps are generally temporary and seasonal, tightly tied to the flowering of their preferred food trees. However, understanding the availability of feeding resources is difficult because flowering and fruiting are not reliable every year, and can vary between localities (SEQ Catchments 2012). These are important aspects of camp preference and movement between camps, and have implications for long-term management strategies.

Little is known about flying-fox camp preferences; however, research indicates that apart from being in close proximity to food sources, flying-foxes choose to roost in vegetation with at least some of the following general characteristics (SEQ Catchments 2012):

- closed canopy >5 metres high
- dense vegetation with complex structure (upper, mid- and understorey layers)
- within 500 metres of permanent water source
- within 50 kilometres of the coastline or at an elevation <65 metres above sea level
- level topography (<5° incline)
- greater than one hectare to accommodate and sustain large numbers of flying-foxes.

Optimal vegetation available for flying-foxes must allow movement between preferred areas of the camp. Specifically, it is recommended that the size of a patch be approximately three times the area occupied by flying-foxes at any one time (SEQ Catchments 2012).

6.5 Species profiles

6.5.1 Black flying-fox (*Pteropus alecto*)

Figure 12 Black flying-fox indicative species distribution, adapted from OEH 2015a

The black flying-fox (BFF) (Figure 12) has traditionally occurred throughout coastal areas from Shark Bay in Western Australia, across Northern Australia, down through Queensland and into NSW (Churchill 2008; OEH 2015a). Since it was first described there has been a substantial southerly shift by the BFF (Webb & Tidemann 1995). This shift has consequently led to an increase in indirect competition with the threatened GHFF, which appears to be favouring the BFF (DoE 2016a).

They forage on the fruit and blossoms of native and introduced plants (Churchill 2008; OEH 2015a), including orchard species at times.

BFF are largely nomadic animals with movement and local distribution influenced by climatic variability and the flowering and fruiting patterns of their preferred food plants. Feeding commonly occurs within 20 kilometres of the camp site (Markus & Hall 2004).

BFF usually roost beside a creek or river in a wide range of warm and moist habitats, including lowland rainforest gullies, coastal stringybark forests and mangroves. During the breeding season camp sizes can change significantly in response to the availability of food and the arrival of animals from other areas.

6.5.2 Grey-headed flying-fox (*Pteropus poliocephalus*)

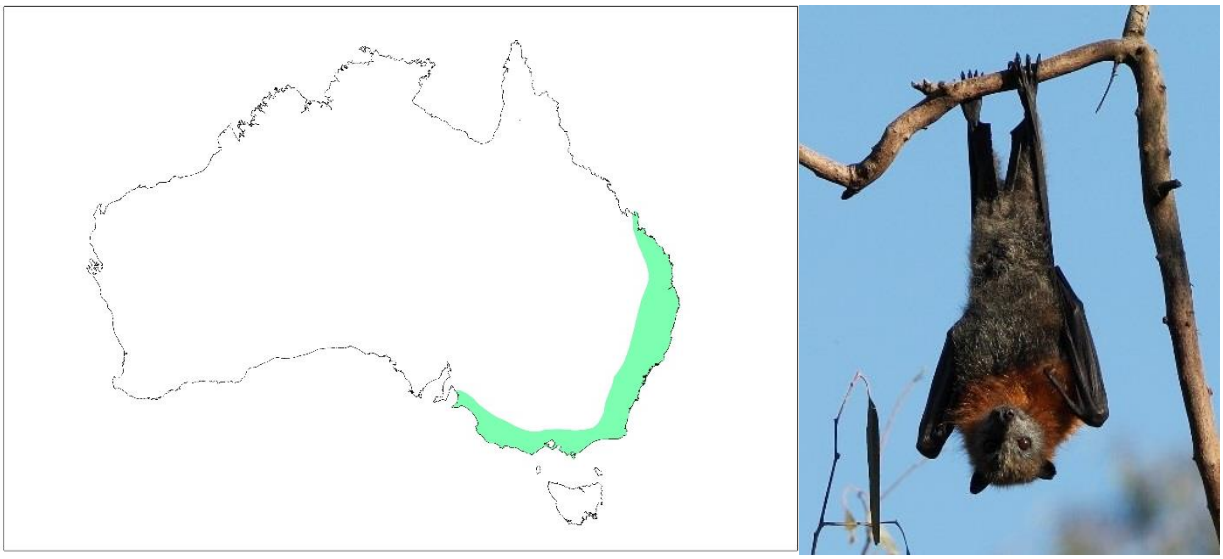

Figure 13 Grey-headed flying-fox indicative species distribution, adapted from OEH 2015a

The grey-headed flying-fox (GHFF) (Figure 13) is found throughout eastern Australia, generally within 200 kilometres of the coast, from Finch Hatton in Queensland to Melbourne, Victoria (OEH 2015d). This species now ranges into South Australia and has been observed in Tasmania (DoE 2016a). It requires foraging resources and camp sites within rainforests, open forests, closed and open woodlands (including melaleuca swamps and banksia woodlands). This species is also found throughout urban and agricultural areas where food trees exist and will raid orchards at times, especially when other food is scarce (OEH 2015a).

All the GHFF in Australia are regarded as one population that moves around freely within its entire national range (Webb & Tidemann 1996; DoE 2015). GHFF may travel up to 100 km in a single night with a foraging radius of up to 50 kilometres from their camp (McConkey et al. 2012). They have been recorded travelling over 500 kilometres over 48 hours when moving from one camp to another (Roberts et al. 2012). GHFF generally show a high level of fidelity to camp sites, returning year after year to the same site, and have been recorded returning to the same branch of a particular tree (SEQ Catchments 2012). This may be one of the reasons flying-foxes continue to return to small urban bushland blocks that may be remnants of historically-used larger tracts of vegetation.

The GHFF population has a generally annual southerly movement in spring and summer, with their return to the coastal forests of north-east NSW and south-east Queensland in winter (Ratcliffe 1932; Eby 1991; Parry-Jones & Augee 1992; Roberts et al. 2012). This results in large fluctuations in the number of GHFF in NSW, ranging from as few as 20% of the total population in winter up to around 75% of the total population in summer (Eby 2000). They are widespread throughout their range during summer, but in spring and winter are uncommon in the south. In autumn they occupy primarily coastal lowland camps and are uncommon inland and on the south coast of NSW (DECCW 2009).

There is evidence the GHFF population declined by up to 30% between 1989 and 2000 (Birt 2000; Richards 2000 cited in OEH 2011a). There is a wide range of ongoing threats to the

survival of the GHFF, including habitat loss and degradation, deliberate destruction associated with the commercial horticulture industry, conflict with humans, infrastructure-related mortality (e.g. entanglement in barbed wire fencing and fruit netting, power line electrocution, etc.) and competition and hybridisation with the BFF (DECCW 2009). For these reasons it is listed as vulnerable to extinction under NSW and federal legislation (see Section 4).

6.5.3 Little red flying-fox (*Pteropus scapulatus*)

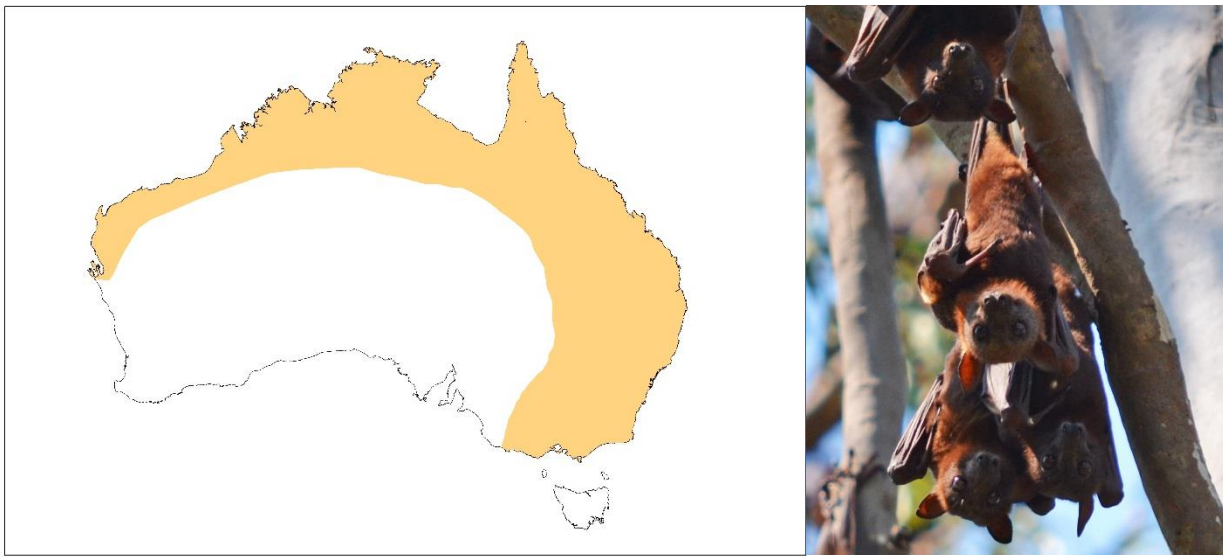

Figure 14 Little red flying-fox indicative species distribution, adapted from OEH 2015a

The little red flying-fox (LRFF) (Figure 14) is widely distributed throughout northern and eastern Australia, with populations occurring across northern Australia and down the east coast into Victoria.

The LRFF forages almost exclusively on nectar and pollen, although will eat fruit at times and occasionally raids orchards (Australian Museum 2010). LRFF often move sub-continental distances in search of sporadic food supplies. The LRFF has the most nomadic distribution, strongly influenced by availability of food resources (predominantly the flowering of eucalypt species) (Churchill 2008), which means the duration of their stay in any one place is generally very short.

Habitat preferences of this species are quite diverse and range from semi-arid areas to tropical and temperate areas, and can include sclerophyll woodland, melaleuca swamplands, bamboo, mangroves and occasionally orchards (IUCN 2015). LRFF are frequently associated with other *Pteropus* species. In some colonies, LRFF individuals can number many hundreds of thousands and they are unique among *Pteropus* species in their habit of clustering in dense bunches on a single branch. As a result, the weight of roosting individuals can break large branches and cause significant structural damage to roost trees, in addition to elevating soil nutrient levels through faecal material (SEQ Catchments 2012).

Throughout its range, populations within an area or occupying a camp can fluctuate widely. There is a general migration pattern in LRFF, whereby large congregations of over one million individuals can be found in northern camp sites (e.g. Northern Territory, North Queensland) during key breeding periods (Vardon & Tidemann 1999). LRFF travel south to visit the coastal areas of south-east Queensland and NSW during the summer months. Outside these periods LRFF undertake regular movements from north to south during winter–spring (July–October) (Milne & Pavey 2011).

6.5.4 Reproduction

Black and grey-headed flying-foxes

Males initiate contact with females in January with peak conception occurring around March to April/May; this mating season represents the period of peak camp occupancy (Markus 2002). Young (usually a single pup) are born six months later from September to November (Churchill 2008). The birth season becomes progressively earlier, albeit by a few weeks, in more northerly populations (McGuckin & Blackshaw 1991), however out of season breeding is common with births occurring later in the year.

Young are highly dependent on their mother for food and thermoregulation. Young are suckled and carried by the mother until approximately four weeks of age (Markus & Blackshaw 2002). At this time they are left at the camp during the night in a crèche until they begin foraging with their mother in January and February (Churchill 2008) and are usually weaned by six months of age around March. Sexual maturity is reached at two years of age with a life expectancy up to 20 years in the wild (Pierson & Rainey 1992).

As such, the critical reproductive period for GHFF and BFF is generally from August (when females are in final trimester) to the end of peak conception around April. Dependent pups are usually present from September to March (see Figure 15).

Little red flying-fox

The LRFF breeds approximately six months out of phase with the other flying-foxes. Peak conception occurs around October to November, with young born between March and June (McGuckin & Blackshaw 1991; Churchill 2008) (Figure 15). Young are carried by their mother for approximately one month then left at the camp while she forages (Churchill 2008). Suckling occurs for several months while young are learning how to forage. LRFF generally birth and rear young in temperate areas (rarely in NSW).

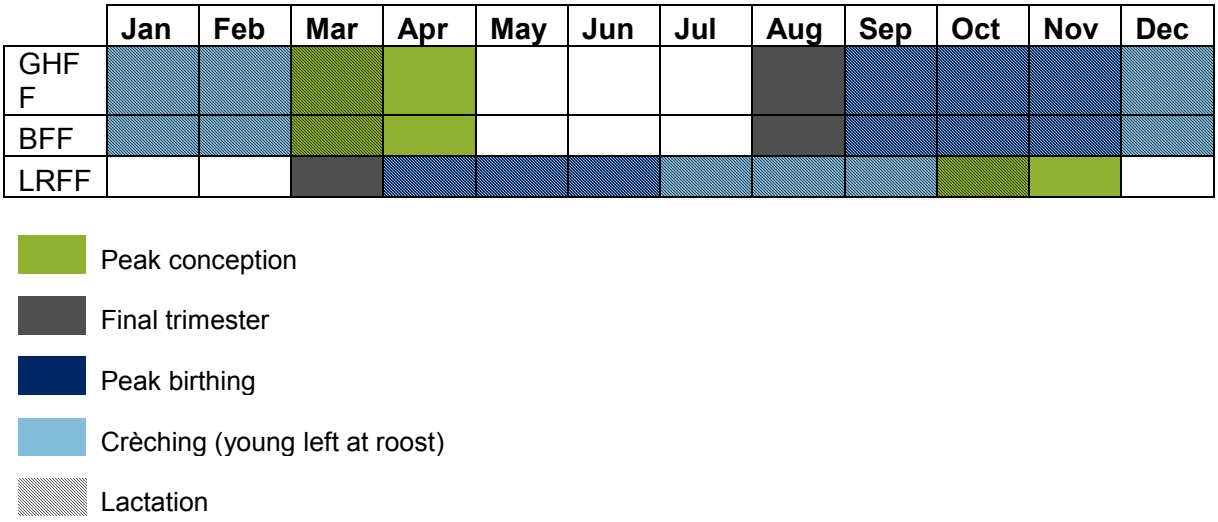

Figure 15 Indicative flying-fox reproductive cycle. Note that LRFF rarely birth and rear young in NSW. The breeding season of all species is variable between years and location, and expert assessment is required to accurately determine phases in the breeding cycle.

7. Human and animal health

Flying-foxes, like all animals, carry pathogens that may pose human health risks. Many of these are viruses which cause only asymptomatic infections in flying-foxes themselves but may cause significant disease in other animals that are exposed. In Australia the most well-defined of these include Australian bat lyssavirus (ABLV), Hendra virus (HeV) and Menangle virus. Specific information on these viruses is provided in Appendix 4.

Outside of an occupational cohort, including wildlife carers and vets, human exposure to these viruses is extremely rare and similarly transmission rates and incidence of human infection are very low. In addition, HeV infection in humans apparently requires transfer from an infected intermediate equine host and direct transmission from bats to humans has not been reported. Thus despite the fact that human infection with these agents can be fatal, the probability of infection is extremely low and the overall public health risk is judged to be low (Qld Health 2016).

7.1 Disease and flying-fox management

A recent study at several camps before, during and after disturbance (Edson et al. 2015) showed no statistical association between HeV prevalence and flying-fox disturbance. However the consequences of chronic or ongoing disturbance and harassment and its effect on HeV infection were not within the scope of the study and are therefore unknown.

The effects of stress are linked to increased susceptibility and expression of disease in both humans (AIHW 2012) and animals (Henry & Stephens-Larson 1985; Aich et. al. 2009), including reduced immunity to disease.

Therefore it can be assumed that management actions which may cause stress (e.g. dispersal), particularly over a prolonged period or at times where other stressors are increased (e.g. food shortages, habitat fragmentation, etc.), are likely to increase the susceptibility and prevalence of disease within the flying-fox population, and consequently the risk of transfer to humans.

Furthermore, management actions or natural environmental changes may increase disease risk by:

- forcing flying-foxes into closer proximity to one another, increasing the probability of disease transfer between individuals and within the population
- resulting in abortions and/or dropped young if inappropriate methods are used during critical periods of the breeding cycle. This will increase the likelihood of direct interaction between flying-foxes and the public, and potential for disease exposure
- adoption of inhumane methods with potential to cause injury which would increase the likelihood of the community coming into contact with injured/dying flying-foxes.

The potential to increase disease risk should be carefully considered as part of a full risk assessment when determining the appropriate level of management and the associated mitigation measures required.

8. Camp management options

8.1 Level 1 actions: routine camp management

8.1.1 Education and awareness programs

This management option involves undertaking a comprehensive and targeted flying-fox education and awareness program to provide accurate information to the local community about flying-foxes.

Such a program would include managing risk and alleviating concern about health and safety issues associated with flying-foxes, options available to reduce impacts from roosting and foraging flying-foxes, an up-to-date program of works being undertaken at the camp, and information about flying-fox numbers and flying-fox behaviour at the camp.

Residents should also be made aware that faecal drop and noise at night is mainly associated with plants that provide food, independent of camp location. Staged removal of foraging species such as fruit trees and palms from residential yards, or management of fruit (e.g. bagging, pruning) will greatly assist in mitigating this issue.

Collecting and providing information should always be the first response to community concerns in an attempt to alleviate issues without the need to actively manage flying-foxes or their habitat. Where it is determined that management is required, education should similarly be a key component of any approach. See also Section 3 and incorporate an education and awareness program into any community engagement plan.

An education program may include components shown in Figure 16.

The likelihood of improving community understanding of flying-fox issues is high. However, the extent to which that understanding will help alleviate conflict issues is probably less so. Extensive education for decision-makers, the media and the broader community may be required to overcome negative attitudes towards flying-foxes.

It should be stressed that a long-term solution to the issue resides with better understanding flying-fox ecology and applying that understanding to careful urban planning and development.

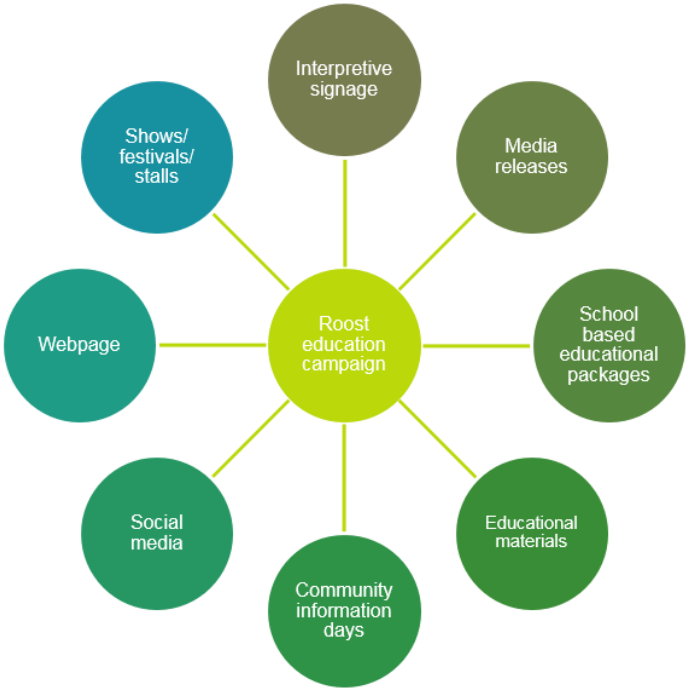

Figure 16 Possible components of an education program

8.1.2 Property modification without subsidies

The managers of land on which a flying-fox camp is located would promote or encourage the adoption of certain actions on properties adjacent or near to the camp to minimise impacts from roosting and foraging flying-foxes (note that approval may be required for some activities, refer to Section 4 for further information):

- Create visual/sound/smell barriers with fencing or hedges. To avoid attracting flying-foxes, species selected for hedging should not produce edible fruit or nectar-exuding flowers, should grow in dense formation between two and five metres (Roberts 2006) (or be maintained at less than 5 metres). Vegetation that produces fragrant flowers can assist in masking camp odour where this is of concern.
- Manage foraging trees (i.e. plants that produce fruit/nectar-exuding flowers) within properties through pruning/covering with bags or wildlife friendly netting, early removal of fruit, or tree replacement.
- Cover vehicles, structures and clothes lines where faecal contamination is an issue, or remove washing from the line before dawn/dusk.
- Move or cover eating areas (e.g. BBQs and tables) within close proximity to a camp or foraging tree to avoid contamination by flying-foxes.
- Install double-glazed windows, insulation and use air-conditioners when needed to reduce noise disturbance and smell associated with a nearby camp.
- Follow horse husbandry and property management guidelines provided at the NSW Department of Primary Industries Hendra virus web page (DPI 2015a).

- Include suitable buffers and other provisions (e.g. covered car parks) in planning of new developments.
- Turn off lighting at night which may assist flying-fox navigation and increase fly-over impacts.
- Consider removable covers for swimming pools and ensure working filter and regular chlorine treatment.
- Appropriately manage rainwater tanks, including installing first-flush systems.
- Avoid disturbing flying-foxes during the day as this will increase camp noise.

The cost would be borne by the person or organisation who modifies the property; however, opportunities for funding assistance (e.g. environment grants) may be available for management activities that reduce the need to actively manage a camp.

8.1.3 Property modification subsidies

Fully funding or providing subsidies to property owners for property modifications may be considered to manage the impacts of the flying-foxes. Providing subsidies to install infrastructure may improve the value of the property, which may also offset concerns regarding perceived or actual property value or rental return losses.

The level and type of subsidy would need to be agreed to by the entity responsible for managing the flying-fox camp.

8.1.4 Service subsidies

This management option involves providing property owners with a subsidy to help manage impacts on the property and lifestyle of residents. The types of services that could be subsidised include clothes washing, cleaning outside areas and property, car washing or power bills. Rate reductions could also be considered.

Critical thresholds of flying-fox numbers at a camp and distance to a camp may be used to determine when subsidies would apply.

8.1.5 Routine camp maintenance and operational activities

Examples of routine camp management actions are provided in the Policy. These include:

- removal of tree limbs or whole trees that pose a genuine health and safety risk, as determined by a qualified arborist
- weed removal, including removal of noxious weeds under the *Noxious Weeds Act 1993*, or species listed as undesirable by a council
- trimming of understorey vegetation or the planting of vegetation
- minor habitat augmentation for the benefit of the roosting animals
- mowing of grass and similar grounds-keeping actions that will not create a major disturbance to roosting flying-foxes

- application of mulch or removal of leaf litter or other material on the ground.

Protocols should be developed for carrying out operations that may disturb flying-foxes, which can result in excess camp noise. Such protocols could include limiting the use of disturbing activities to certain days or certain times of day in the areas adjacent to the camp, and advising adjacent residents of activity days. Such activities could include lawn-mowing, using chainsaws, whipper-snippers, using generators and testing alarms or sirens.

8.1.6 Revegetation and land management to create alternative habitat

This management option involves revegetating and managing land to create alternative flying-fox roosting habitat through improving and extending existing low-conflict camps or developing new roosting habitat in areas away from human settlement.

Selecting new sites and attempting to attract flying-foxes to them has had limited success in the past, and ideally habitat at known camp sites would be dedicated as a flying-fox reserve. However, if a staged and long-term approach is used to make unsuitable current camps less attractive, whilst concurrently improving appropriate sites, it is a viable option (particularly for the transient and less selective LRFF). Supporting further research into flying-fox camp preferences may improve the potential to create new flying-fox habitat.

When improving a site for a designated flying-fox camp, preferred habitat characteristics detailed in Section 6.4 should be considered.

Foraging trees planted amongst and surrounding roost trees (excluding in/near horse paddocks) may help to attract flying-foxes to a desired site. They will also assist with reducing foraging impacts in residential areas. Consideration should be given to tree species that will provide year-round food, increasing the attractiveness of the designated site. Depending on the site, the potential negative impacts to a natural area will need to be considered if introducing non-indigenous plant species.

The presence of a water source is likely to increase the attractiveness of an alternative camp location. Supply of an artificial water source should be considered if unavailable naturally, however this may be cost-prohibitive.

Potential habitat mapping using camp preferences (see Section 6.4) and suitable land tenure can assist in initial alternative site selection. A feasibility study would then be required prior to site designation to assess likelihood of success and determine the warranted level of resource allocated to habitat improvement.

8.1.7 Provision of artificial roosting habitat

This management option involves constructing artificial structures to augment roosting habitat in current camp sites or to provide new roosting habitat. Trials using suspended ropes have been of limited success as flying-foxes only used the structures that were very close to the available natural roosting habitat. It is thought that the structure of the vegetation below and around the ropes is important.

8.1.8 Protocols to manage incidents

This management option involves implementing protocols for managing incidents or situations specific to particular camps. Such protocols may include 'bat watch' patrols at sites that host vulnerable people, management of pets at sites popular for walking dogs or heat stress incidents (when the camp is subjected to extremely high temperatures leading to flying-foxes changing their behaviour and/or dying).

8.1.9 Participation in research

This management option involves participating in research to improve knowledge of flying-fox ecology to address the large gaps in our knowledge about flying-fox habits and behaviours and why they choose certain sites for roosting. Further research and knowledge sharing at local, regional and national levels will enhance our understanding and management of flying-fox camps.

8.1.10 Appropriate land-use planning

Land-use planning instruments may be able to be used to ensure adequate distances are maintained between future residential developments and existing or historical flying-fox camps. While this management option will not assist in the resolution of existing land-use conflict, it may prevent issues for future residents.

8.1.11 Property acquisition

Property acquisition may be considered if negative impacts cannot be sufficiently mitigated using other measures. This option will clearly be extremely expensive, however is likely to be more effective than dispersal and in the long-term may be less costly.

8.1.12 Do nothing

The management option to 'do nothing' involves not undertaking any management actions in relation to the flying-fox camp and leaving the situation and site in its current state.

8.2 Level 2 actions: in-situ management

8.2.1 Buffers

Buffers can be created through vegetation removal and/or the installation of permanent/semi-permanent deterrents.

Creating buffers may involve planting low-growing or spiky plants between residents or other conflict areas and the flying-fox camp. Such plantings can create a visual buffer between the camp and residences or make areas of the camp inaccessible to humans.

Buffers greater than 300 metres are likely to be required to fully mitigate amenity impacts (SEQ Catchments 2012). The usefulness of a buffer to mitigate odour and noise impacts generally declines if the camp is within 50 metres of human habitation (SEQ Catchments 2012), however any buffer will assist and should be as wide as the site allows.

Buffers through vegetation removal

Vegetation removal aims to alter the area of the buffer habitat sufficiently so that it is no longer suitable as a camp. The amount required to be removed varies between sites and camps, ranging from some weed removal to removal of most of the canopy vegetation.

Any vegetation removal should be done using a staged approach, with the aim of removing as little native vegetation as possible. This is of particular importance at sites with other values (e.g. ecological or amenity), and in some instances the removal of any native vegetation will not be appropriate. Thorough site assessment, further to desktop searches, will inform whether vegetation management is suitable (e.g. can impacts to other wildlife and/or the community be avoided?).

Removing vegetation can also increase visibility into the camp and noise issues for neighbouring residents which may create further conflict.

Suitable experts (Appendix 5) should be consulted to assist selective vegetation trimming/removal to minimise vegetation loss and associated impacts.

The importance of under- and mid-storey vegetation in the buffer area for flying-foxes during heat stress events also requires consideration.

Buffers without vegetation removal

Permanent or semi-permanent deterrents can be used to make buffer areas unattractive to flying-foxes for roosting, without the need for vegetation removal. This is often an attractive option where vegetation has high ecological or amenity value.

While many deterrents have been trialled in the past with limited success, there are some options worthy of further investigation:

- Visual deterrents – Visual deterrents such as plastic bags, fluoro vests (GeoLINK 2012) and balloons (Ecosure 2016, pers. comm.) in roost trees have shown to have localised effects, with flying-foxes deterred from roosting within 1–10 metres of the deterrents. The type and placement of visual deterrents would need to be varied regularly to avoid habituation.
- Noise emitters on timers – Noise needs to be random, varied and unexpected to avoid flying-foxes habituating. As such these emitters would need to be portable, on varying timers and a diverse array of noises would be required. It is likely to require some level of additional disturbance to maintain its effectiveness, and ways to avoid disturbing flying-foxes from desirable areas would need to be identified. This is also likely to be disruptive to nearby residents.
- Smell deterrents – For example, bagged python excrement hung in trees has previously had a localised effect (GeoLINK 2012). The smell of certain deterrents may also impact nearby residents, and there is potential for flying-foxes to habituate.
- Canopy-mounted water sprinklers – This method has been effective in deterring flying-foxes during dispersals (Ecosure personal experience), and a current trial in

Queensland is showing promise for keeping flying-foxes out of designated buffer zones. This option can be logistically difficult (installation and water sourcing) and may be cost-prohibitive. Design and use of sprinklers need to be considerate of animal welfare and features of the site. For example, misting may increase humidity and exacerbate heat stress events, and overuse may impact other environmental values of the site.

Note that any deterrent with a high risk of causing inadvertent dispersal may be considered a Level 3 action.

The use of visual deterrents, in the absence of effective maintenance, could potentially lead to an increase in rubbish in the natural environment.

8.2.2 Noise attenuation fencing

Noise attenuation fencing could be installed in areas where the camp is particularly close to residents. This may also assist with odour reduction, and perspex fencing could be investigated to assist fence amenity. Although expensive to install, this option could negate the need for habitat modification, maintaining the ecological values of the site, and may be more cost-effective than ongoing management.

8.3 Level 3 actions: disturbance or dispersal

8.3.1 Nudging

Noise and other low intensity active disturbance restricted to certain areas of the camp can be used to encourage flying-foxes away from high conflict areas. This technique aims to actively 'nudge' flying-foxes from one area to another, while allowing them to remain at the camp site.

Unless the area of the camp is very large, nudging should not be done early in the morning as this may lead to inadvertent dispersal of flying-foxes from the entire camp site. Disturbance during the day should be limited in frequency and duration (e.g. up to four times per day for up to 10 minutes each) to avoid welfare impacts. As with dispersal, it is also critical to avoid periods when dependent young are present (as identified by a flying-fox expert).

8.3.2 Dispersal

Dispersal aims to encourage a camp to move to another location, through either disturbance or habitat modification.

Dispersal can broadly be categorised as 'passive' or 'active' as detailed below.

Passive dispersal

Removing vegetation in a staged manner can be used to passively disperse a camp, by gradually making the habitat unattractive so that flying-foxes will disperse of their own accord over time with little stress (rather than being more forcefully moved with noise, smoke, etc.). This is less stressful to flying-foxes, and greatly reduces the risk of splinter colonies forming in other locations (as flying-foxes are more likely to move to other known sites within their camp

network when not being forced to move immediately, as in active dispersal).

Generally, a significant proportion of vegetation needs to be removed in order to achieve dispersal of flying-foxes from a camp or to prevent camp re-establishment. For example, flying-foxes abandoned a camp in Bundall, Queensland once 70% of the canopy/mid-storey and 90% of the understorey had been removed (Ecosure 2011). Ongoing maintenance of the site is required to prevent vegetation structure returning to levels favourable for colonisation by flying-foxes. Importantly, at nationally important camps (defined in Section 4.2.1) sufficient vegetation must be retained to accommodate the maximum number of flying-foxes recorded at the site.

This option may be preferable in situations where the vegetation is of relatively low ecological and amenity value, and alternative known permanent camps are located nearby with capacity to absorb the additional flying-foxes. While the likelihood of splinter colonies forming is lower than with active dispersal, if they do form following vegetation modification there will no longer be an option to encourage flying-foxes back to the original site. This must be carefully considered before modifying habitat.

Active dispersal through disturbance

Dispersal is more effective when a wide range of tools are used on a randomised schedule with animals less likely to habituate (Ecosure pers. obs. 1997–2015). Each dispersal team member should have at least one visual and one aural tool that can be used at different locations on different days (and preferably swapped regularly for alternate tools). Exact location of these and positioning of personnel will need to be determined on a daily basis in response to flying-fox movement and behaviour, as well as prevailing weather conditions (e.g. wind direction for smoke drums).

Active dispersal will be disruptive for nearby residents given the timing and nature of activities, and this needs to be considered during planning and community consultation.

This method does not explicitly use habitat modification as a means to disperse the camp, however if dispersal is successful, some level of habitat modification should be considered. This will reduce the likelihood of flying-foxes attempting to re-establish the camp and the need for follow-up dispersal as a result. Ecological and aesthetic values will need to be considered for the site, with options for modifying habitat the same as those detailed for buffers above.

There is a range of potential risks, costs and legal implications that are greatly increased with dispersal (compared with in-situ management as above).

These include:

- impact on animal welfare and flying-fox conservation
- splintering the camp into other locations that are equally or more problematic
- shifting the issue to another area
- impact on habitat value
- effects on the flying-fox population, including disease status and associated public health risk

- impacts to nearby residents associated with ongoing dispersal attempts
- excessive initial and/or ongoing capacity and financial investment
- negative public perception and backlash
- increased aircraft strike risk associated with changed flying-fox movement patterns
- unsuccessful management requiring multiple attempts, which may exacerbate all of the above.

A summary of all recorded dispersals to 2014 is provided in Appendix 6, which demonstrates costs and issues involved.

8.4 Unlawful activities

8.4.1 Culling

Culling is addressed here as it is often raised by community members as a preferred management method; however, culling is contrary to the objects of the BC Act and will not be permitted as a method to manage flying-fox camps.

8.5 Site-specific analysis of camp management options

Table 3 Analysis of management options; definitions and descriptions of each management option are provided in Section 8. $ = Low cost (<$10,000); $$ = Moderate cost ($10,000-$99,000); $$$ = High cost (i.e. >$100,000).

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Site-specific detail and actions
Level 1 actions					
Education and awareness programs	Fear of disease Noise Smell Faecal drop	$	Low cost, promotes conservation of FFs, contributes to attitude change which may reduce general need for camp intervention, increasing awareness and providing options for landholders to reduce impacts can be an effective long-term solution, can be undertaken quickly, will not impact on ecological or amenity value of the site.	Education and advice itself will not mitigate all issues, and may be seen as not doing enough.	Kempsey Shire Council will provide educational material on its website, and links to other relevant information. Council will also continue to consult directly with affected community members to ensure they understand the actual (low) risk, seasonal patterns, and are aware of measures to mitigate risk and impacts. Interpretative signage will be considered for Rudder Park and Riverview Park. The potential to promote viewing the fly-out from Riverview Park will also be investigated, which as a tourist attraction would benefit the local community. For example, since 1984 Batty Boat Cruises have been run regularly for tourists to watch flying-foxes leave their roosts from the Brisbane River.
Property modification / service subsidies	Noise Smell Faecal drop Health/wellbeing Property devaluation Lost rental return	$–$$	Property modification is one of the most effective ways to reduce amenity impacts of a camp without dispersal (and associated risks), relatively low cost, promotes conservation of FFs, can be undertaken quickly, will not impact on the site, may add value to the property. Subsidising services (e.g. cleaning) may also encourage tolerance of living near a camp.	May be cost-prohibitive for private landholders, unlikely to fully mitigate amenity issues in outdoor areas.	Council will ensure nearby residents are aware of ways to modify property that will both increase property value and reduce impacts from flying-foxes. Council will also investigate the feasibility of a subsidy program to assist nearby residents and business with property modification, services (e.g. cleaning), rate reductions, or other assistance (e.g. car covers, clothes line covers, free pressure cleaners hire, etc.).

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Site-specific detail and actions
Routine camp management	Health/wellbeing	$	Will allow property maintenance, likely to improve habitat, could improve public perception of the site, will ensure safety risks of a public site can be managed. Weed removal has the potential to reduce roost availability and reduce numbers of roosting FFs. To avoid this, weed removal should be staged and alternative roost habitat planted, otherwise activities may constitute a Level 3 action.	Will not generally mitigate amenity impacts for nearby landholders.	Properties can be maintained provided actions are not aimed at disturbing the camp. Intentional disturbance without a licence from OEH is a breach of legislation and may be prosecuted.
Alternative habitat creation	All	$$–$$$	If successful in attracting FFs away from high conflict areas, dedicated habitat in low conflict areas will mitigate all impacts, promotes FF conservation. Rehabilitation of degraded habitat that is likely to be suitable for FF use could be a more practical and faster approach than habitat creation.	Generally costly, long-term approach so cannot be undertaken quickly, previous attempts to attract FFs to a new site have not been known to succeed.	Council will investigate the potential for staged bamboo removal, in combination with planting fast-growing, suitable roost trees away from adjacent residents. This would form part of a long-term approach to management, as sufficient roost habitat must be available at all times to ensure flying-foxes are not displaced to neighbouring residences. The aim of such habitat creation is not to have a net increase in roost space (and potential flying-fox numbers) but to incrementally replace exotic bamboo at the site.
Provision of artificial roosting habitat	All	$–$$	If successful in attracting FFs away from high conflict areas, artificial roosting habitat in low conflict areas will assist in mitigating all impacts, generally low cost, can be undertaken quickly, promotes FF conservation.	Would need to be combined with other measures (e.g. buffers/alternative habitat creation) to mitigate impacts, previous attempts have had limited success.	This option may be considered as part of a long-term strategy to replace exotic bamboo, however is not being considered during the life of the Plan.
Protocols to manage incidents	Health/wellbeing	$	Low cost, will reduce actual risk of negative human/pet–FF interactions, promotes conservation of FFs, can be undertaken quickly, will not impact the site.	Will not generally mitigate amenity impacts.	Council will ensure the following protocols are in place for staff, and to advise the community: • What to do if a dead, injured or orphaned flying-fox is encountered. • What to do if someone is bitten or scratched.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Site-specific detail and actions
					• Requirements for working in and around a camp. • Heat Stress Event strategy to reduce future mortality (determined in consultation with wildlife carer organisations and other relevant stakeholders). Council will also fund the collection and disposal of flying-foxes which may die during such a mass-mortality event. Council will also develop an internal procedure to address emergency, or arising issues (including compliance with the Local Government Act 1993, Appendix 3) for Rudder Park as appropriate.
Research	All	$	Supporting research to improve understanding may contribute to more effectively mitigating all impacts, promotes FF conservation.	Generally cannot be undertaken quickly, management trials may require further cost input.	Council will support researchers wishing to study flying-foxes in the Shire, particularly projects which will assist in understanding local flying-fox movements and ways to mitigate impacts on the community.
Appropriate land-use planning	All	$	Likely to reduce future conflict, promotes FF conservation. Identification of degraded sites that may be suitable for long-term rehabilitation for FFs could facilitate offset strategies should clearing be required under Level 2 actions.	Will not generally mitigate current impacts, land-use restrictions may impact the landholder.	Council-assessable applications for development near a flying-fox camp will be assessed for the need for measures to avoid future impacts (e.g. buffers, aspect, covered areas, double-glazing, etc.).
Property acquisition	All for specific property owners Nil for broader community	$$$	Will reduce future conflict with the owners of acquired property.	Owners may not want to move, only improves amenity for those who fit criteria for acquisition, very expensive.	Property acquisition near the Rudder Park camp is not considered feasible.
Do nothing	Nil	Nil	No resource expenditure.	Will not mitigate impacts and unlikely to be considered acceptable by the community.	Council is committed to assisting affected community members and this options has not been considered.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Site-specific detail and actions
Level 2 actions					
Buffers through vegetation removal	Noise Smell Health/wellbeing Property devaluation Lost rental return	$$-$$$	Will reduce impacts, promotes FF conservation, can be undertaken quickly, limited maintenance costs. Bamboo would need to be treated. Beautification would also be desirable.	Will impact the site, will not generally eliminate impacts, vegetation removal may not be favoured by the community.	Bamboo will be removed along the Council property boundary to provide a buffer between adjacent residents and the camp (further detail in Section 9). At request, Council will include properties affected by the Rudder Park flying-fox camp on relevant Council licence applications, to support landholders who wish to manage vegetation on their property. Note that an OEH-approved Vegetation Management Plan is required prior to vegetation removal that forms part of a Level 2 or 3 action. This should also consider Aboriginal Cultural Heritage values in accordance with the NPW Act.
Buffers without vegetation removal	Noise Smell Health/wellbeing Damage to vegetation Property devaluation Lost rental return	$$	Successful creation of a buffer will reduce impacts, promotes FF conservation, can be undertaken quickly, options without vegetation removal may be preferred by the community.	May impact the site, buffers will not generally eliminate impacts, maintenance costs may be significant, often logistically difficult, limited trials so likely effectiveness unknown.	Deterrents may be used in combination with bamboo removal, as detailed in Section 9.
Noise attenuation fencing	Noise Smell Health/wellbeing Property devaluation Lost rental return	$$-$$$	Will eliminate/significantly reduce noise impacts, will reduce other impacts, limited maintenance costs.	Costly, likely to impact visual amenity of the site, will not eliminate all impacts, may impact other wildlife at the site.	This options is not feasible due to the steep slope of the site.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Site-specific detail and actions
Level 3 actions					
Nudging	All	$$–$$$	If nudging is successful this may mitigate all impacts.	Costly, FFs will continue attempting to recolonise the area unless combined with habitat modification/ deterrents.	Nudging (or vegetation management/permanent deterrents) may be required as a reactive measure to ensure the camp footprint does not expand further into private residences.
Passive dispersal through vegetation management	All at that site but not generally appropriate for amenity impacts only (see Section 8)	$$$	If successful can mitigate all impacts at that site, compared with active dispersal: less stress on FFs, less ongoing cost, less restrictive in timing with ability for evening vegetation removal.	Costly, will impact site, risk of removing habitat before outcome known, potential to splinter the camp creating problems at other locations (although less than active dispersal), potential welfare impacts, disturbance to community, negative public perception, unknown conservation impacts, unpredictability makes budgeting and risk assessment difficult, may increase disease risk (see Section 7.1), potential to increase risk to aircraft safety due to changed movement patterns/altered behaviour. Cost prohibitive – include cost quoted for buffer alone.	Broad-scale vegetation removal at Rudder Park is not appropriate as it will most likely push FFs into adjacent residences, exacerbating the issue. Due to the nature of the site and access difficulties, removal of the bamboo is also cost prohibitive (based on previous quotes to implement buffers, removal of all bamboo would be in excess of $250,000).
Active dispersal	All at that site but not generally appropriate for amenity impacts only (see Section 8)	$$$	If successful can mitigate all impacts at that site, often stated as the preferred method for impacted community members.	May be very costly, often unsuccessful, ongoing dispersal generally required unless combined with habitat modification, potential to splinter the camp creating problems in other locations, potential for significant animal welfare impacts, disturbance to community, negative public perception, unknown conservation impacts, unpredictability makes budgeting and risk assessment difficult, may increase disease risk (see Section 7.1), potential to to increase risk to aircraft safety due to changed movement patterns/altered behaviour.	As detailed in Section 2.4, OEH will not support dispersal at this site, due to associated issues (outlined in Section 8.3.2) prior to implementation of lower level actions.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Site-specific detail and actions
				Would require vegetation management/ongoing dispersal, both cost prohibitive (examples Appendix 6). Access for dispersal would also be very difficult and dangerous, especially in the dark.	

9. Planned management approach

Table 3 (Section 8) is an overview of the planned management approach for the Rudder Park camp. For complex management activities (e.g. buffers) further detail is provided below.

As detailed in Section 4, approval by OEH (via a licence application) will be required prior to any activity below which directly affects the camp. An OEH-approved Vegetation Management Plan is also required prior to commencing vegetation removal that forms part of a Level 2 or 3 action. This should also consider Aboriginal Cultural Heritage values in accordance with the NPW Act. Measures to avoid impacting flying-foxes during works are detailed in Section 10.

Council will also develop an internal procedure to address emergency, or arising issues (including compliance with the *Local Government Act 1993*) for Rudder Park as appropriate.

9.1 Buffers (Level 2)

Buffers between affected residents and roosting flying-foxes will be created through a combination of vegetation management (bamboo removal) and canopy-mounted sprinklers.

9.2 Vegetation management

A 15 m buffer will be created on Council-managed land at the edge of the adjacent residential boundary, as shown in blue in Figure 17. Bamboo should be removed from this area by first killing individual clumps, which is most effectively done through stem injecting (via drill and fill) using glyphosate and water mix at a mix of 1:1.

Bamboo can be left to collapse in situ (with access restriction to ensure human safety), which is expected to occur within 12 months of it dying. The time from stem injection to death will be dependent on season. If physical removal is preferable, bamboo can be cut into smaller pieces after having died and dragged out to a chipper. Note that a chipper will need to be of sufficient distance from the camp to ensure flying-fox welfare (i.e. issues associated with noise disturbance).

Bamboo is flexible, and the dense stand is mainly self-supporting, with the outer stems bending outwards almost the full height (up to ~15m). Flying-foxes will roost on these leaning stems (including dead, stem-injected stems). Vegetation management contractors will therefore be consulted on potential methods to prevent bamboo leaning into the buffer and providing roost habitat. Possible options include:

- using a non-flexible material to tie outer stems (from the top) to the main stand to prevent them leaning. This would require access to the top of the stand, and potentially machinery to lift the outer stems up whilst being tied.
- cut bamboo at the far edge of the buffer (closest to bamboo that will be retained) at varying heights to help support the weight of the remaining bamboo. Flying-foxes will be unlikely to use stems lower than five metres, so this may be 1-2 rows of bamboo

cut to three metres, then four metres, then five metres, etc. Bamboo in the camp habitat to be retained should be maintained at least eight metres high.

Canopy-mounted sprinklers will also assist in deterring flying-foxes from any bamboo that leans into the buffer area (Section 9.3).

This buffer should then be planted with species that do not attract roosting flying-foxes (i.e. those that grow less than 3-4 metres). Plants that produce nectar-exuding flowers or edible fruits will also be limited to avoid attracting flying-foxes from the nearby Colin Dickson Street camp to forage in close proximity to residents, and minimise faecal drop. Vegetation that produces fragrant flowers may assist in masking camp odour, for example native gardenia (*Atractocarpus spp*), native frangipani (*Hymenosporum flavum*), and native jasmines (*Jasminum didymium or J. simplicifolium*).

Re-planting (and maintaining) the buffer area will also improve the general amenity of Rudder Park.

The estimated cost to stem inject bamboo within the buffer (blue area in Figure 17) and allow to collapse in situ is $5,000. Physical removal and chipping would cost approximately an additional $8,000. Re-planting the buffer area, including maintenance for the first year, would likely be a further $5,000. In addition to these costs, ongoing maintenance, monitoring and reporting will also be required.

9.3 Canopy-mounted sprinklers

Canopy sprinklers have been used successfully elsewhere to deter flying-foxes from areas of conflict. It is not the intention to disperse flying-foxes away from the camp, but maintain an adequate buffer between residents and the flying-fox camp.

Canopy sprinklers were installed at Emerald Woods Park on the Sunshine Coast (Queensland), with residents adjacent to the camp given the option to activate sprinklers for short periods during the day if flying-foxes enter the buffer zone. By moving flying-foxes out of the buffer zone (the high conflict areas), there was also less disturbance of the camp, which provided the secondary benefit of reduced noise, smell and daytime fly-overs (and faecal drop). Residents report a sense of regained control, which combined with the increased distance to roosting flying-foxes achieved with the sprinklers, has greatly assisted in reducing conflict with the camp. It is recommended residents near the Rudder Park camp should be able to activate sprinklers when necessary (with consideration to guidelines below).

Provided that adequate water pressure can be achieved (with a pump station), each sprinkler should have approximately a 13-15 m reach (radius). Shown in red on Figure 17 are approximate locations where three sprinklers are planned for installation as soon as practicable to minimise current conflict (Stage 1 management). The camp is generally restricted to the stand of bamboo, with a buffer of vegetation less desirable to roosting flying-foxes between residents to the north and east of Rudder Park. As such, sprinklers at these edges of the camp are not considered necessary at this stage, but approximate locations are shown in orange should they be required to maintain this buffer in the future.

Note that consultation is still required with irrigation/sprinkler specialists to confirm feasibility at this site, however based on previous Ecosure experience this option should be achievable. Some minor tree trimming, including in private residences, may be required to ensure sprinklers are not impeded. Species, numbers and trimming extent will be detailed in the Vegetation Management Plan and licence application(s) to OEH.

Installation costs for two similar programs elsewhere, including all infrastructure and eight sprinklers, were at a cost of approximately $30,000. The majority of this cost is in infrastructure (pump shed, control board, plumbing, etc.) with individual sprinklers costing less than $1,000. As such the installation of three sprinklers, and associated infrastructure (pump, control board, etc.) will cost an estimated $20,000 (plus maintenance and operation costs, including ~100 L water/week/sprinkler).

9.3.1 Installation

- Placement - Exact placement will be dependent on finding suitable trees which can be accessed with an Elevated Work Platform, or alternatively if safe for installation by tree climbers. Note that it is anticipated that at least one additional visit will be required to adjust sprinklers during the trial.
- Water pressure – Water pressure must be firm so it is sufficient to deter flying-foxes, however must not risk injuring flying-foxes (or other fauna) or knocking an animal from the tree. Water mist should be minimised if possible (see also Section 9.3.2).
- Noise – Sprinklers should release a jet of air prior to water, as an additional deterrent and to cue animals to move prior to water being released. The intention of the sprinklers is to make the buffer unattractive, and effectively ‘train’ individuals to stay out of the buffer area.
- Potential for additional sprinklers – Infrastructure installed for the initial three sprinklers should accommodate additional sprinklers if possible should they be required in the future.
- Residents involved in a similar approved trial elsewhere also reported noise impacts associated with the water hammer, which should be minimised through design as much as possible.
- Tree health – Sprinklers and hosing must be attached to trees in a way that does not impact tree health or growth.
- Access for maintenance/adjustments – Sprinklers should be designed and attached in a way that allows the easiest possible access for future maintenance, replacement and sprinkler head adjustments.
- Mounting poles may be installed in some areas if a suitable tree is not available and/or to allow easier access to sprinkler heads for maintenance. These will be designed to withstand high wind and vegetation debris fall, and will be highly visible to flying-foxes to avoid collisions.
- Sprinkler control – The system control station should allow independent programming of each individual sprinkler. The number of times per day each sprinkler is activated, duration of each activation and sequence of sprinkler activation needs to be fully

adjustable (minutes and seconds programming required). The operational time of day also needs to be adjustable. Ideally water pressure to individual sprinklers could also be adjusted.

- Discrete installation – As much as practicable, sprinklers and hoses should be hidden from public view for amenity value and to limit potential for vandalism.

9.3.2 Operation

- Sprinklers will operate on a random schedule, and in a staggered manner (i.e. not all sprinklers operating at the same time, to avoid excessive disturbance). Each activation will be for approximately 20 seconds per sprinkler. It is anticipated each sprinkler will be activated up to four times per hour between 0600 and 1700, totalling approximately 15 minutes run time per sprinkler per day. Sprinklers will not operate during fly-in or fly-out periods to avoid inadvertent dispersal.
- Sprinkler settings will need to be changed regularly to avoid flying-foxes habituating, and to account for seasonal changes (e.g. not in the heat of the day during summer when they may be an attractant). Individual sprinklers may also need to be temporarily turned off depending on location of creching young, or if it appears likely that animals will be displaced to undesirable locations.
- Flying-fox heat stroke generally occurs when the temperature reaches 42°C, however can occur at lower temperatures in more humid conditions (Bishop 2015). Given that humidity is most likely to be increased with water mist, if sprinkler design cannot limit mist, sprinklers may need to be turned off in higher temperatures (e.g. >30°C) to avoid exacerbating heat stress. Conversely, if temperatures exceed 38°C sprinklers may assist in reducing heat related mortality.

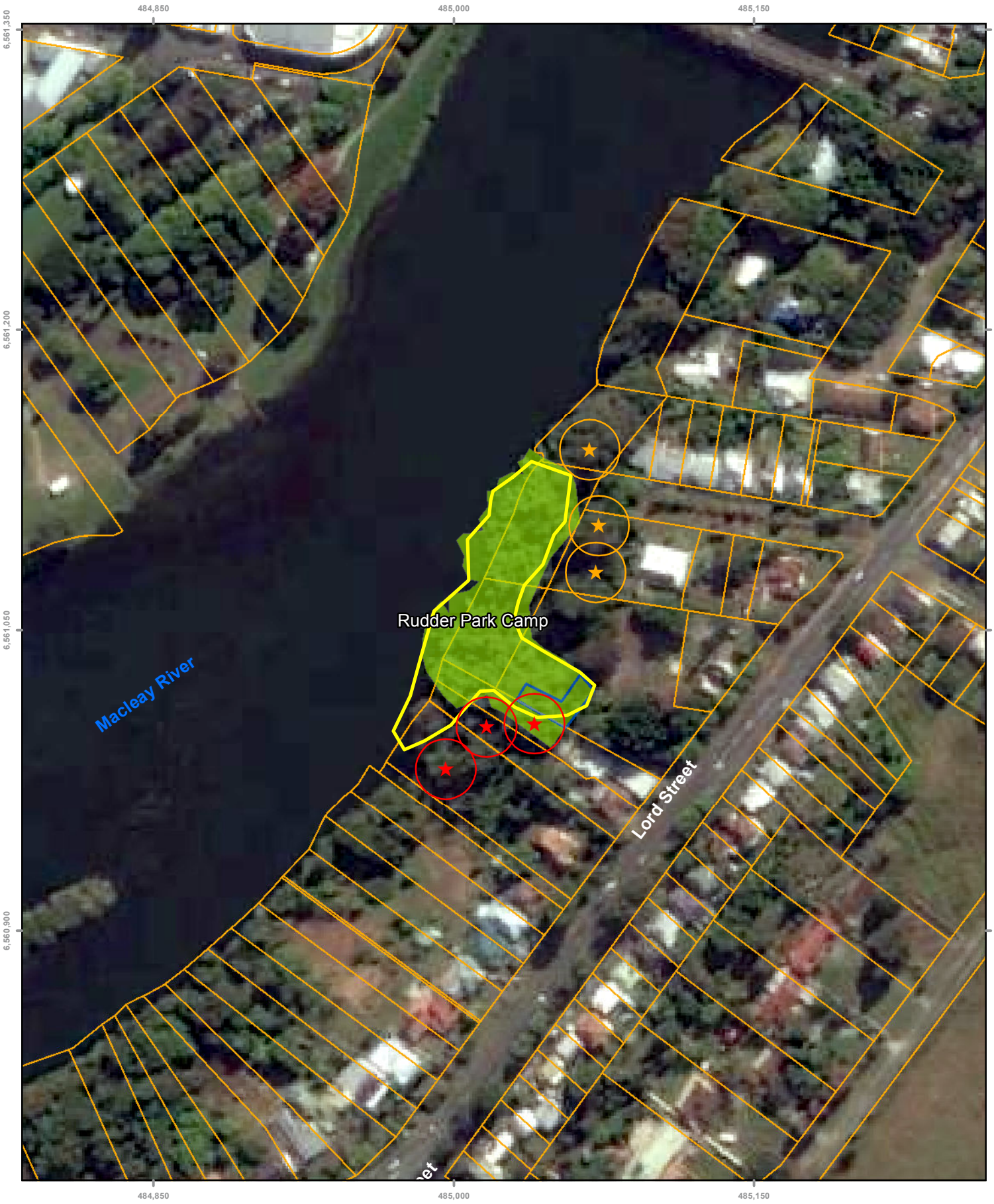

Figure 17: Rudder Park management areas

Kempsey Shire Council

Rudder Park CMP

Stage 1 management

- Sprinkler
- 15m buffer

Reactive management (if required)

- Sprinkler
- 15m buffer

- Extent of bamboo
- Buffer area
- Flying Fox camp extent as at March 2017

ecosure

Job number: PR2399
Revision: 0
Author: ALM
Date: 12/06/2017

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Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
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PR2399_MP17_RudderPkMgtAreas
A4

10. Assessment of impacts to flying-foxes

10.1 Regional context

Proposed Level 2 actions do not aim to disperse any individuals from the site and so potential habitat has not been modelled. Known camp sites in the East Kempsey area are mapped and discussed in Section 2.

10.2 Flying-fox habitat to be affected

Planned vegetation buffer works (blue area in Figure 17) will remove approximately 0.04 ha of the 0.67 ha of exotic bamboo monoculture.

Sprinklers aim to contain flying-foxes within their normal extent, and therefore will not exclude them from their regular roost space.

Replanting the buffer area where bamboo is removed with native species will have an overall biodiversity gain.

10.3 Standard measures to avoid impacts

The following mitigation measures will be complied with at all times during Plan implementation.

10.3.1 All management activities

- All personnel will be appropriately experienced, trained and inducted. Induction will include each person's responsibilities under this Plan.
- All personnel will be briefed prior to the action commencing each day, and debriefed at the end of the day.
- Works will cease and OEH consulted in accordance with the 'stop work triggers' section of the Plan.
- Large crews will be avoided where possible.
- The use of loud machinery and equipment that produces sudden impacts/noise will be limited. Where loud equipment (e.g. chainsaws) is required they will be started away from the camp and allowed to run for a short time to allow flying-foxes to adjust.
- Activities that may disturb flying-foxes at any time during the year will begin as far from the camp as possible, working towards the camp gradually to allow flying-foxes to habituate.
- Any activity likely to disturb flying-foxes so that they take flight will be avoided during the day during the sensitive GHFF/BFF birthing period (i.e. when females are in final trimester or the majority are carrying pups, generally August – December) and avoided altogether during crèching (generally November/December to February).

Where works cannot be done at night after fly-out during these periods, it is preferable they are undertaken in the late afternoon close to or at fly-out. If this is also not possible, a person experienced in flying-fox behaviour will monitor the camp for at least the first two scheduled actions (or as otherwise deemed to be required by that person) to ensure impacts are not excessive and advise on the most appropriate methods (e.g. required buffer distances, approach, etc.).

- OEH will be immediately contacted if LRFF are present between March and October, or are identified as being in final trimester / with dependent young.
- Non-critical maintenance activities will ideally be scheduled when the camp is naturally empty. Where this is not possible (e.g. at permanently occupied camps) they will be scheduled for the best period for that camp (e.g. when the camp is seasonally lower in numbers and breeding will not be interrupted, or during the non-breeding season, generally May to July).
- Works will not take place in periods of adverse weather including strong winds, sustained heavy rains, in very cold temperatures or during periods of likely population stress (e.g. food bottlenecks). Wildlife carers will be consulted to determine whether the population appears to be under stress.
- Works will be postponed on days predicted to exceed 35°C (or ideally 30°C), and for one day following a day that reached ≥35°C. If an actual heat stress event has been recorded at the camp or at nearby camps, a rest period of several weeks will be scheduled to allow affected flying-foxes to fully recover. See the OEH fact sheet on Responding to heat stress in flying-fox camps.
- Evening works may commence after fly-out. Noise generated by the works should create a first stage disturbance, with any remaining flying-foxes taking flight. Works should be paused at this stage to monitor for any remaining flying-foxes (including crèching young, although December – February should be avoided for this reason) and ensure they will not be impacted. All Level 1 and 2 works (including pack up) will cease by 0100 to ensure flying-foxes returning early in the morning are not inadvertently dispersed. Works associated with Level 3 actions may continue provided flying-foxes are not at risk of being harmed.
- If impacts at other sites are considered, in OEH's opinion, to be a result of management actions under this Plan, assistance will be provided by the proponent to the relevant land manager to ameliorate impacts. Details of this assistance are to be developed in consultation with OEH.
- Any proposed variations to works detailed in the Plan will be approved, in writing, by OEH before any new works occur.
- OEH may require changes to methods or cessation of management activities at any time.
- Ensure management actions and results are recorded to inform future planning. See the OEH fact sheet on Monitoring, evaluating and reporting.

Human safety

- All personnel to wear protective clothing including long sleeves and pants; additional items such as eye protection and a hat are also recommended. People working under the camp should wash their clothes daily. Appropriate hygiene practices will be adopted such as washing hands with soap and water before eating/smoking.
- All personnel who may come into contact with flying-foxes will be vaccinated against Australian bat lyssavirus with current titre.
- A wash station will be available on site during works along with an anti-viral antiseptic (e.g. Betadine) should someone be bitten or scratched.
- Details of the nearest hospital or doctor who can provide post-exposure prophylaxis will be kept on site.

Post-works

- Reports for Level 1 actions will be provided to OEH annually. Reports for Level 2 and 3 actions will be submitted to OEH one month after commencement of works and then quarterly for the life of the Plan (up to five years) (for all Level 3 actions and in periods where works have occurred for Level 2 actions). Each report is to include:
    - results of pre- and post-work population monitoring
    - any information on new camps that have formed in the area
    - impacts at other locations that may have resulted from management, and suggested amelioration measures
    - an assessment of how the flying-foxes reacted to the works, with particular detail on the most extreme response and average response, outlining any recommendations for what aspects of the works went well and what aspects did not work well
    - further management actions planned including a schedule of works
    - an assessment[5] of how the community responded to the works, including details on the number and nature of complaints before and after the works
    - detail on any compensatory plantings undertaken or required
    - expenditure (financial and in-kind costs)
    - Plan evaluation and review (see Section 12).

10.3.2 Buffer works (Level 2)

Prior to works

- Residents adjacent to the camp will be individually notified one week prior to on-ground works commencing. This will include information on what to do if an injured or orphaned flying-fox is observed, a reminder not to participate in or interfere with the program, and details on how to report unusual flying-fox behaviour/daytime sightings. Relevant contact details will be provided (e.g. Program Coordinator). Resident

[5] A similar approach should be taken to pre-management engagement (see Section 3) to allow direct comparison, and responses should be assessed against success measures (Section 9) to evaluate success.

requests for retention of vegetation and other concerns relating to the program will be taken into consideration.

- Information will be placed on Council's website along with contact information.
- OEH will be notified at least 48 hours before works commence.
- A protocol, in accordance with the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012), for flying-fox rescue will be developed including contact details of rescue and rehabilitation organisations. This protocol will be made available to all relevant staff, residents and volunteers prior to the action commencing. See Appendix 7 for an example protocol.
- A licensed wildlife carer will be notified prior to beginning works in the event that rescue/care is required.

Monitoring

- A flying-fox expert (identified in Appendix 5) will undertake an on-site population assessment prior to, during works and after works have been completed, including:
  - number of each species
  - ratio of females in final trimester
  - approximate age of any pups present including whether they are attached or likely to be crèched
  - visual health assessment
  - mortalities.
- Counts will be done at least:
  - once immediately prior to works
  - daily during works
  - immediately following completion
  - one month following completion
  - 12 months following completion.

During works

- A flying-fox expert (identified in Appendix 5) will attend the site as often as OEH considers necessary to monitor flying-fox behaviour and ensure compliance with the Plan and the Policy. They must also be able to identify pregnant females, flightless young, individuals in poor health and be aware of climatic extremes and food stress events. This person will make an assessment of the relevant conditions and advise the supervisor/proponent whether the activity can go ahead.

10.3.3 Vegetation trimming/removal

- Any vegetation (including weed) removal or modification forming part of a Level 2 or 3 action will be in accordance with an approved Vegetation Management Plan.
- Dead wood and hollows will be retained on site where possible as habitat.
- Vegetation chipping is to be undertaken as far away from roosting flying-foxes as possible.

10.3.4 Canopy vegetation trimming/removal

Prior to works

- Trees to be removed or lopped will be clearly marked (e.g. with flagging tape) prior to works commencing, to avoid unintentionally impacting trees to be retained.

During works

- Any tree lopping, trimming or removal is undertaken under the supervision of a suitably qualified arborist (minimum qualification of Certificate III in Horticulture (Arboriculture) who is a member of an appropriate professional body such as the National Arborists Association).
- Trimming will be in accordance with relevant Australian Standards (e.g. AS4373 Pruning of Amenity Trees), and best practice techniques used to remove vegetation in a way that avoids impacting other fauna and remaining habitat.
- No tree in which a flying-fox is roosting will be trimmed or removed. Works may continue in trees adjacent to roost trees only where a person experienced in flying-fox behaviour assesses that no flying-foxes are at risk of being harmed. A person experienced in flying-fox behaviour is to remain on site to monitor, when canopy trimming/removal is required within 50 m of roosting flying-foxes.
- While most females are likely to be carrying young (generally September – January) vegetation removal within 50 m of the camp will only be done in the evening after fly-out, unless otherwise advised by a flying-fox expert.

10.3.5 Stop work triggers

The management program will cease and will not recommence without consulting OEH if:

- any of the animal welfare triggers occur on more than two days during the program, such as unacceptable levels of stress (see Table 4)
- there is a flying-fox injury or death
- a new camp/camps appear to be establishing
- impacts are created or exacerbated at other locations
- there appears to be potential for conservation impacts (e.g. reduction in breeding success identified through independent monitoring)
- standard measures to avoid impacts (detailed in Section 10.3) cannot be met.

Management may also be terminated at any time if:

- unintended impacts are created for the community around the camp
- allocated resources are exhausted.

Table 4 Planned action for potential impacts during management. A person with experience in flying-fox behaviour (as per Appendix 5) will monitor for welfare triggers and direct works in accordance with the criteria below

Welfare trigger	Signs	Action
Unacceptable levels of stress	If any individual is observed: · panting · saliva spreading · located on or within 2 m of the ground	Works to cease for the day.
Fatigue	In-situ management · more than 30% of the camp takes flight · individuals are in flight for more than 5 minutes · flying-foxes appear to be leaving the camp Dispersal · low flying · laboured flight · settling despite dispersal efforts	In-situ management Works to cease and recommence only when flying-foxes have settled* / move to alternative locations at least 50 m from roosting animals. Dispersal Works to cease for the day.
Injury/death	· a flying-fox appears to have been injured/killed on site (including aborted foetuses) · any flying-fox death is reported within 1 km of the dispersal site that appears to be related to the dispersal · females in final trimester · dependent/crèching young present · loss of condition evident	Works to cease immediately and OEH notified AND rescheduled OR adapted sufficiently so that significant impacts (e.g. death/injury) are highly unlikely to occur, as confirmed by an independent expert (see Appendix 5) OR stopped indefinitely and alternative management options investigated.

*maximum of two unsuccessful attempts to recommence work before ceasing for the day.

11. Assessment of impacts to other threatened species

There is only a small amount of tropical bamboo (0.67 ha) to be removed from Rudder Park, which will be replaced with native species and will be managed to prevent re-occurrence of bamboo (and other invasive species). Bamboo will be removed in a manner that will avoid impacts to surrounding vegetation and therefore is unlikely to have a negative impact on the vegetation community. In fact, the increase in indigenous vegetation from re-plantings is likely to enhance the ecological value of the site.

Wildlife other than flying-foxes may be affected; for example, canopy foraging birds may be physically deterred from the buffers, or nectar in these areas may be less prolific due to wash out. Conversely, additional frog habitat may be created by pooling water, as has occurred at Emerald Woods (QLD). However, in the case of Rudder Park, the surrounding vegetation is primarily camphor laurel (*Cinnamomum camphora*) and cleared, rural paddocks. Discouraging foraging in flowering camphor will reduce the spread of this pest plant species, and sprinklers are unlikely to deter urban-adapted bird species such as magpies (*Cracticus tibicen*) or rainbow lorikeets (*Trichoglossus moluccanus*).

Pooling of water from the sprinklers is likely to be short term and would only attract frog species that prefer ephemeral water bodies such as the common eastern froglet (*Crinia signifera*) and striped marsh frog (*Limnodynastes peronii*). Habitat at the site and surrounds in not considered suitable for threatened frog species.

The above impacts are unlikely to have a negative impact on any other threatened flora and fauna species, or their habitats, and as such further assessment either under the BC Act or the EPBC Act is not considered to be required.

12. Evaluation and review

The planned life of the Plan is five years. It will have a scheduled review annually, which will include evaluation of management actions against measures shown in Section 8.

The following will also trigger a reactive review of the Plan:

- completion of a management activity
- progression to a higher level of management
- changes to relevant policy/legislation
- new management techniques becoming available
- outcomes of research that may influence the Plan
- incidents associated with the camp.

Results of each review will be included in reports to OEH in accordance with conditions of licences for relevant activities.

If the Plan is to remain current, a full review including stakeholder consultation and expert input will be undertaken in the final year of the Plan's life prior to being re-submitted to OEH.

13. Plan administration

13.1 Monitoring and reporting

Reports for Level 1 actions that comply with this Plan are not required to be submitted to OEH. Council will keep internal records to allow the effectiveness of each management action to be evaluated.

Reports for Level 2 actions will be submitted to OEH one month after commencement of works and then quarterly in periods where works have occurred. Each report is to include:

- results of pre- and post-work population monitoring
- any information on new camps that have formed in the area
- impacts at other locations that may have resulted from management, and suggested amelioration measures
- an assessment of how the flying-foxes reacted to the works, with particular detail on the most extreme response and average response, outlining any recommendations for what aspects of the works went well and what aspects did not work well
- further management actions planned including a schedule of works
- an assessment of how the community responded to the works, including details on the number and nature of complaints before and after the works
- detail on any compensatory planting
- expenditure and contributors
- outcomes from evaluation and review (Section 11).

13.2 Management structure and responsibilities

Council is responsible for implementation of the Plan once it has been endorsed by OEH and relevant licences obtained (see Sections 8.5 and 9). Council will seek advice from OEH and other flying-fox experts as required during implementation.

All Council personnel and contractors working in Rudder Park are responsible for complying with mitigation measures detailed in Section 10.1. Council will ensure contractors are aware of their responsibilities under the Plan and will assist where required.

Council will also ensure surrounding residents are aware of their legislative responsibilities to avoid disturbing flying-foxes at the camp.

All on-ground works need to be performed in accordance with a Safe Work Method Statement that includes risks and mitigation measures for working in a flying-fox camp.

If there is a sudden influx of flying-foxes to the camp, other councils and agencies should be consulted to determine if it is related to a dispersal. If this is the case, assistance will be sought

from the council dispersing to manage any issues that arise.

Further detail will be provided in relevant licence applications prior to works commencing.

13.3 Funding commitment

Council will incorporate relevant actions as set out in Table 3 into future operational and delivery plans.

Cost sharing may be required for works and/or ongoing operational costs (e.g. for sprinklers) on private property.

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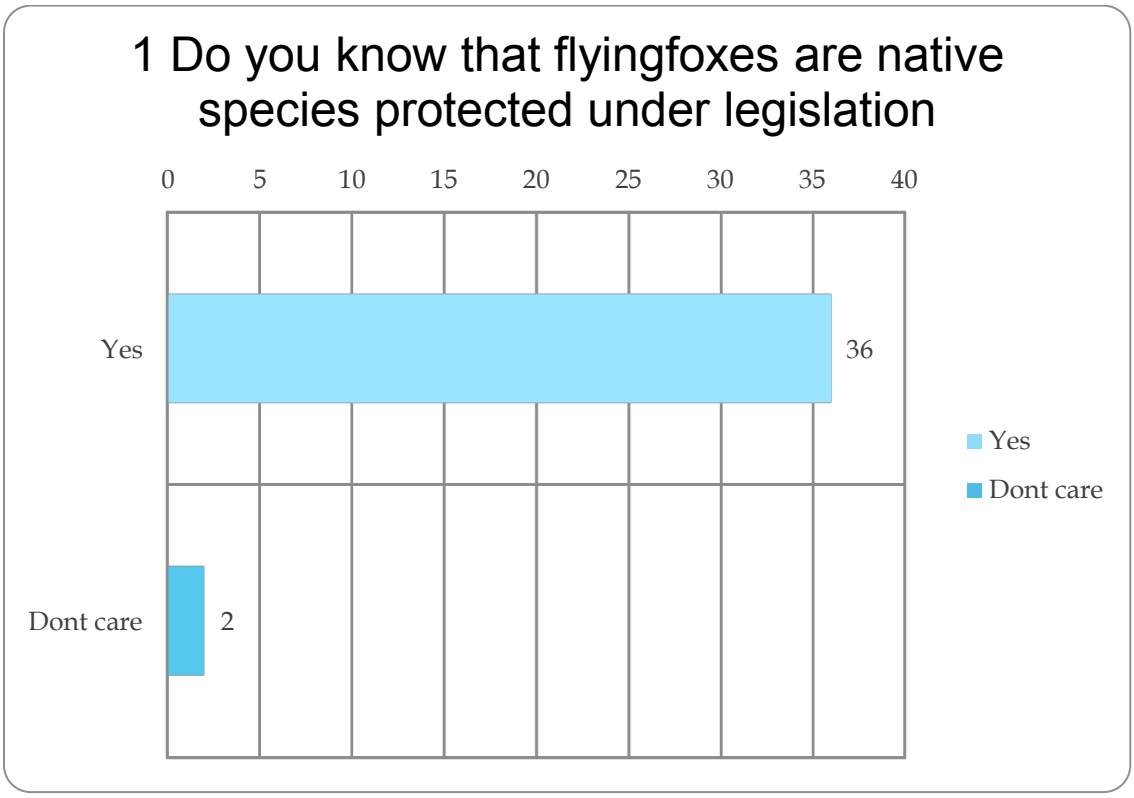
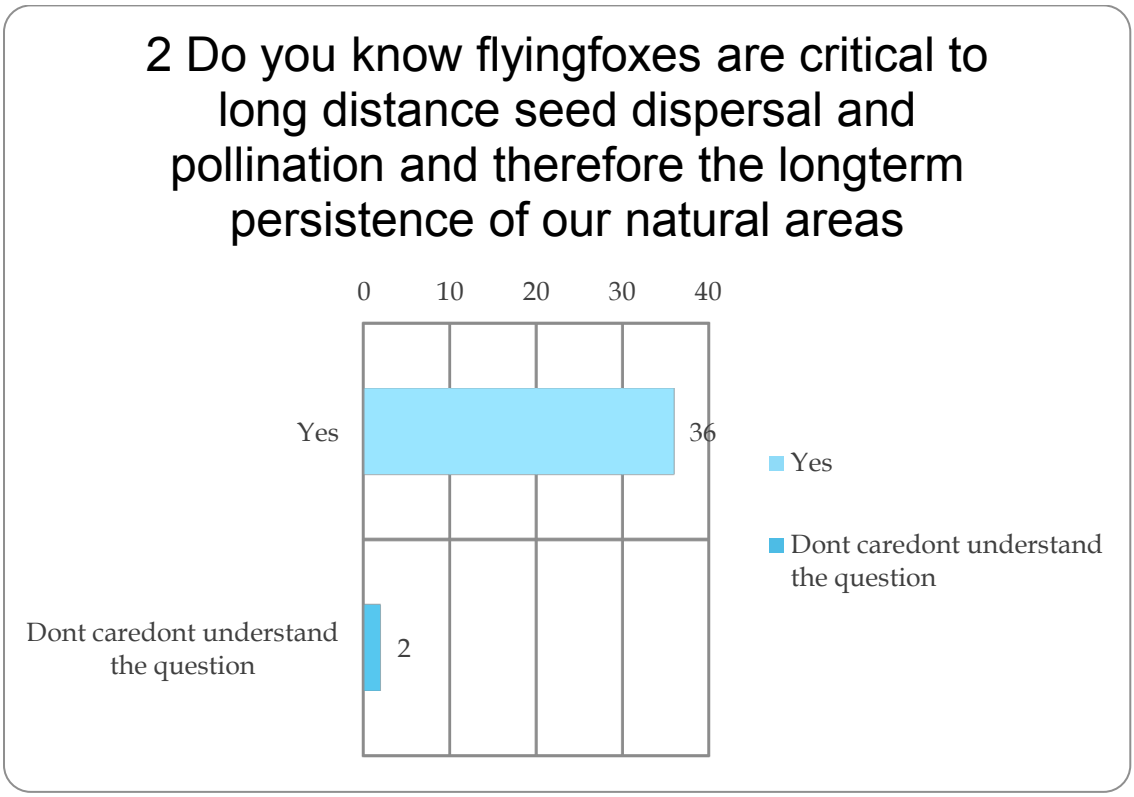
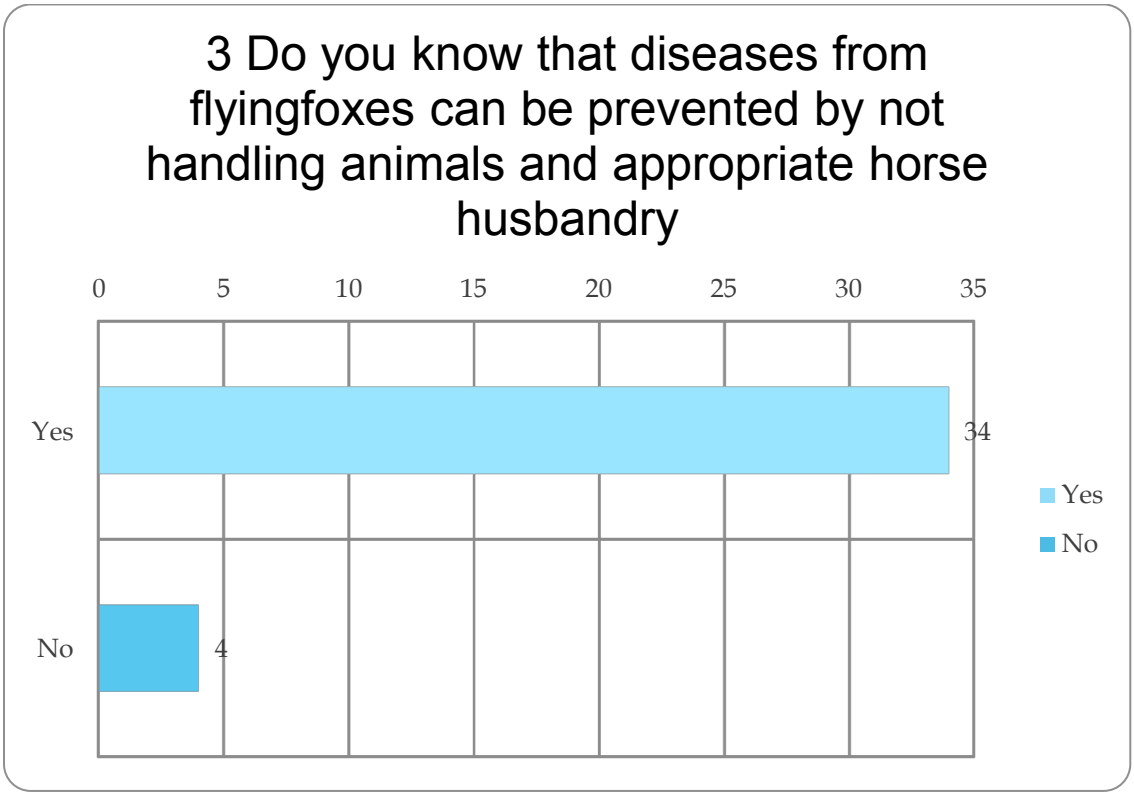
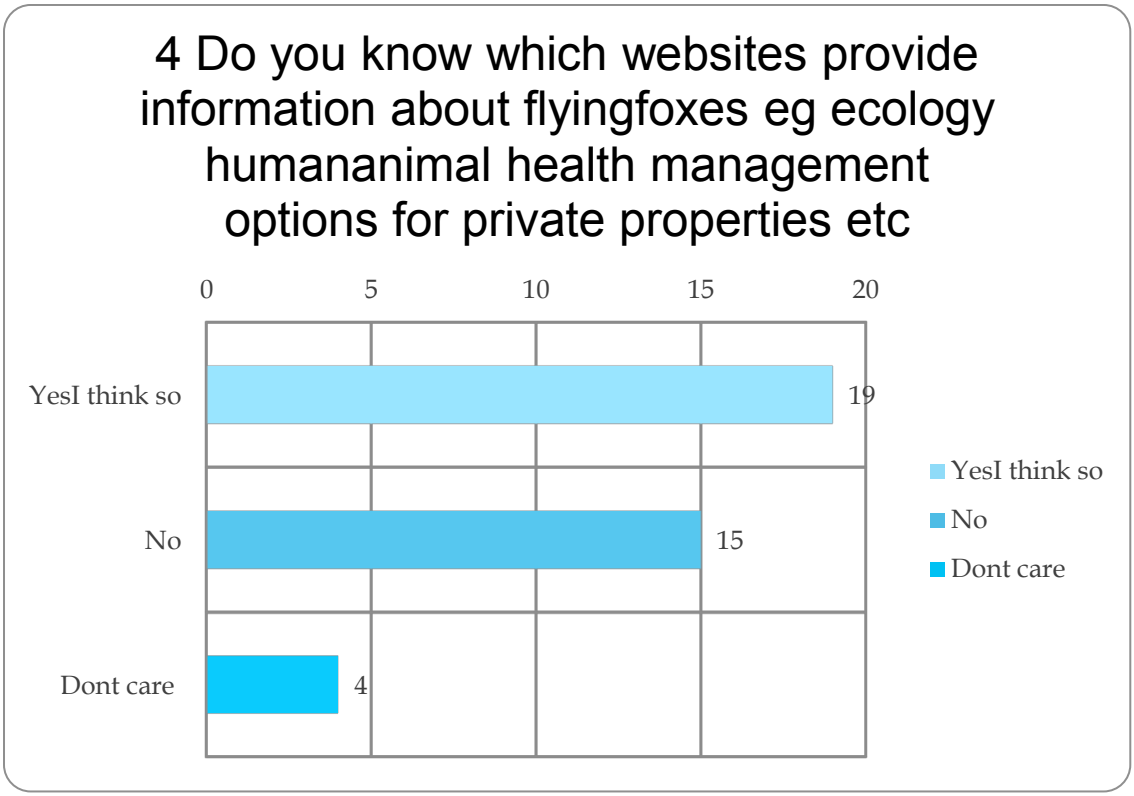
Appendix 1 Survey results

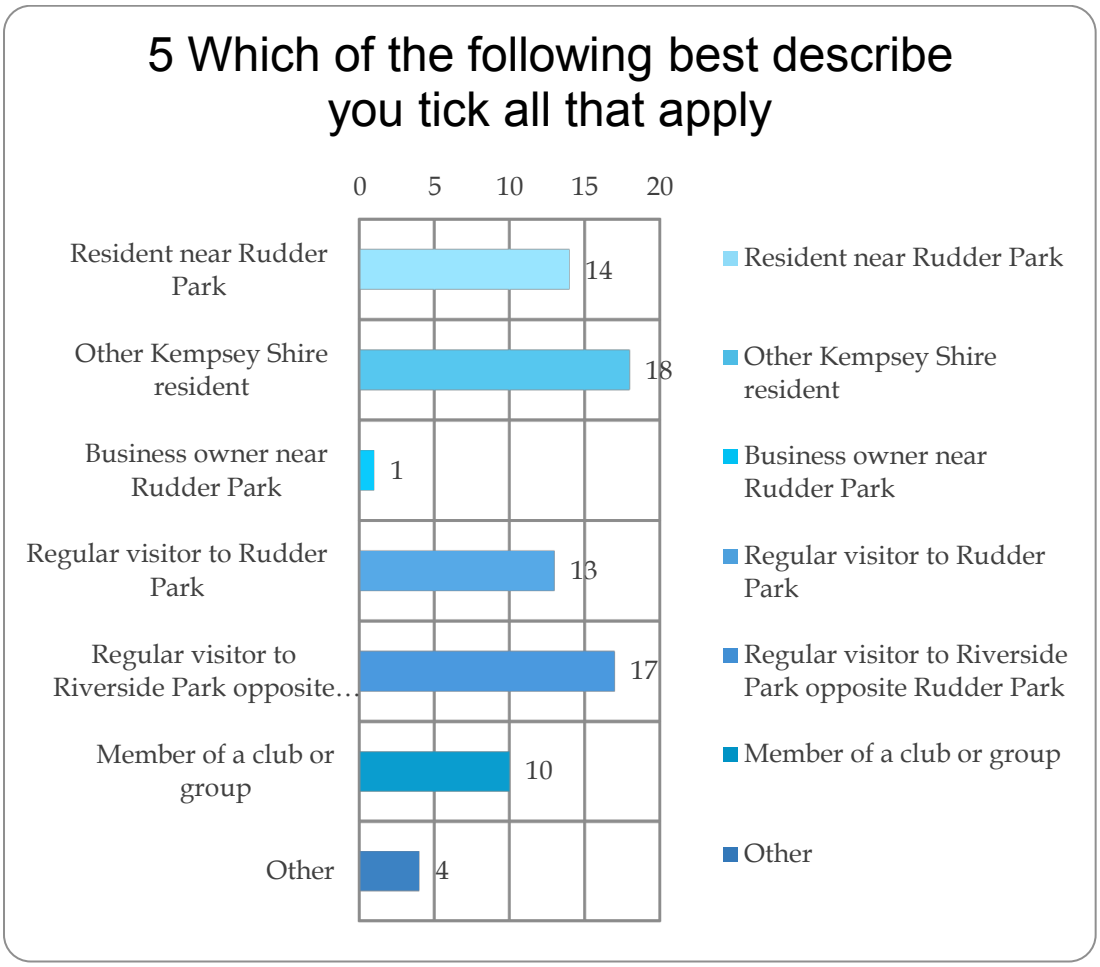
Graphs for all survey results are provided below.

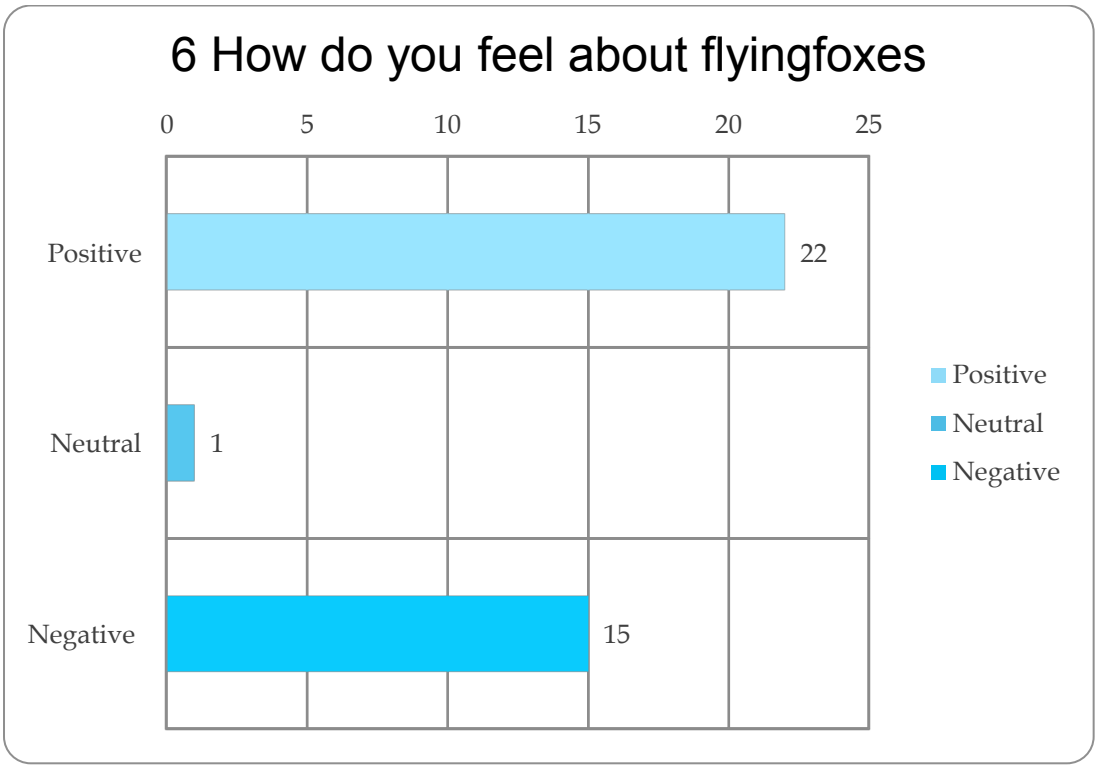


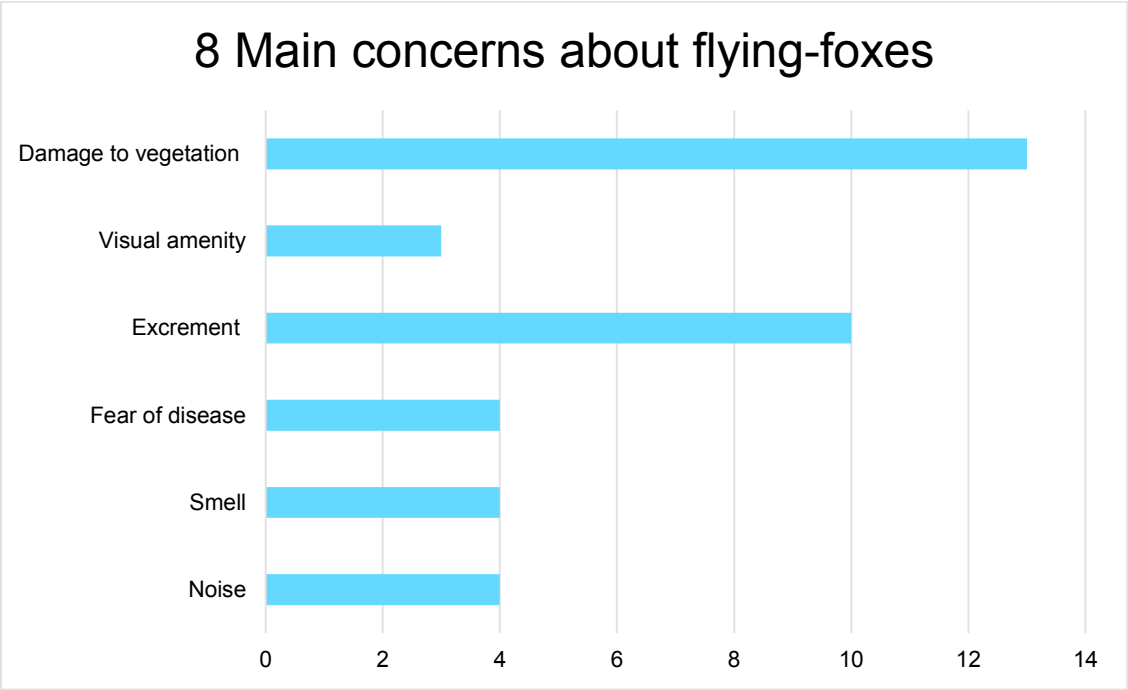


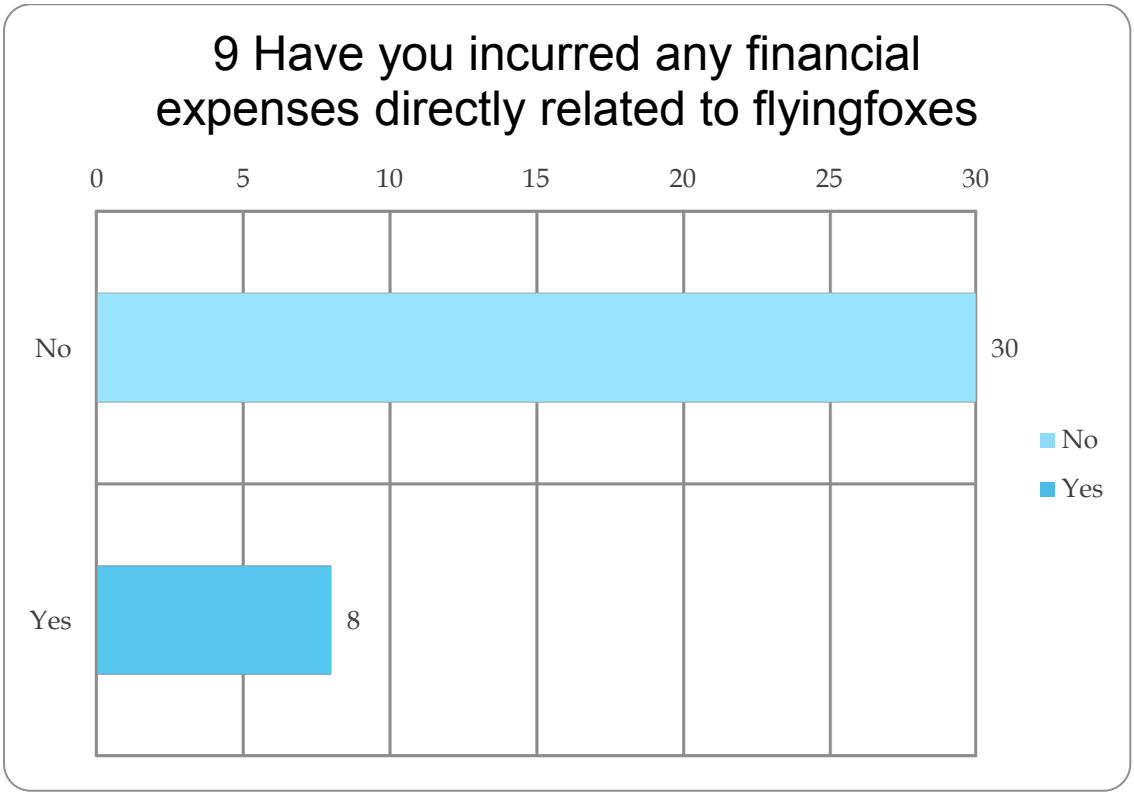

3 Do you know that diseases from flyingfoxes can be prevented by not handling animals and appropriate horse husbandry
0
5
10
15
20
25
30
35
Yes
No
34
4
Yes
No

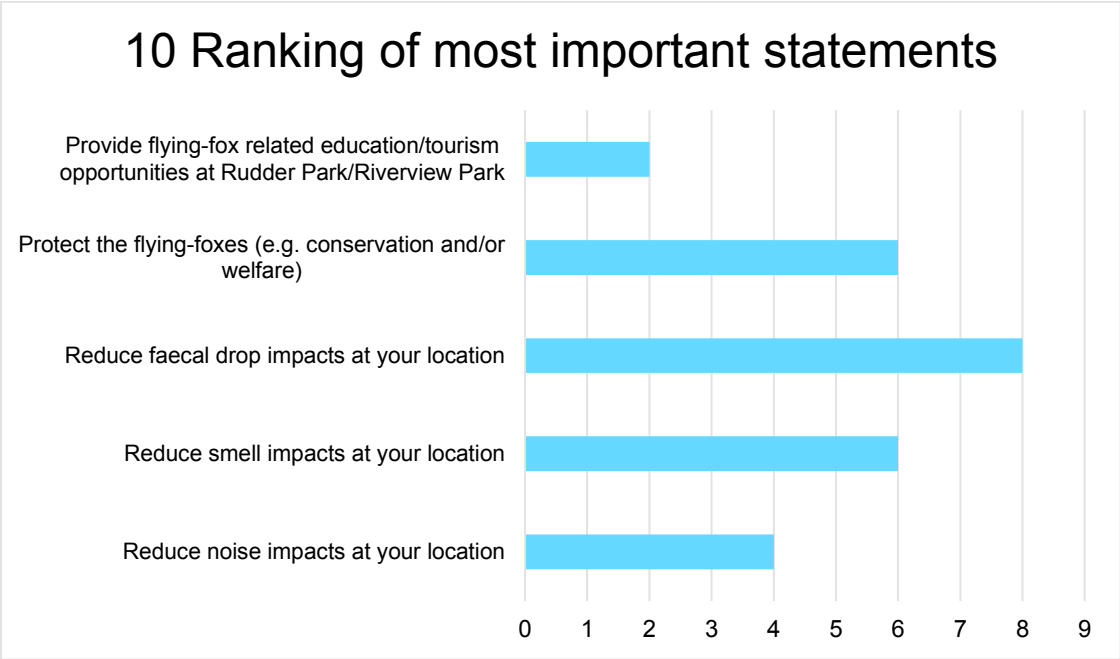

4 Do you know which websites provide information about flyingfoxes eg ecology humananimal health management options for private properties etc
0
5
10
15
20
YesI think so
No
Dont care
19
15
4
YesI think so
No
Dont care

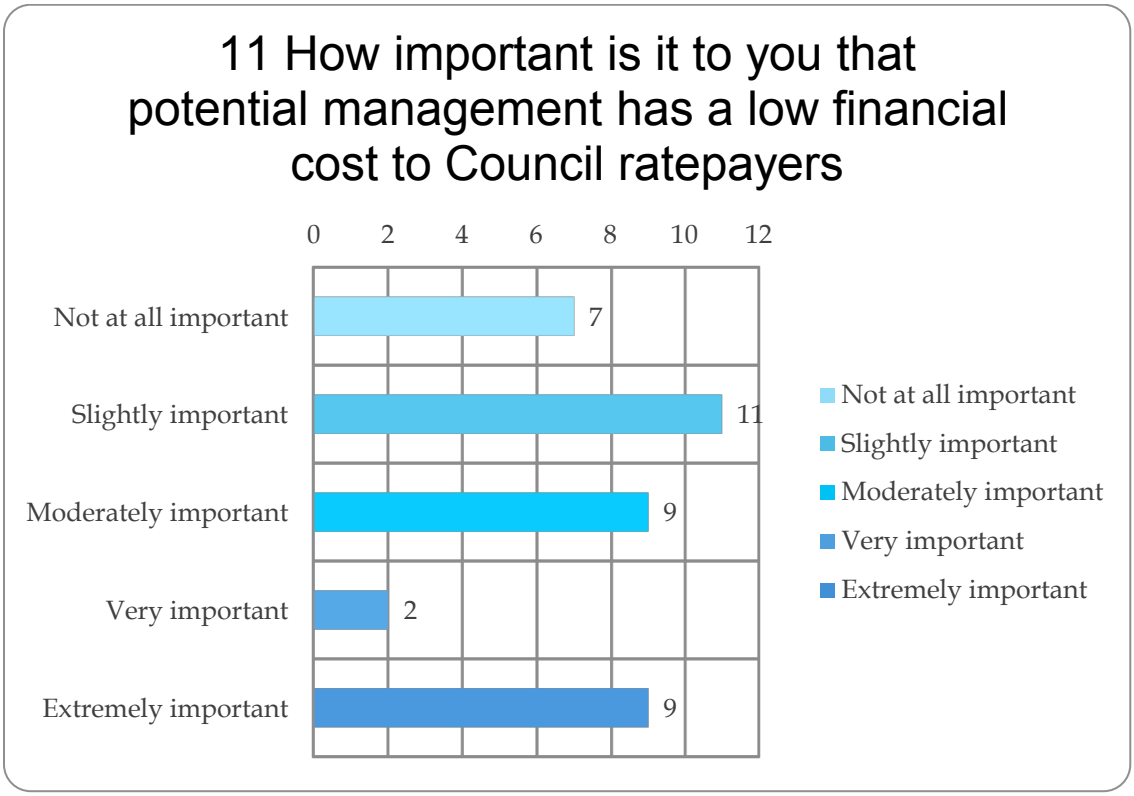

5 Which of the following best describe you tick all that apply
0
5
10
15
20
Resident near Rudder Park
Other Kempsey Shire resident
Business owner near Rudder Park
Regular visitor to Rudder Park
Regular visitor to Riverside Park opposite…
Member of a club or group
Other
14
18
1
13
17
10
4
Resident near Rudder Park
Other Kempsey Shire resident
Business owner near Rudder Park
Regular visitor to Rudder Park
Regular visitor to Riverside Park opposite Rudder Park
Member of a club or group
Other

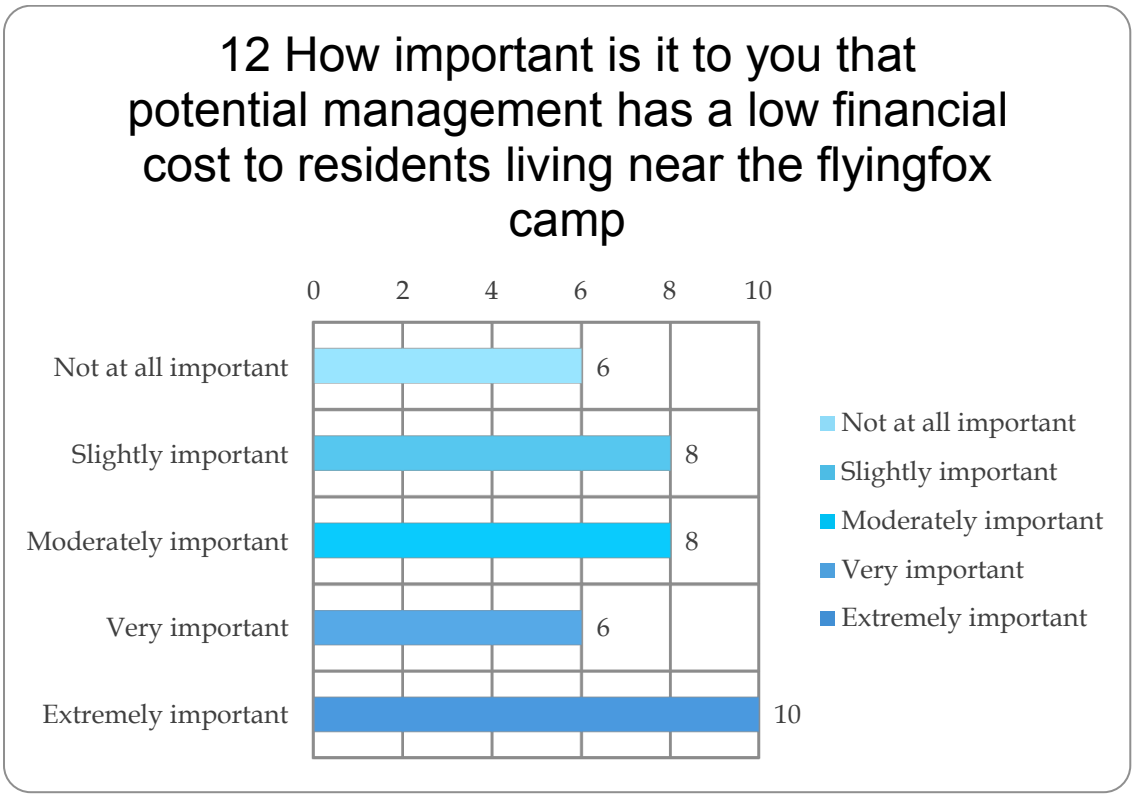

6 How do you feel about flyingfoxes
0
5
10
15
20
25
Positive
Neutral
Negative
22
1
15
Positive
Neutral
Negative

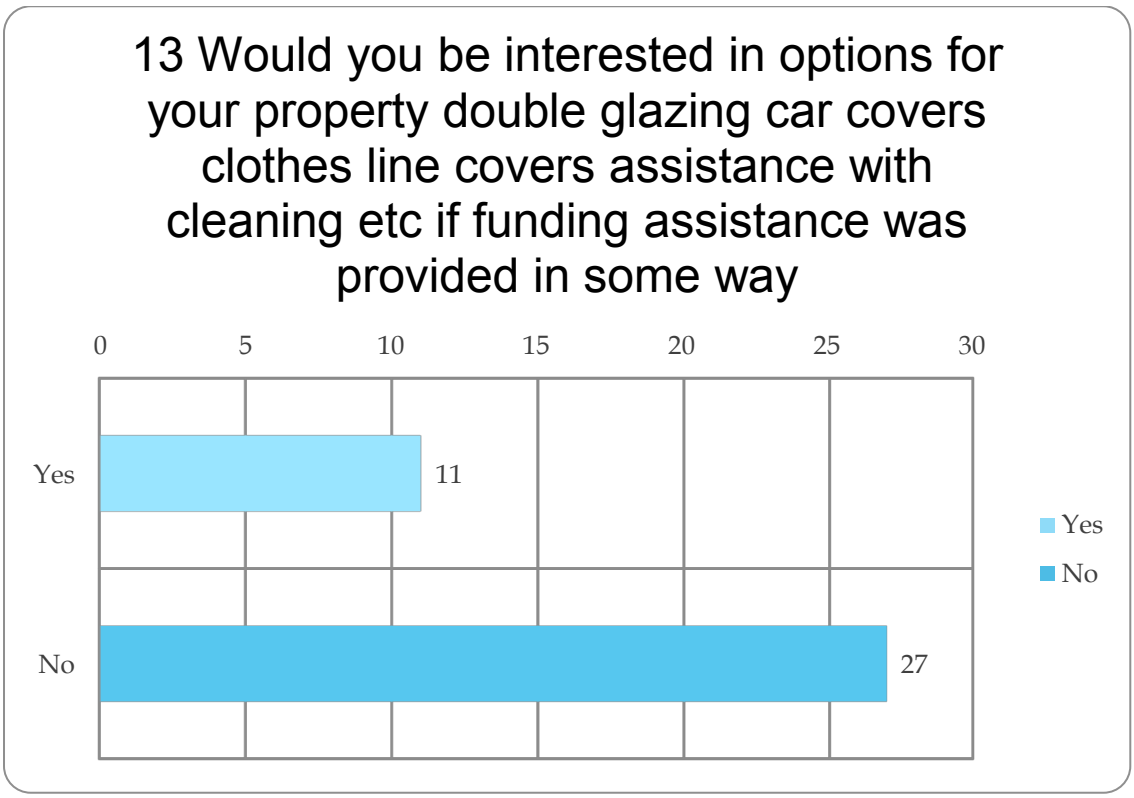

8 Main concerns about flying-foxes
Damage to vegetation
Visual amenity
Excrement
Fear of disease
Smell
Noise
0
2
4
6
8
10
12
14


9 Have you incurred any financial expenses directly related to flyingfoxes
0
5
10
15
20
25
30
No
30
Yes
8
No
Yes

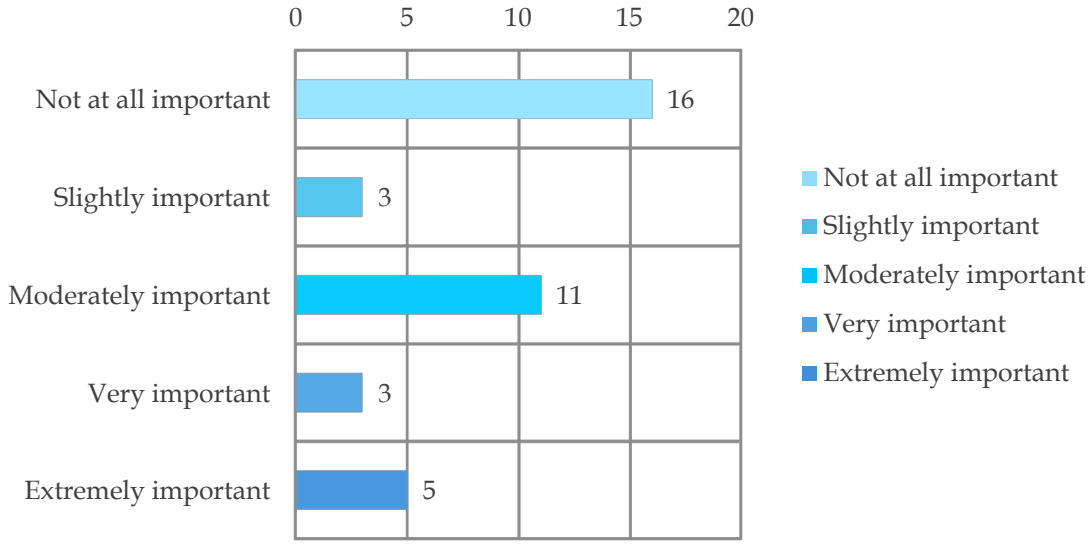

10 Ranking of most important statements
Provide flying-fox related education/tourism opportunities at Rudder Park/Riverview Park
Protect the flying-foxes (e.g. conservation and/or welfare)
Reduce faecal drop impacts at your location
Reduce smell impacts at your location
Reduce noise impacts at your location
0 1 2 3 4 5 6 7 8 9


11 How important is it to you that potential management has a low financial cost to Council ratepayers
0 2 4 6 8 10 12
Not at all important
Slightly important
Moderately important
Very important
Extremely important
7
11
9
2
9
Not at all important
Slightly important
Moderately important
Very important
Extremely important

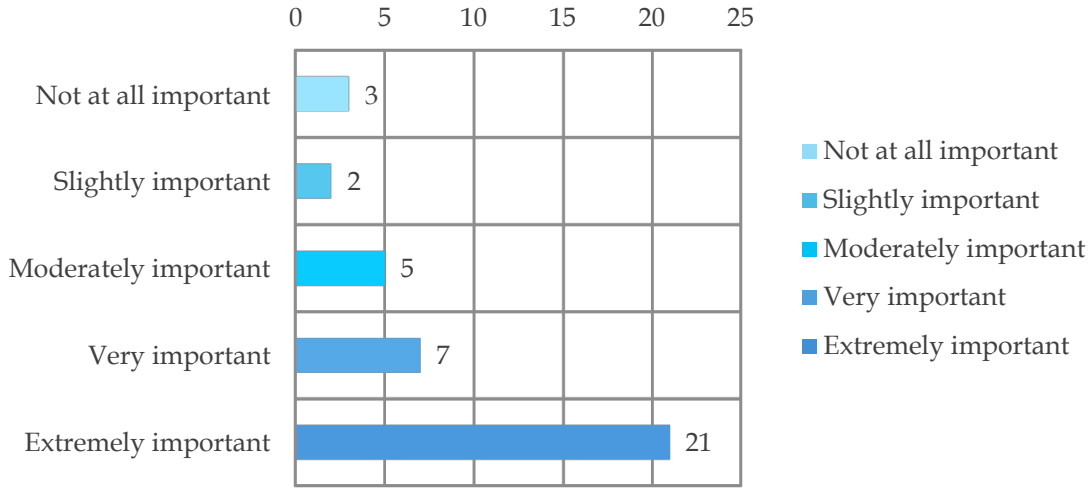

12 How important is it to you that potential management has a low financial cost to residents living near the flyingfox camp
0
2
4
6
8
10
Not at all important
Slightly important
Moderately important
Very important
Extremely important
6
8
8
6
10
Not at all important
Slightly important
Moderately important
Very important
Extremely important

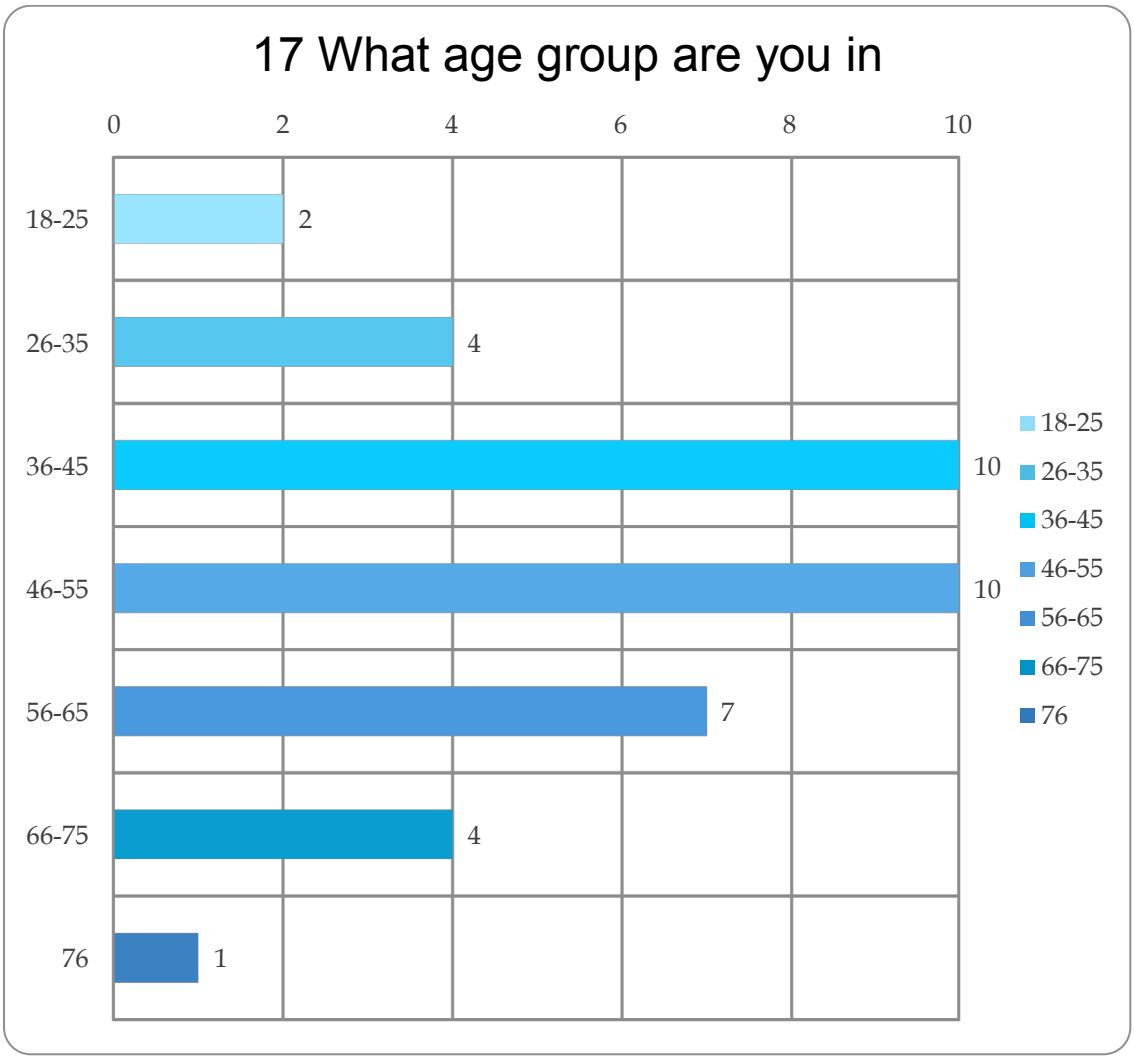

13 Would you be interested in options for your property double glazing car covers clothes line covers assistance with cleaning etc if funding assistance was provided in some way
0
5
10
15
20
25
30
Yes
No
11
27
Yes
No

14 How important is it to you that management does not disrupt residents and businesses during implementation



15 How important is it to you that management does not move the flyingfox camp to other areas that may also be near residents or businesses




17 What age group are you in
0
2
4
6
8
10
18-25
26-35
36-45
46-55
56-65
66-75
76
2
4
10
10
7
4
1
18-25
26-35
36-45
46-55
56-65
66-75
76

Appendix 2 Other key legislation for consideration

Local government legislation

Local government is required to prepare planning schemes (including Environmental Planning Instruments and Development Control Plans) consistent with provisions under the *Environmental Planning and Assessment Act 1979* (EP&A Act; see Section 4.1.5 of the template).

Local Environment Plans are environmental planning instruments that are legal documents and that relate to a local government area. Other environmental planning instruments, such as State Environmental Planning Policies (SEPPs), may relate to the whole or part of the state. A development control plan provides detailed planning and design guidelines to support the planning controls in a Local Environment Plan, but they are not legal documents.

Planning schemes enable a local government authority to manage growth and change in their local government area (LGA) through land use and administrative definitions, zones, overlays, infrastructure planning provisions, assessment codes and other administrative provisions. A planning scheme identifies the kind of development requiring approval, as well as zoning all areas within the LGA based on the environmental values and development requirements of that land. Planning schemes could potentially include a flying-fox habitat overlay, and may designate some habitat as flying-fox conservation areas.

State legislation

Rural Fires Act 1997

The objects of this Act are to prevent, mitigate and suppress bushfires and coordinate bush firefighting, while protecting persons from injury or death, and reduce property damage from fire. A permit is generally required from the Rural Fire Service for any fires in the open that are lit during the local Bush Fire Danger Period as determined each year. This may be relevant for fires used to disperse flying-foxes, or for any burning associated with vegetation management.

Protection of the Environment Operations Act 1997

The main object of the *Protection of the Environment Operations Act 1997* (POEO Act) is to set out explicit protection of the environment polices (PEPs) and adopt more innovative approaches to reducing pollution.

The use of smoke as a dispersal mechanism may constitute ‘chemical production’ under Schedule 1, clause 8 of the POEO Act, so this type of dispersal activity may require a licence under Chapter 3 of the Act.

The POEO Act also regulates noise including ‘offensive noise’. The Protection of the Environment Operations (Noise Control) Regulation 2008 (Part 4, Division 2) provides information on the types of noise that can be ‘offensive’ and for which the Environment

Protection Authority (EPA) can issue fines. This may include noise generated as a part of dispersal activities. It is best to discuss the types of noise makers and the sound levels and times these will be generated, along with identified noise receptors, with Council prior to any dispersal. Detailed advice and guidance on noise regulation can be found in the EPA's *Noise guide for local government* (EPA 2013).

Crown Lands Act 1989

The principles of Crown land management include the observance of environmental protection principles and the conservation of its natural resources, including water, soil, flora, fauna and scenic quality. Any works on land that is held or reserved under the Crown Lands Act 1989 (including vegetation management and dispersal activities) are an offence under the Act without prior authorisation obtained through the Department of Primary Industries (Lands).

Local Government Act 1993

The primary purpose of this Act is to provide the legal framework for an effective, efficient and environmentally responsible, open system of local government. Most relevant to flying-fox management is that it also provides encouragement for the effective participation of local communities in the affairs of local government and sets out guidance on the use and management of community land which may be applicable to land which requires management of flying-foxes.

State Environmental Planning Policies

SEPPs are environmental planning instruments which address specific planning issues within NSW. These SEPPs often remove power from local councils in order to control specific types of development or development in specific areas. SEPPs often transfer decision-making from Council to the Planning Minister. While there may be others, some of the SEPPs likely to apply at some flying-fox camps are outlined below.

SEPP 14 – Coastal Wetlands

This policy provides additional protection for coastal wetlands by requiring development consent to be obtained before any clearing, draining, filling or construction of levees can occur on a mapped wetland. Camps are unlikely to fall within the bounds of a SEPP 14 wetland, but additional restrictions for vegetation management in these areas may be required if they do.

SEPP 26 – Littoral Rainforests

SEPP 26 aims to protect coastal rainforests (littoral rainforests) by requiring development consent for activities within or adjacent to mapped coastal rainforest. It is unlikely that clearing for flying-fox management would be considered significant enough to trigger this SEPP but this should be confirmed if the site is within a mapped SEPP 26 area.

SEPP 19 – Bushland in Urban Areas

The aim of this policy is to protect and preserve bushland within urban areas which are defined in Schedule 1 of the SEPP. Broadly, this covers most LGAs within the Greater Sydney Region.

It does not cover:

- land reserved or dedicated under the *National Parks and Wildlife Act 1974*
- state forests, flora reserves or timber reserves under the *Forestry Act 1916*
- land to which SEPP (Western Sydney Parklands) 2009 applies.

Bushland within the designated LGAs may not be disturbed without the consent of the council unless the disturbance is for: bushfire hazard reduction, facilitating recreational use of the bushland in accordance with a plan of management referred to in clause 8 of the policy and essential infrastructure such as electricity, sewerage, gas or main roads. If the land owned by the proponent is zoned as SEPP 19 bushland, council approval would be required under this SEPP. Council should be contacted to discuss any potential disturbance associated with camp management.

SEPP (Vegetation in Non-Rural Areas) 2017

This policy aims to protect the biodiversity, and amenity values of trees, and other vegetation in non-rural areas of the State. A person must not cut down, fell, up root, kill, poison, ringbark, burn or otherwise destroy the vegetation, or lop or otherwise remove a substantial part of the vegetation to which this Policy applies without a permit granted by council, or in the case of vegetation clearing exceeding the biodiversity offset thresholds (as stated in Part 7 of the *Biodiversity Conservation Regulations 2017*), approval by the Native Vegetation Panel.

Proponents will need to consider whether the SEPP (Vegetation in Non-Rural Areas) applies to their proposal, and if any approvals are required under the BC Act.

Appendix 3 Database search results

Scientific	Common Name	NSW Status	Commonwealth Status
Cherax cuspidatus			
Gambusia holbrooki	Mosquito Fish		
Adelotus brevis	Tusked Frog	P	
Crinia parinsignifera	Eastern Sign-bearing Froglet	P	
Crinia signifera	Common Eastern Froglet	P	
Limnodynastes dumerilii	Eastern Banjo Frog	P	
Limnodynastes peronii	Brown-striped Frog	P	
Mixophyes fasciolatus	Great Barred Frog	P	
Mixophyes iteratus	Giant Barred Frog	E1,P,2	E
Paracrinia haswelli	Haswell's Froglet	P	
Pseudophryne bibronii	Bibron's Toadlet	P	
Pseudophryne coriacea	Red-backed Toadlet	P	
Uperoleia fusca	Dusky Toadlet	P	
Uperoleia laevigata	Smooth Toadlet	P	
Litoria brevipalmata	Green-thighed Frog	V,P	
Litoria caerulea	Green Tree Frog	P	
Litoria dentata	Bleating Tree Frog	P	
Litoria fallax	Eastern Dwarf Tree Frog	P	
Litoria freycineti	Freycinet's Frog	P	
Litoria gracilenta	Dainty Green Tree Frog	P	
Litoria latopalmata	Broad-palmed Frog	P	
Litoria lesueuri	Lesueur's Frog	P	
Litoria nasuta	Rocket Frog	P	
Litoria peronii	Peron's Tree Frog	P	
Litoria revelata	Revealed Frog	P	
Litoria tyleri	Tyler's Tree Frog	P	
Litoria verreauxii	Verreaux's Frog	P	
Chelodina longicollis	Eastern Snake-necked Turtle	P	
Emydura macquarii macquarii	Macquarie River Turtle	P	
Bellatorias major	Land Mullet	P	
Calyptotis ruficauda	Red-tailed Calyptotis	P	
Cryptoblepharus virgatus	Cream-striped Shinning-skink	P	
Ctenotus robustus	Robust Ctenotus	P	
Ctenotus taeniolatus	Copper-tailed Skink	P	
Egernia mcpheei	Eastern Crevice Skink	P	
Eulamprus quoyii	Eastern Water-skink	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Lampropholis amicula	Friendly Sunskink	P	
Lampropholis delicata	Dark-flecked Garden Sunskink	P	
Lampropholis guichenoti	Pale-flecked Garden Sunskink	P	
Lampropholis sp.	unidentified grass skink	P	
Tiliqua scincoides	Eastern Blue-tongue	P	
Amphibolurus muricatus	Jacky Lizard	P	
Amphibolurus nobbi	Nobbi	P	
Intellagama lesueurii	Eastern Water Dragon	P	
Pogona barbata	Bearded Dragon	P	
Varanus varius	Lace Monitor	P	
Morelia spilota	Carpet & Diamond Pythons	P	
Dendrelaphis punctulatus	Common Tree Snake	P	
Cryptophis nigrescens	Eastern Small-eyed Snake	P	
Demansia psammophis	Yellow-faced Whip Snake	P	
Hemiaspis signata	Black-bellied Swamp Snake	P	
Pseudechis porphyriacus	Red-bellied Black Snake	P	
Pseudonaja textilis	Eastern Brown Snake	P	
Alectura lathami	Australian Brush-turkey	P	
Coturnix pectoralis	Stubble Quail	P	
Coturnix ypsilophora	Brown Quail	P	
Excalfactoria chinensis	King Quail	P	
Pavo cristatus	Indian Peafowl		
Anas castanea	Chestnut Teal	P	
Anas gracilis	Grey Teal	P	
Anas platyrhynchos	Mallard		
Anas superciliosa	Pacific Black Duck	P	
Aythya australis	Hardhead	P	
Chenonetta jubata	Australian Wood Duck	P	
Cygnus atratus	Black Swan	P	
Dendrocygna eytoni	Plumed Whistling-Duck	P	
Poliocephalus poliocephalus	Hoary-headed Grebe	P	
Tachybaptus novaehollandiae	Australasian Grebe	P	
Columba leucomela	White-headed Pigeon	P	
Columba livia	Rock Dove		
Geopelia humeralis	Bar-shouldered Dove	P	
Geopelia striata	Peaceful Dove	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Leucosarcia melanoleuca	Wonga Pigeon	P	
Lopholaimus antarcticus	Topknot Pigeon	P	
Macropygia amboinensis	Brown Cuckoo-Dove	P	
Ocyphaps lophotes	Crested Pigeon	P	
Phaps chalcoptera	Common Bronzewing	P	
Phaps elegans	Brush Bronzewing	P	
Streptopelia chinensis	Spotted Turtle-Dove		
Podargus strigoides	Tawny Frogmouth	P	
Eurostopodus mystacalis	White-throated Nightjar	P	
Aegotheles cristatus	Australian Owlet-nightjar	P	
Apus pacificus	Fork-tailed Swift	P	C,J,K
Hirundapus caudacutus	White-throated Needletail	P	C,J,K
Anhinga novaehollandiae	Australasian Darter	P	
Microcarbo melanoleucos	Little Pied Cormorant	P	
Phalacrocorax carbo	Great Cormorant	P	
Phalacrocorax sulcirostris	Little Black Cormorant	P	
Phalacrocorax varius	Pied Cormorant	P	
Pelecanus conspicillatus	Australian Pelican	P	
Ephippiorhynchus asiaticus	Black-necked Stork	E1,P	
Ardea ibis	Cattle Egret	P	C,J
Ardea intermedia	Intermediate Egret	P	
Ardea modesta	Eastern Great Egret	P	
Ardea pacifica	White-necked Heron	P	
Egretta garzetta	Little Egret	P	
Egretta novaehollandiae	White-faced Heron	P	
Ixobrychus flavicollis	Black Bittern	V,P	
Nycticorax caledonicus	Nankeen Night Heron	P	
Platalea flavipes	Yellow-billed Spoonbill	P	
Platalea regia	Royal Spoonbill	P	
Plegadis falcinellus	Glossy Ibis	P	C
Threskiornis molucca	Australian White Ibis	P	
Threskiornis spinicollis	Straw-necked Ibis	P	
Accipiter cirrocephalus	Collared Sparrowhawk	P	
Accipiter fasciatus	Brown Goshawk	P	
Accipiter novaehollandiae	Grey Goshawk	P	
Aquila audax	Wedge-tailed Eagle	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Aviceda subcristata	Pacific Baza	P	
Circus approximans	Swamp Harrier	P	
Circus assimilis	Spotted Harrier	V,P	
Elanus axillaris	Black-shouldered Kite	P	
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P	C
Haliastur indus	Brahminy Kite	P	
Haliastur sphenurus	Whistling Kite	P	
Hamirostra melanosternon	Black-breasted Buzzard	V,P,3	
Hieraaetus morphnoides	Little Eagle	V,P	
Lophoictinia isura	Square-tailed Kite	V,P,3	
Milvus migrans	Black Kite	P	
Pandion cristatus	Eastern Osprey	V,P,3	
Falco berigora	Brown Falcon	P	
Falco cenchroides	Nankeen Kestrel	P	
Falco longipennis	Australian Hobby	P	
Falco peregrinus	Peregrine Falcon	P	
Fulica atra	Eurasian Coot	P	
Gallinula tenebrosa	Dusky Moorhen	P	
Gallirallus philippensis	Buff-banded Rail	P	
Porphyrio porphyrio	Purple Swamphen	P	
Porzana fluminea	Australian Spotted Crake	P	
Porzana pusilla	Baillon's Crake	P	
Himantopus himantopus	Black-winged Stilt	P	
Elseyornis melanops	Black-fronted Dotterel	P	
Pluvialis fulva	Pacific Golden Plover	P	C,J,K
Vanellus miles	Masked Lapwing	P	
Vanellus tricolor	Banded Lapwing	P	
Irediparra gallinacea	Comb-crested Jacana	V,P	
Calidris acuminata	Sharp-tailed Sandpiper	P	C,J,K
Calidris ferruginea	Curlew Sandpiper	E1,P	CE,C,J,K
Gallinago hardwickii	Latham's Snipe	P	C,J,K
Turnix varius	Painted Button-quail	P	
Sternula albifrons	Little Tern	E1,P	C,J,K
Cacatua galerita	Sulphur-crested Cockatoo	P	
Cacatua sanguinea	Little Corella	P	
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2	
Eolophus roseicapillus	Galah	P	
Alisterus scapularis	Australian King-Parrot	P	
Glossopsitta concinna	Musk Lorikeet	P	
Glossopsitta pusilla	Little Lorikeet	V,P	
Platycercus elegans	Crimson Rosella	P	
Platycercus eximius	Eastern Rosella	P	
Psephotus haematonotus	Red-rumped Parrot	P	
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	P	
Trichoglossus haematodus	Rainbow Lorikeet	P	
Trichoglossus/Glossopsitta sp.	Unidentified Lorikeet	P	
Centropus phasianinus	Pheasant Coucal	P	
Cacomantis flabelliformis	Fan-tailed Cuckoo	P	
Cacomantis pallidus	Pallid Cuckoo	P	
Cacomantis variolosus	Brush Cuckoo	P	
Chalcites basalis	Horsfield's Bronze-Cuckoo	P	
Chalcites lucidus	Shining Bronze-Cuckoo	P	
Chalcites minutillus	Little Bronze-Cuckoo	P	
Cuculus optatus	Oriental Cuckoo	P	
Eudynamys orientalis	Eastern Koel	P	
Scythrops novaehollandiae	Channel-billed Cuckoo	P	
Ninox novaeseelandiae	Southern Boobook	P	
Ninox strenua	Powerful Owl	V,P,3	
Tyto javanica	Eastern Barn Owl	P	
Tyto longimembris	Eastern Grass Owl	V,P,3	
Tyto novaehollandiae	Masked Owl	V,P,3	
Tyto tenebricosa	Sooty Owl	V,P,3	
Ceyx azureus	Azure Kingfisher	P	
Dacelo novaeguineae	Laughing Kookaburra	P	
Todiramphus macleayii	Forest Kingfisher	P	
Todiramphus sanctus	Sacred Kingfisher	P	
Merops ornatus	Rainbow Bee-eater	P	J
Eurystomus orientalis	Dollarbird	P	
Climacteris erythrops	Red-browed Treecreeper	P	
Cormobates leucophaea	White-throated Treecreeper	P	
Ptilonorhynchus violaceus	Satin Bowerbird	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Malurus cyaneus	Superb Fairy-wren	P	
Malurus lamberti	Variegated Fairy-wren	P	
Malurus melanocephalus	Red-backed Fairy-wren	P	
Malurus sp.	Unidentified Fairy-wren	P	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	P	
Acanthiza lineata	Striated Thornbill	P	
Acanthiza nana	Yellow Thornbill	P	
Acanthiza pusilla	Brown Thornbill	P	
Acanthiza reguloides	Buff-rumped Thornbill	P	
Gerygone mouki	Brown Gerygone	P	
Gerygone olivacea	White-throated Gerygone	P	
Sericornis citreogularis	Yellow-throated Scrubwren	P	
Sericornis frontalis	White-browed Scrubwren	P	
Sericornis magnirostra	Large-billed Scrubwren	P	
Smicrornis brevirostris	Weebill	P	
Pardalotus punctatus	Spotted Pardalote	P	
Pardalotus striatus	Striated Pardalote	P	
Acanthorhynchus tenuirostris	Eastern Spinebill	P	
Anthochaera carunculata	Red Wattlebird	P	
Anthochaera chrysoptera	Little Wattlebird	P	
Caligavis chrysops	Yellow-faced Honeyeater	P	
Entomyzon cyanotis	Blue-faced Honeyeater	P	
Grantiella picta	Painted Honeyeater	V,P	V
Lichmera indistincta	Brown Honeyeater	P	
Manorina melanocephala	Noisy Miner	P	
Meliphaga lewinii	Lewin's Honeyeater	P	
Melithreptus affinis	Black-headed Honeyeater	P	
Melithreptus brevirostris	Brown-headed Honeyeater	P	
Melithreptus lunatus	White-naped Honeyeater	P	
Myzomela sanguinolenta	Scarlet Honeyeater	P	
Philemon citreogularis	Little Friarbird	P	
Philemon corniculatus	Noisy Friarbird	P	
Phylidonyris niger	White-cheeked Honeyeater	P	
Phylidonyris novaehollandiae	New Holland Honeyeater	P	
Plectorhyncha lanceolata	Striped Honeyeater	P	
Ptilotula fuscus	Fuscous Honeyeater	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Orthonyx temminckii	Logrunner	P	
Psophodes olivaceus	Eastern Whipbird	P	
Daphoenositta chrysoptera	Varied Sittella	V,P	
Coracina novaehollandiae	Black-faced Cuckoo-shrike	P	
Coracina papuensis	White-bellied Cuckoo-shrike	P	
Coracina tenuirostris	Cicadabird	P	
Colluricincla harmonica	Grey Shrike-thrush	P	
Colluricincla megarhyncha	Little Shrike-thrush	P	
Falcunculus frontatus frontatus	Eastern Shrike-tit	P	
Pachycephala pectoralis	Golden Whistler	P	
Pachycephala rufiventris	Rufous Whistler	P	
Oriolus sagittatus	Olive-backed Oriole	P	
Sphecotheres vieilloti	Australasian Figbird	P	
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P	
Artamus leucorynchus	White-breasted Woodswallow	P	
Artamus personatus	Masked Woodswallow	P	
Cracticus nigrogularis	Pied Butcherbird	P	
Cracticus tibicen	Australian Magpie	P	
Cracticus torquatus	Grey Butcherbird	P	
Strepera graculina	Pied Currawong	P	
Dicrurus bracteatus	Spangled Drongo	P	
Rhipidura albiscapa	Grey Fantail	P	
Rhipidura leucophrys	Willie Wagtail	P	
Rhipidura rufifrons	Rufous Fantail	P	
Corvus coronoides	Australian Raven	P	
Corvus orru	Torresian Crow	P	
Corvus tasmanicus	Forest Raven	P	
Carterornis leucotis	White-eared Monarch	V,P	
Grallina cyanoleuca	Magpie-lark	P	
Monarcha melanopsis	Black-faced Monarch	P	
Myiagra cyanoleuca	Satin Flycatcher	P	
Myiagra inquieta	Restless Flycatcher	P	
Myiagra rubecula	Leaden Flycatcher	P	
Symposiachrus trivirgatus	Spectacled Monarch	P	
Eopsaltria australis	Eastern Yellow Robin	P	
Microeca fascinans	Jacky Winter	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Petroica boodang	Scarlet Robin	V,P	
Petroica phoenicea	Flame Robin	V,P	
Petroica rosea	Rose Robin	P	
Tregellasia capito	Pale-yellow Robin	P	
Cisticola exilis	Golden-headed Cisticola	P	
Acrocephalus australis	Australian Reed-Warbler	P	
Cincloramphus cruralis	Brown Songlark	P	
Cincloramphus mathewsi	Rufous Songlark	P	
Megalurus gramineus	Little Grassbird	P	
Megalurus timoriensis	Tawny Grassbird	P	
Zosterops lateralis	Silvereye	P	
Hirundo neoxena	Welcome Swallow	P	
Petrochelidon ariel	Fairy Martin	P	
Petrochelidon nigricans	Tree Martin	P	
Zoothera lunulata	Bassian Thrush	P	
Sturnus tristis	Common Myna		
Sturnus vulgaris	Common Starling		
Dicaeum hirundinaceum	Mistletoebird	P	
Lonchura castaneothorax	Chestnut-breasted Mannikin	P	
Lonchura punctulata	Nutmeg Mannikin		
Neochmia temporalis	Red-browed Finch	P	
Taeniopygia bichenovii	Double-barred Finch	P	
Passer domesticus	House Sparrow		
Anthus novaeseelandiae	Australian Pipit	P	
Ornithorhynchus anatinus	Platypus	P	
Tachyglossus aculeatus	Short-beaked Echidna	P	
Antechinus stuartii	Brown Antechinus	P	
Antechinus swainsonii	Dusky Antechinus	P	
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E
Phascogale tapoatafa	Brush-tailed Phascogale	V,P	
Sminthopsis murina	Common Dunnart	P	
Isoodon macrourus	Northern Brown Bandicoot	P	
Isoodon/Perameles sp.	unidentified Bandicoot	P	
Perameles nasuta	Long-nosed Bandicoot	P	
Phascolarctos cinereus	Koala	V,P	V
Vombatus ursinus	Common Wombat	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Petaurus australis	Yellow-bellied Glider	V,P	
Petaurus breviceps	Sugar Glider	P	
Petaurus norfolcensis	Squirrel Glider	V,P	
Petauroides volans	Greater Glider	P	V
Pseudocheirus peregrinus	Common Ringtail Possum	P	
Acrobates pygmaeus	Feathertail Glider	P	
Trichosurus sp.	brushtail possum	P	
Trichosurus vulpecula	Common Brushtail Possum	P	
Macropus giganteus	Eastern Grey Kangaroo	P	
Macropus rufogriseus	Red-necked Wallaby	P	
Thylogale thetis	Red-necked Pademelon	P	
Wallabia bicolor	Swamp Wallaby	P	
Pteropus alecto	Black Flying-fox	P	
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V
Pteropus scapulatus	Little Red Flying-fox	P	
Rhinolophus megaphyllus	Eastern Horseshoe-bat	P	
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P	
Austronomus australis	White-striped Freetail-bat	P	
Mormopterus norfolkensis	Eastern Freetail-bat	V,P	
Mormopterus norfolkensis/sp 1	Unidentified Mastiff-bat	P	
Mormopterus ridei	Eastern Free-tailed Bat		
Mormopterus sp.	mastiff-bat	P	
Chalinolobus gouldii	Gould's Wattled Bat	P	
Chalinolobus morio	Chocolate Wattled Bat	P	
Chalinolobus nigrogriseus	Hoary Wattled Bat	V,P	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P	
Kerivoula papuensis	Golden-tipped Bat	V,P	
Miniopterus australis	Little Bentwing-bat	V,P	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V,P	
Myotis macropus	Southern Myotis	V,P	
Nyctophilus geoffroyi	Lesser Long-eared Bat	P	
Nyctophilus gouldi	Gould's Long-eared Bat	P	
Nyctophilus sp.	long-eared bat	P	
Scoteanax rueppellii	Greater Broad-nosed Bat	V,P	
Scotorepens orion	Eastern Broad-nosed Bat	P	
Scotorepens sp 1	Central-eastern Broad-nosed Bat	P	

Scientific	Common Name	NSW Status	Commonwealth Status
Scotorepens sp.	Unidentified broad-nosed bat	P	
Vespadelus darlingtoni	Large Forest Bat	P	
Vespadelus pumilus	Eastern Forest Bat	P	
Vespadelus regulus	Southern Forest Bat	P	
Vespadelus sp.	Unidentified Eptesicus	P	
Vespadelus troughtoni	Eastern Cave Bat	V,P	
Vespadelus vulturnus	Little Forest Bat	P	
Mus musculus	House Mouse		
Rattus fuscipes	Bush Rat	P	
Rattus lutreolus	Swamp Rat	P	
Rattus norvegicus	Brown Rat		
Rattus rattus	Black Rat		
Rattus sp.	rat	P	
Canis lupus	Dingo, domestic dog		
Canis lupus familiaris	Dog		
Vulpes vulpes	Fox		
Felis catus	Cat		
Lepus capensis	Brown Hare		
Oryctolagus cuniculus	Rabbit		
Bos taurus	European cattle		
Cervus sp.	Unidentified Deer		
Jalmenus evagoras evagoras	Common Imperial Blue		
Danaus plexippus	Monarch Butterfly		
Euploea core	Common Crow		
Heteronympha merope	Common Brown		
Junonia villida calybe	Meadow Argus Butterfly		
Vanessa kershawi	Australian painted lady		
Brunoniella australis	Blue Trumpet		
Brunoniella pumilio	Dwarf Blue Trumpet		
Pseuderanthemum variabile	Pastel Flower		
Adiantum aethiopicum	Common Maidenhair	P	
Adiantum formosum	Giant Maidenhair	P	
Adiantum hispidulum	Rough Maidenhair	P	
Alisma plantago-aquatica	Water Plantain		
Alternanthera denticulata	Lesser Joyweed		
Alternanthera pungens	Khaki Weed		

Scientific	Common Name	NSW Status	Commonwealth Status
Amaranthus spinosus	Needle Burr		
Euroschinus falcatus var. falcatus	Ribbonwood		
Laxmannia gracilis	Slender Wire Lily		
Thysanotus tuberosus	Common Fringe-lily		
Tricoryne elatior	Yellow Autumn-lily		
Actinotus helianthi	Flannel Flower	P	
Centella asiatica	Indian Pennywort		
Conium maculatum	Hemlock		
Cyclospermum leptophyllum	Slender Celery		
Daucus glochidiatus	Native Carrot		
Foeniculum vulgare	Fennel		
Hydrocotyle hirta	Hairy Pennywort		
Hydrocotyle tripartita	Pennywort		
Xanthosia pilosa	Woolly Xanthosia		
Araujia sericifera	Moth Vine		
Asclepias curassavica	Blood Flower		
Gomphocarpus physocarpus	Balloon Cotton Bush		
Marsdenia rostrata	Milk Vine		
Marsdenia suaveolens	Scented Marsdenia		
Parsonsia straminea	Common Silkpod		
Tabernaemontana pandacaqui	Banana Bush		
Tylophora paniculata	Thin-leaved Tylophora		
Alocasia brisbanensis	Cunjevoi		
Gymnostachys anceps	Settler's Twine		
Zantedeschia aethiopica	Arum Lily		
Polyscias sambucifolia	Elderberry Panax		
Araucaria cunninghamii	Hoop Pine		
Archontophoenix cunninghamiana	Bangalow Palm	P	
Syagrus romanzoffiana	Cocos Palm		
Asparagus aethiopicus	Asparagus Fern		
Asphodelus fistulosus	Onion Weed		
Asplenium attenuatum	Simple Spleenwort		
Asplenium australasicum	Bird's Nest Fern	P	
Cordyline stricta	Narrow-leaved Palm Lily	P	
Ageratina adenophora	Crofton Weed		
Ageratum conyzoides subsp. conyzoides	Goatweed		

Scientific	Common Name	NSW Status	Commonwealth Status
Ambrosia artemisiifolia	Annual Ragweed		
Baccharis halimifolia	Groundsel Bush		
Bidens pilosa	Cobbler's Pegs		
Cassinia aculeata	Dolly Bush		
Cassinia uncata	Sticky Cassinia		
Centipeda minima subsp. minima	spreading sneezeweed		
Chrysanthemoides monilifera subsp. rotundata	Bitou Bush		
Cirsium vulgare	Spear Thistle		
Conyza bonariensis	Flaxleaf Fleabane		
Conyza spp.	A Fleabane		
Conyza sumatrensis	Tall fleabane		
Cotula coronopifolia	Water Buttons		
Erechtites valerianifolia	Brazilian Fireweed		
Euchiton involucratus	Star Cudweed		
Euchiton spp.	A Cudweed		
Galinsoga parviflora	Potato Weed		
Gamochaeta purpurea	Purple Cudweed		
Hypochaeris glabra	Smooth Catsear		
Hypochaeris radicata	Catsear		
Hypochaeris spp.	A Catsear		
Lagenifera stipitata	Blue Bottle-daisy		
Lagenophora gracilis	Slender Lagenophora		
Ozothamnus diosmifolius	White Dogwood		
Pseudognaphalium luteoalbum	Jersey Cudweed		
Senecio madagascariensis	Fireweed		
Senecio spp.	Groundsel, Fireweed		
Sigesbeckia orientalis subsp. orientalis	Indian Weed		
Silybum marianum	Variegated Thistle		
Soliva sessilis	Bindyi		
Sonchus oleraceus	Common Sowthistle		
Tagetes minuta	Stinking Roger		
Taraxacum officinale	Dandelion		
Xanthium occidentale	Noogoora Burr		
Xerochrysum bracteatum	Golden Everlasting		
Azolla filiculoides	Pacific Azolla		

Scientific	Common Name	NSW Status	Commonwealth Status
Anredera cordifolia	Madeira Vine		
Jacaranda mimosifolia	Jacaranda		
Pandorea jasminoides	Bower Vine		
Pandorea pandorana	Wonga Wonga Vine		
Blandfordia grandiflora	Christmas Bells	P	
Blechnum cartilagineum	Gristle Fern		
Blechnum indicum	Swamp Water Fern		
Blechnum minus	Soft Water Fern		
Doodia aspera	Prickly Rasp Fern		
Doodia australis	Common Rasp Fern		
Doodia caudata	Small Rasp Fern		
Echium plantagineum	Patterson's Curse		
Capsella bursa-pastoris	Shepherd's Purse		
Cardamine hirsuta	Common Bittercress		
Sisymbrium officinale	Hedge Mustard		
Opuntia stricta	Common Prickly Pear		
Callitriche stagnalis	Common Starwort		
Wahlenbergia communis	Tufted Bluebell		
Wahlenbergia gracilis	Sprawling Bluebell		
Canna indica	Tous-les-mois Arrowroot		
Capparis arborea	Native Pomegranate		
Lonicera japonica	Japanese Honeysuckle		
Stellaria media	Common Chickweed		
Allocasuarina littoralis	Black She-Oak		
Allocasuarina torulosa	Forest Oak		
Casuarina glauca	Swamp Oak		
Denhamia celastroides	Denhamia		
Denhamia silvestris	Narrow-leaved Orangebark		
Hypericum gramineum	Small St John's Wort		
Hypericum perforatum	St. Johns Wort		
Commelina cyanea	Native Wandering Jew		
Tradescantia fluminensis	Wandering Jew		
Convolvulus arvensis	Field Bindweed		
Convolvulus erubescens	Pink Bindweed		
Cuscuta campestris	Golden Dodder		
Dichondra repens	Kidney Weed		

Scientific	Common Name	NSW Status	Commonwealth Status
Ipomoea purpurea	Common Morning Glory		
Citrullus lanatus var. lanatus	Wild Melon, Camel Melon, Bitter		
Sechium edule	Choko		
Caldcluvia paniculosa	Soft Corkwood		
Geissois benthamiana	Red Carabeen		
Schizomeria ovata	Crabapple		
Callitris glaucophylla	White Cypress Pine		
Callitris rhomboidea	Port Jackson Pine		
Baumea articulata	Jointed Twig-rush		
Bolboschoenus fluviatilis	Marsh Club-rush		
Carex appressa	Tall Sedge		
Carex fascicularis	Tassel Sedge		
Carex inversa	Knob Sedge		
Cyperus difformis	Dirty Dora		
Cyperus eragrostis	Umbrella Sedge		
Cyperus involucratus	Umbrella Plant		
Cyperus rotundus	Nutgrass		
Eleocharis sphacelata	Tall Spike Rush		
Fimbristylis dichotoma	Common Fringe-sedge		
Gahnia aspera	Rough Saw-sedge		
Gahnia clarkei	Tall Saw-sedge		
Gahnia melanocarpa	Black Fruit Saw-sedge		
Gahnia sieberiana	Red-fruit Saw-sedge	P	
Isolepis inundata	Club-rush		
Lepidosperma laterale	Variable Sword-sedge		
Schoenus apogon	Fluke Bogrush		
Nephrolepis cordifolia	Fishbone Fern		
Histiopteris incisa	Bat's Wing Fern		
Hypolepis muelleri	Harsh Ground Fern		
Pteridium esculentum	Bracken		
Calochlaena dubia	Rainbow Fern		
Dicksonia antarctica	Soft Treefern	P	
Hibbertia aspera	Rough Guinea Flower		
Hibbertia dentata	Twining Guinea Flower		
Hibbertia diffusa	Wedge Guinea Flower		
Hibbertia obtusifolia	Hoary Guinea Flower		

Scientific	Common Name	NSW Status	Commonwealth Status
Hibbertia scandens	Climbing Guinea Flower		
Hibbertia serpyllifolia	Hairy Guinea Flower		
Dioscorea transversa	Native Yam		
Drosera peltata	A Sundew		
Lastreopsis acuminata	Shiny Shield Fern		
Lastreopsis decomposita	Trim Shield Fern		
Diospyros pentamera	Myrtle Ebony		
Elaeocarpus kirtonii	Silver Quandong		
Elaeocarpus obovatus	Hard Quandong		
Elaeocarpus reticulatus	Blueberry Ash		
Elatine gratioloides	Waterwort		
Epacris microphylla	Coral Heath		
Epacris pulchella	Wallum Heath		
Leucopogon ericoides	Pink Beard-heath		
Leucopogon juniperinus	Prickly Beard-heath		
Leucopogon spp.	A Beard-heath		
Lissanthe strigosa	Peach Heath		
Melichrus procumbens	Jam Tarts		
Trochocarpa laurina	Tree Heath		
Quintinia sieberi	Possumwood		
Quintinia verdonii	Grey Possumwood		
Aleurites moluccana	Candle Nut		
Croton verreauxii	Green Native Cascarilla		
Euphorbia peplus	Petty Spurge		
Mallotus philippensis	Red Kamala		
Ricinus communis	Castor Oil Plant		
Eupomatia laurina	Bolwarra		
Senna septemtrionalis	Arsenic Bush		
Bossiaea obcordata	Spiny Bossiaea		
Canavalia rosea	Coastal Jack Bean		
Chorizema parviflorum	Eastern Flame Pea		
Daviesia genistifolia	Broom Bitter Pea		
Daviesia ulicifolia	Gorse Bitter Pea		
Desmodium brachypodum	Large Tick-trefoil		
Desmodium gunnii	Slender Tick-trefoil		
Erythrina x sykesii	Coral tree		

Scientific	Common Name	NSW Status	Commonwealth Status
Glycine clandestina	Twining glycine		
Glycine microphylla	Small-leaf Glycine		
Glycine tabacina	Variable Glycine		
Glycine tomentella	Woolly Glycine		
Gompholobium latifolium	Golden Glory Pea		
Gompholobium pinnatum	Pinnate Wedge Pea		
Hardenbergia violacea	False Sarsaparilla		
Jacksonia scoparia	Dogwood		
Kennedia rubicunda	Dusky Coral Pea		
Macroptilium atropurpureum	Siratro		
Medicago lupulina	Black Medic		
Mirbelia rubiifolia	Heathy Mirbelia		
Phyllota phylicoides	Heath Phyllota		
Pultenaea daphnoides	Large-leaf Bush-pea		
Pultenaea paleacea	Chaffy Bush-pea		
Pultenaea villosa	Hairy Bush-pea		
Trifolium incarnatum	Crimson Clover		
Trifolium repens	White Clover		
Ulex europaeus	Gorse		
Zornia dyctiocarpa var. dyctiocarpa	Zornia		
Acacia binervata	Two-veined Hickory		
Acacia binervia	Coast Myall		
Acacia brownii	Heath Wattle		
Acacia complanata	Flat-stemmed Wattle		
Acacia concurrens	Curracabah		
Acacia falciformis	Broad-leaved Hickory		
Acacia fimbriata	Fringed Wattle		
Acacia floribunda	White Sally		
Acacia implexa	Hickory Wattle		
Acacia irrorata	Green Wattle		
Acacia longifolia subsp. longifolia	Sydney Golden Wattle		
Acacia longifolia subsp. sophorae	Coastal Wattle		
Acacia longissima	Long-leaf Wattle		
Acacia maidenii	Maiden's Wattle		
Acacia mearnsii	Black Wattle		
Acacia melanoxylon	Blackwood		

Scientific	Common Name	NSW Status	Commonwealth Status
Acacia myrtifolia	Red-stemmed Wattle		
Acacia podalyriifolia	Queensland Silver Wattle		
Acacia spp.	Wattle		
Acacia terminalis	Sunshine Wattle		
Acacia ulicifolia	Prickly Moses		
Archidendron grandiflorum	Pink Lace Flower		
Fumaria bastardii	Bastards Fumitory		
Centaurium erythraea	Common Centaury		
Schenkia spicata	Spike Centaury		
Geranium solanderi	Native Geranium		
Goodenia hederacea	Ivy Goodenia		
Goodenia ovata	Hop Goodenia		
Scaevola albida	Pale Fan-flower		
Grammitis billardierei	Finger Fern		
Gonocarpus tetragynus	Poverty Raspwort		
Gonocarpus teucrioides	Germander Raspwort		
Hydrocharis dubia	Frogbit		
Ottelia ovalifolia subsp. ovalifolia	Swamp Lily		
Vallisneria australis	Eelweed		
Hypoxis hygrometrica	Golden Weather-grass		
Crocosmia x crocosmiiflora	Montbretia		
Patersonia glabrata	Leafy Purple-flag		
Patersonia sericea	Silky Purple-Flag		
Juncus acutus subsp. acutus	Sharp Rush		
Juncus articulatus	A Rush		
Triglochin procera	Water Ribbons		
Triglochin striata	Streaked Arrowgrass		
Ajuga australis	Austral Bugle		
Clerodendrum tomentosum	Hairy Clerodendrum		
Gmelina leichhardtii	White Beech		
Mentha x spicata	Spearmint		
Prostanthera incisa	Cut-leaved Mint-bush		
Cassytha pubescens	Downy Dodder-laurel		
Cinnamomum camphora	Camphor Laurel		
Cinnamomum oliveri	Oliver's Sassafras		
Cryptocarya glaucescens	Jackwood		

Scientific	Common Name	NSW Status	Commonwealth Status
Cryptocarya meissneriana	Thick-leaved Laurel		
Cryptocarya microneura	Murrogun		
Cryptocarya obovata	Pepperberry		
Cryptocarya rigida	Forest Maple		
Endiandra sieberi	Hard Corkwood		
Neolitsea dealbata	Hairy-leaved Bolly Gum		
Utricularia aurea	Golden Bladderwort		
Lilium formosanum	Formosan Lily		
Lindsaea linearis	Screw Fern		
Lindsaea microphylla	Lacy Wedge Fern		
Pratia purpurascens	Whiteroot		
Lomandra confertifolia	Matrush		
Lomandra filiformis	Wattle Matt-rush		
Lomandra glauca	Pale Mat-rush		
Lomandra longifolia	Spiny-headed Mat-rush		
Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush		
Lomandra spp.	Mat-rush		
Amyema miquelii	Box Mistletoe		
Amyema spp.	Mistletoe		
Eustrephus latifolius	Wombat Berry		
Geitonoplesium cymosum	Scrambling Lily		
Lycopodiella cernua	Scrambling Clubmoss		
Lycopodiella lateralis	Slender Clubmoss		
Brachychiton acerifolius	Illawarra Flame Tree		
Brachychiton populneus	Kurrajong		
Commersonia fraseri	Brush Kurrajong		
Heritiera actinophylla	Black Booyong		
Hibiscus diversifolius	Swamp Hibiscus		
Hibiscus heterophyllus subsp. heterophyllus	Native Rosella		
Sida rhombifolia	Paddy's Lucerne		
Marsilea hirsuta	Short-fruited Nardoo		
Marsilea spp.	A Nardoo		
Melia azedarach	White Cedar		
Synoum glandulosum subsp. glandulosum	Scentless Rosewood		

Scientific	Common Name	NSW Status	Commonwealth Status
Toona ciliata	Red Cedar		
Legnephora moorei	Round-leaf Vine		
Sarcopetalum harveyanum	Pearl Vine		
Stephania japonica	Snake vine		
Nymphoides indica	Water Snowflake		
Hedycarya angustifolia	Native Mulberry		
Wilkiea huegeliana	Veiny Wilkiea		
Ficus benjamina	Weeping Fig		
Ficus coronata	Creek Sandpaper Fig		
Ficus fraseri	Sandpaper Fig		
Ficus rubiginosa	Port Jackson Fig		
Ficus watkinsiana	Strangling Fig		
Maclura cochinchinensis	Cockspur Thorn		
Morus alba	White Mulberry		
Myrsine howittiana	Brush Muttonwood		
Acmena smithii	Lilly Pilly		
Angophora costata	Sydney Red Gum		
Archirhodomyrtus beckleri	Rose Myrtle		
Baeckea linifolia	Weeping Baeckea	P	
Callistemon flavovirens	Green Bottlebrush		
Callistemon pachyphyllus	Wallum Bottlebrush		
Callistemon salignus	Willow Bottlebrush		
Callistemon sieberi	River Bottlebrush		
Corymbia gummifera	Red Bloodwood		
Corymbia intermedia	Pink Bloodwood		
Corymbia maculata	Spotted Gum		
Eucalyptus acmenoides	White Mahogany		
Eucalyptus agglomerata	Blue-leaved Stringybark		
Eucalyptus amplifolia	Cabbage Gum		
Eucalyptus biturbinata	Grey Gum		
Eucalyptus carnea	Thick-leaved Mahogany		
Eucalyptus crebra	Narrow-leaved Ironbark		
Eucalyptus eugenioides	Thin-leaved Stringybark		
Eucalyptus fibrosa	Red Ironbark		
Eucalyptus globoidea	White Stringybark		
Eucalyptus grandis	Flooded Gum		

Scientific	Common Name	NSW Status	Commonwealth Status
Eucalyptus laevopinea	Silver-top Stringybark		
Eucalyptus microcorys	Tallowwood		
Eucalyptus paniculata	Grey Ironbark		
Eucalyptus pilularis	Blackbutt		
Eucalyptus placita	A Grey Ironbark		
Eucalyptus planchoniana	Bastard Tallowwood		
Eucalyptus propinqua	Small-fruited Grey Gum		
Eucalyptus racemosa	Narrow-leaved Scribbly Gum		
Eucalyptus resinifera	Red Mahogany		
Eucalyptus robusta	Swamp Mahogany		
Eucalyptus saligna	Sydney Blue Gum		
Eucalyptus seeana	Narrow-leaved Red Gum		
Eucalyptus signata	Scribbly Gum		
Eucalyptus tereticornis	Forest Red Gum		
Eucalyptus umbra	Broad-leaved White Mahogany		
Euryomyrtus ramosissima	Rosy Baeckea		
Kunzea ericoides	Burgan		
Leptospermum juniperinum	Prickly Tea-tree		
Leptospermum laevigatum	Coast Teatree		
Leptospermum liversidgei	Olive Tea-tree		
Leptospermum polygalifolium	Tantoon		
Leptospermum spp.	Tea-tree		
Leptospermum trinervium	Slender Tea-tree		
Lophostemon confertus	Brush Box		
Lophostemon suaveolens	Swamp Mahogany, Swamp Turpentine		
Melaleuca armillaris subsp. armillaris	Bracelet Honey-myrtle		
Melaleuca linariifolia	Flax-leaved Paperbark		
Melaleuca quinquenervia	Broad-leaved Paperbark		
Melaleuca styphelioides	Prickly-leaved Tea Tree		
Melaleuca thymifolia	Thyme Honey-myrtle		
Metrosideros excelsa	New Zealand Christmas Bush		
Rhodamnia rubescens	Scrub Turpentine		
Syncarpia glomulifera	Turpentine		
Syzygium australe	Brush Cherry		
Syzygium crebrinerve	Rose Satinash		
Tristaniopsis laurina	Kanooka		

Scientific	Common Name	NSW Status	Commonwealth Status
Mirabilis jalapa	Four-o'clock Flower		
Nymphaea caerulea subsp. zanzibarensis	Cape Waterlily		
Ochna serrulata	Mickey Mouse Plant		
Ligustrum lucidum	Large-leaved Privet		
Ligustrum sinense	Small-leaved Privet		
Notelaea longifolia	Large Mock-olive		
Notelaea venosa	Veined Mock-olive		
Ludwigia peploides subsp. montevidensis	Water Primrose		
Botrychium australe	Parsley Fern		
Acianthus spp.	Mosquito Orchid	P	
Caladenia catenata	White Caladenia	P	
Calanthe triplicata	Christmas Orchid	P	
Cryptostylis erecta	Tartan Tongue Orchid	P	
Cryptostylis subulata	Large Tongue Orchid	P	
Cymbidium suave	Snake Orchid	P	
Dendrobium linguiforme	Tongue Orchid	P	
Genoplesium fimbriatum	Fringed Midge Orchid	P	
Genoplesium nudiscapum	Dense Midge Orchid	P	
Microtis rara	Scented Onion Orchid	P	
Plectorrhiza tridentata	Tangle Orchid	P	
Pseudovanilla foliata	Great Climbing Orchid	P	
Pterostylis spp.	Greenhood	P	
Argemone ochroleuca subsp. ochroleuca	Mexican Poppy		
Passiflora edulis	Common Passionfruit		
Passiflora suberosa	Cork Passionfruit		
Passiflora subpeltata	White Passionflower		
Philydrum lanuginosum	Frogsmouth		
Dianella caerulea	Blue Flax-lily		
Dianella longifolia	Blueberry Lily		
Thelionema caespitosum	Tufted Blue-lily		
Breynia oblongifolia	Coffee Bush		
Glochidion ferdinandi	Cheese Tree		
Phyllanthus hirtellus	Thyme Spurge		
Phyllanthus tenellus	Hen and Chicken		

Scientific	Common Name	NSW Status	Commonwealth Status
Phyllanthus virgatus	Wiry Spurge		
Poranthera microphylla	Small Poranthera		
Phytolacca octandra	Inkweed		
Pinus elliottii	Slash Pine		
Pinus radiata	Radiata Pine		
Billardiera scandens	Hairy Apple Berry		
Bursaria spinosa subsp. spinosa	Native Blackthorn		
Hymenosporum flavum	Native Frangipani		
Pittosporum multiflorum	Orange Thorn		
Pittosporum revolutum	Rough Fruit Pittosporum		
Pittosporum spinescens	Wallaby Apple		
Pittosporum undulatum	Sweet Pittosporum		
Plantago lanceolata	Lamb's Tongues		
Veronica plebeia	Trailing Speedwell		
Andropogon virginicus	Whisky Grass		
Anisopogon avenaceus	Oat Speargrass		
Aristida ramosa	Purple Wiregrass		
Aristida spp.	A Wiregrass		
Aristida vagans	Threeawn Speargrass		
Axonopus compressus	Broad-leaved Carpet Grass		
Axonopus fissifolius	Narrow-leafed Carpet Grass		
Bothriochloa biloba	Lobed Bluegrass		
Briza maxima	Quaking Grass		
Briza minor	Shivery Grass		
Bromus catharticus	Praire Grass		
Capillipedium spicigerum	Scented-top Grass		
Chloris gayana	Rhodes Grass		
Chrysopogon filipes	Australian Vetiver		
Cymbopogon refractus	Barbed Wire Grass		
Cynodon dactylon	Common Couch		
Dichelachne crinita	Longhair Plumegrass		
Dichelachne micrantha	Shorthair Plumegrass		
Dichelachne spp.	A Plumegrass		
Digitaria ciliaris	Summer Grass		
Digitaria didactyla	Queensland Blue Couch		
Digitaria parviflora	Small-flowered Finger Grass		

Scientific	Common Name	NSW Status	Commonwealth Status
Digitaria ramularis	Finger Panic Grass		
Digitaria sanguinalis	Crab Grass		
Digitaria spp.	A Finger Grass		
Echinochloa crus-galli	Barnyard Grass		
Echinopogon caespitosus	Bushy Hedgehog-grass		
Echinopogon ovatus	Forest Hedgehog Grass		
Echinopogon spp.	A Hedgehog Grass		
Ehrharta erecta	Panic Veldtgrass		
Eleusine indica	Crowsfoot Grass		
Entolasia marginata	Bordered Panic		
Entolasia stricta	Wiry Panic		
Eragrostis brownii	Brown's Lovegrass		
Eragrostis cilianensis	Stinkgrass		
Eragrostis curvula	African Lovegrass		
Eragrostis leptostachya	Paddock Lovegrass		
Eragrostis spp.	A Lovegrass		
Eragrostis tenuifolia	Elastic Grass		
Eremochloa bimaculata	Poverty Grass		
Imperata cylindrica	Blady Grass		
Isachne globosa	Swamp Millet		
Leersia hexandra	Swamp Ricegrass		
Megathyrsus maximum var. pubiglumis	green panic		
Melinis repens	Red Natal Grass		
Microlaena stipoides	Weeping Grass		
Panicum effusum	Hairy Panic		
Panicum obseptum	White Water Panic		
Panicum pygmaeum	Pygmy Panic		
Panicum simile	Two-colour Panic		
Panicum spp.	Panicum		
Paspalum dilatatum	Paspalum		
Paspalum distichum	Water Couch		
Paspalum mandiocanum	Broadleaf Paspalum		
Paspalum orbiculare	Ditch Millet		
Paspalum urvillei	Vasey Grass		
Pennisetum clandestinum	Kikuyu Grass		
Phalaris aquatica	Phalaris		

Scientific	Common Name	NSW Status	Commonwealth Status
Phalaris arundinacea var. picta	Ribbon Grass		
Phragmites australis	Common Reed		
Poa sieberiana	Snowgrass		
Pseudoraphis paradoxa	Slender Mudgrass		
Pseudoraphis spinescens	Spiny Mudgrass		
Rytidosperma pallidum	Redanther Wallaby Grass; Silvertop Wallaby Grass		
Setaria palmifolia	Palm Grass		
Setaria pumila	Pale Pigeon Grass		
Setaria sphacelata	South African Pigeon Grass		
Sorghum halepense	Johnson Grass		
Sporobolus africanus	Parramatta Grass		
Sporobolus fertilis	Giant Parramatta Grass		
Sporobolus natalensis	Giant Rat's Tail Grass		
Stenotaphrum secundatum	Buffalo Grass		
Comesperma ericinum	Pyramid Flower		
Polygala japonica	Dwarf Milkwort		
Persicaria decipiens	Slender Knotweed		
Persicaria hydropiper	Water Pepper		
Persicaria lapathifolia	Pale Knotweed		
Persicaria orientalis	Princes Feathers		
Persicaria spp.	Knotweed		
Persicaria subsessilis	Hairy Knotweed		
Polygonum arenastrum	Wireweed		
Rumex conglomeratus	Clustered Dock		
Rumex crispus	Curled Dock		
Rumex spp.	Dock		
Platycerium bifurcatum	Elkhorn Fern	P	
Platycerium superbum	Staghorn	P	
Pyrrosia rupestris	Rock Felt Fern		
Eichhornia crassipes	Water Hyacinth		
Potamogeton tricarinatus	Floating Pondweed		
Banksia aemula	Wallum Banksia		
Banksia integrifolia	Coast Banksia		
Banksia integrifolia subsp. integrifolia	Coastal Banksia		
Banksia oblongifolia	Fern-leaved Banksia		

Scientific	Common Name	NSW Status	Commonwealth Status
Banksia serrata	Old-man Banksia		
Banksia spinulosa	Hairpin Banksia	P	
Grevillea robusta	Silky Oak		
Grevillea sericea	Pink Spider Flower		
Hakea dactyloides	Finger Hakea		
Hakea salicifolia	Willow-leaved Hakea		
Lomatia fraseri	Silky Lomatia		
Lomatia myricoides	River Lomatia		
Lomatia silaifolia	Crinkle Bush	P	
Persoonia lanceolata	Lance Leaf Geebung	P	
Persoonia levis	Broad-leaved Geebung	P	
Persoonia linearis	Narrow-leaved Geebung	P	
Petrophile canescens	Conesticks	P	
Stenocarpus sinuatus	Firewheel Tree		
Cheilanthes austrotenuifolia	Rock Fern		
Cheilanthes distans	Bristly Cloak Fern		
Pteris tremula	Tender Brake		
Pteris vittata	Chinese Brake		
Clematis aristata	Old Man's Beard		
Clematis glycinoides	Headache Vine		
Ranunculus inundatus	River Buttercup		
Ranunculus plebeius	Forest Buttercup		
Alphitonia excelsa	Red Ash		
Pomaderris ligustrina	Privet Pomaderris		
Ripogonum album	White Supplejack		
Rubus parvifolius	Native Raspberry		
Rubus rosifolius	Rose-leaf Bramble		
Rubus ulmifolius	Blackberry		
Morinda jasminoides	Sweet Morinda		
Opercularia aspera	Coarse Stinkweed		
Opercularia diphylla	Stinkweed		
Opercularia hispida	Hairy Stinkweed		
Pomax umbellata	Pomax		
Psychotria daphnoides	Smooth Psychotria		
Richardia brasiliensis	Mexican Clover		
Acronychia littoralis	Scented Acronychia	E1,P	E

Scientific	Common Name	NSW Status	Commonwealth Status
Acronychia oblongifolia	White Aspen		
Boronia polygalifolia	Dwarf Boronia	P	
Citrus x taitensis	Rough Lemon		
Flindersia schottiana	Cudgerie		
Geijera salicifolia	Brush Wilga		
Melicope micrococca	Hairy-leaved Doughwood		
Zieria smithii	Sandfly Zieria		
Populus nigra	Lombardy Poplar		
Salix babylonica	Weeping Willow		
Exocarpos cupressiformis	Cherry Ballart		
Leptomeria acida	Sour Currant Bush		
Arytera divaricata	Coogera		
Cupaniopsis anacardioides	Tuckeroo		
Diploglottis australis	Native Tamarind		
Dodonaea spp.	A Hopbush		
Dodonaea triquetra	Large-leaf Hop-bush		
Guioa semiglauca	Guioa		
Jagera pseudorhus var. pseudorhus	Foambark Tree		
Rhysotoechia bifoliolata subsp. bifoliolata	Two-leaved Tuckeroo		
Schizaea bifida	Forked Comb Fern		
Bacopa monnieri	Bacopa		
Gratiola peruviana	Australian Brooklime		
Selaginella uliginosa	Swamp Selaginella		
Smilax australis	Lawyer Vine		
Smilax glyciphylla	Sweet Sarsparilla		
Duboisia myoporoides	Corkwood		
Nicotiana suaveolens	Native Tobacco		
Solanum aviculare	Kangaroo Apple		
Solanum mauritianum	Wild Tobacco Bush		
Solanum nigrum	Black-berry Nightshade		
Solanum prinophyllum	Forest Nightshade		
Solanum pungetium	Eastern Nightshade		
Sparganium subglobosum	Floating Bur-reed		
Stackhousia viminea	Slender Stackhousia		
Stylidium graminifolium	Grass Triggerplant		

Scientific	Common Name	NSW Status	Commonwealth Status
Cyclosorus dentatus	Binung		
Pimelea linifolia	Slender Rice Flower		
Trimenia moorei	Bitter Vine		
Typha orientalis	Broad-leaved Cumbungi		
Aphananthe philippinensis	Rough-leaved Elm		
Trema tomentosa var. aspera	Native Peach		
Tasmannia insipida	Brush Pepperbush		
Dendrocnide excelsa	Giant Stinging Tree		
Urtica incisa	Stinging Nettle		
Lantana camara	Lantana		
Verbena bonariensis	Purpletop		
Verbena rigida var. rigida	Veined Verbena		
Alpinia arundelliana	Native Ginger		
Viola betonicifolia	Native Violet		
Viola hederacea	Ivy-leaved Violet		
Cissus antarctica	Water Vine		
Cissus hypoglauca	Giant Water Vine		

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 22/05/17 10:19:03

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

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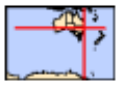
Coordinates
Buffer: 10.0Km



Appendix 4 Additional human and animal health information

Australian bat lyssavirus

ABLV is a rabies-like virus that may be found in all flying-fox species on mainland Australia. It has also been found in an insectivorous microbat and it is assumed it may be carried by any bat species. The probability of human infection with ABLV is very low with less than 1% of the flying-fox population being affected (DPI 2013) and transmission requiring direct contact with an infected animal that is secreting the virus. In Australia three people have died from ABLV infection since the virus was identified in 1996 (NSW Health 2013).

Domestic animals are also at risk if exposed to ABLV. In 2013, ABLV infections were identified in two horses (Shinwari et al. 2014). There have been no confirmed cases of ABLV in dogs in Australia; however, transmission is possible (McCall et al. 2005) and consultation with a veterinarian should be sought if exposure is suspected.

Transmission of the virus from bats to humans is through a bite or scratch, but may have potential to be transferred if bat saliva directly contacts the eyes, nose, mouth or broken skin. ABLV is unlikely to survive in the environment for more than a few hours, especially in dry environments that are exposed to sunlight (NSW Health 2013).

Transmission of closely related viruses suggests that contact or exposure to bat faeces, urine or blood does not pose a risk of exposure to ABLV, nor does living, playing or walking near bat roosting areas (NSW Health 2013).

The incubation period in humans is assumed similar to rabies and variable between two weeks and several years. Similarly the disease in humans presents essentially the same clinical picture as classical rabies. Once clinical signs have developed the infection is invariably fatal. However, infection can easily be prevented by avoiding direct contact with bats (i.e. handling). Pre-exposure vaccination provides reliable protection from the disease for people who are likely to have direct contact with bats, and it is generally a mandatory workplace health and safety requirement that all persons working with bats receive pre-vaccination and have their level of protection regularly assessed. Like classical rabies, ABLV infection in humans also appears to be effectively treated using post-exposure vaccination and so any person who suspects they have been exposed should seek immediate medical treatment. Post-exposure vaccination is usually ineffective once clinical manifestations of the disease have commenced.

If a person is bitten or scratched by a bat they should:

- wash the wound with soap and water for at least five minutes (**do not scrub**)
- contact their doctor immediately to arrange for post-exposure vaccinations.

If bat saliva contacts the eyes, nose, mouth or an open wound, flush thoroughly with water and seek immediate medical advice.

Hendra virus

Flying-foxes are the natural host for Hendra virus (HeV), which can be transmitted from flying-foxes to horses. Infected horses sometimes amplify the virus and can then transmit it to other horses, humans and on two occasions, dogs (DPI 2014). There is no evidence that the virus can be passed directly from flying-foxes to humans or to dogs (AVA 2015). Clinical studies have shown cats, pigs, ferrets and guinea pigs can carry the infection (DPI 2015a).

Although the virus is periodically present in flying-fox populations across Australia, the likelihood of horses becoming infected is low and consequently human infection is extremely rare. Horses are thought to contract the disease after ingesting forage or water contaminated primarily with flying-fox urine (CDC 2014).

Humans may contract the disease after close contact with an infected horse. HeV infection in humans presents as a serious and often fatal respiratory and/or neurological disease and there is currently no effective post-exposure treatment or vaccine available for people. The mortality rate in horses is greater than 70% (DPI 2014). Since 1994, 81 horses have died and four of the seven people infected with HeV have lost their lives (DPI 2014).

Previous studies have shown that HeV spillover events have been associated with foraging flying-foxes rather than camp locations. Therefore risk is considered similar at any location within the range of flying-fox species and all horse owners should be vigilant. Vaccination of horses can protect horses and subsequently humans from infection (DPI 2014), as can appropriate horse husbandry (e.g. covering food and water troughs, fencing flying-fox foraging trees in paddocks, etc.).

Although all human cases of HeV to date have been contracted from infected horses and direct transmission from bats to humans has not yet been reported, particular care should be taken by select occupational groups that could be uniquely exposed. For example, persons who may be exposed to high levels of HeV via aerosol of heavily contaminated substrate should consider additional PPE (e.g. respiratory filters), and potentially dampening down dry dusty substrate.

Menangle virus

Menangle virus (also known as bat paramyxovirus no. 2) was first isolated from stillborn piglets from a NSW piggery in 1997. Little is known about the epidemiology of this virus, except that it has been recorded in flying-foxes, pigs and humans (AVA 2015). The virus caused reproductive failure in pigs and severe febrile (flu-like) illness in two piggery workers employed at the same Menangle piggery where the virus was recorded (AVA 2015). The virus is thought to have been transmitted to the pigs from flying-foxes via an oral–faecal matter route (AVA 2015). Flying-foxes had been recorded flying over the pig yards prior to the occurrence of disease symptoms. The two infected piggery workers made a full recovery and this has been the only case of Menangle virus recorded in Australia.

General health considerations

Flying-foxes, like all animals, carry bacteria and other microorganisms in their guts, some of which are potentially pathogenic to other species. Direct contact with faecal material should be

avoided and general hygiene measures taken to reduce the low risk of gastrointestinal and other disease.

Contamination of water supplies by any animal excreta (birds, amphibians and mammals such as flying-foxes) poses a health risk to humans. Household tanks should be designed to minimise potential contamination, such as using first flush diverters to divert contaminants before they enter water tanks. Trimming vegetation overhanging the catchment area (e.g. the roof of a house) will also reduce wildlife activity and associated potential contamination. Tanks should also be appropriately maintained and flushed, and catchment areas regularly cleaned to remove potential contaminants.

Public water supplies are regularly monitored for harmful microorganisms, and are filtered and disinfected before being distributed. Management plans for community supplies should consider whether any large congregation of animals, including flying-foxes, occurs near the supply or catchment area. Where they do occur, increased frequency of monitoring should be considered to ensure early detection and management of contaminants.

Appendix 5 Expert assessment requirements

The Plan template identifies where expert input is required. The following are the minimum required skills and experience which must be demonstrated by each expert.

Flying-fox expert

Essential

- Knowledge of flying-fox habitat requirements.
- Knowledge and experience in flying-fox camp management.
- Knowledge of flying-fox behaviour, including ability to identify signs of flying-fox stress.
- Ability to differentiate between breeding and non-breeding females.
- Ability to identify females in final trimester.
- Ability to estimate age of juveniles.
- Experienced in flying-fox population monitoring including static and fly-out counts, demographics and visual health assessments.

Desirable

- It is strongly recommended that the expert is independent of the Plan owner to ensure transparency and objectivity. OEH may be able to provide assistance with flying-fox experts.
- ABLV-vaccinated (N.B. This is often an essential requirement during management implementation as detailed within the template).
- Trained in flying-fox rescue (N.B. This is often an essential requirement during management implementation as detailed within the template).
- Local knowledge and experience.

Ecologist

Essential

- At least five years demonstrated experience in ecological surveys, including identifying fauna and flora to species level, fauna habitat and ecological communities.
- The ability to identify flora and fauna, including ground-truthing of vegetation mapping.
- Formal training in ecology or similar, specifically flora and fauna identification.

Desirable

- Tertiary qualification in ecology or similar.
- Local knowledge and experience.

- Accredited Biobanking Assessor under the *Threatened Species Conservation Act 1995*.
- Practising member of the Ecological Consultants Association of NSW.

Depending on the site, for example when vegetation management is proposed for an endangered ecological community or an area with a high likelihood of containing other threatened flora and fauna species, a specialist in that field (e.g. specialist botanist) may be required.

Appendix 6 Dispersal results summary

Roberts and Eby (2013) summarised 17 known flying-fox dispersals between 1990 and 2013, and made the following conclusions:

1. In all cases, dispersed animals did not abandon the local area[6].
2. In 16 of the 17 cases, dispersals did not reduce the number of flying-foxes in the local area.
3. Dispersed animals did not move far (in approx. 63% of cases the animals only moved <600 m from the original site, contingent on the distribution of available vegetation). In 85% of cases, new camps were established nearby.
4. In all cases, it was not possible to predict where replacement camps would form.
5. Conflict was often not resolved. In 71% of cases conflict was still being reported either at the original site or within the local area years after the initial dispersal actions.
6. Repeat dispersal actions were generally required (all cases except where extensive vegetation removal occurred).
7. The financial costs of all dispersal attempts were high, ranging from tens of thousands of dollars for vegetation removal to hundreds of thousands for active dispersals (e.g. using noise, smoke, etc.).

Ecosure, in collaboration with a Griffith University Industry Affiliates Program student, researched outcomes of management in Queensland between November 2013 and November 2014 (the first year since the current Queensland state flying-fox management framework was adopted on 29 November 2013). An overview of findings[7] is summarised below.

- There were attempts to disperse 25 separate roosts in Queensland (compared with nine roosts between 1990 and June 2013 analysed in Roberts and Eby (2013)). Compared with the historical average (less than 0.4 roosts/year) the number of roosts dispersed in the year since the Code was introduced has increased by 6250%.
- Dispersal methods included fog[8], birdfrite, lights, noise, physical deterrents, smoke, extensive vegetation modification, water (including cannons), paintball guns and helicopters.
- The most common dispersal methods were extensive vegetation modification alone and extensive vegetation modification combined with other methods.

[6] Local area is defined as the area within a 20 km radius of the original site = typical feeding area of a flying-fox.

[7] This was based on responses to questionnaires sent to councils; some did not respond and some omitted responses to some questions.

[8] Fog refers to artificial smoke or vapours generated by smoke/fog machines. Many chemical substances used to generate smoke/fog in these machines are considered toxic.

- In nine of the 24 roosts dispersed, dispersal actions did not reduce the number of flying-foxes in the LGA.
- In all cases it was not possible to predict where new roosts would form.
- When flying-foxes were dispersed, they did not move further than 6 km away.
- As at November 2014 repeat actions had already been required in 18 cases.
- Conflict for the council and community was resolved in 60% of cases, but with many councils stating that they feel this resolution is only temporary.
- The financial costs of all dispersal attempts, regardless of methods used were considerable, ranging from $7500 to more than $400,000 (with costs ongoing).

Table 5 Summary of known documented attempts to disperse Australian flying-fox camps using non-lethal methods, during 1990 to 2013 (source: Roberts and Eby 2013)

Location	Species	FF population estimate at time of dispersal	Method	Did the animals leave the local area?	Did the local population reduce in size?	How far did they move?	Were new camps formed (number of new camps if known)?	Number of separate actions	Cost (if known)	Was conflict resolved at the original site?	Was conflict resolved for the community?
Barcaldine, Qld	R	>50,000	VN	no	no	≈2 km	yes (1)	trees in township felled		yes	no
Batchelor, NT	B	200	BNS	no	no	<400 m	yes (1)	2		yes	yes
Boyne Island, Qld	BR	25,000	LNS	no	no	<500 m	yes (2)	3		yes	no
Bundall, Qld[9]	GB	1580	V	uk	no	uk, but 7 camps were within 5 km	no	1	$250,000	yes	uk
Charters Towers, Qld	RB	variable	HLNPOW	no	no	200 m	no (returned to original site)	repeated since 2000	>$500,000	no	no
Dallis Park, NSW	BG	28,000	V	no	yes	300 m	yes (1)	2		yes	no
Duaringa, Qld	R	>30,000	VNFO	no	no	400 m	yes	1	$150,000	yes	uk
Gayndah, Qld	RB	200,000	VN	no	no	600 m	yes	3 actions, repeated		yes	no
Maclean, NSW	BGR	20,000	NS	no	no	350 m	yes (7)	>23	>$400,000 and ongoing	no	no
Mataranka, NT	BR	>200,000	BHLNOSW	no	no	<300 m	uk	>9		no	no
North Eton, Qld	B	4800	VNFB	uk	no	<1.5 km initially	yes (≈4 majority temporary)	2	$45,000	yes	yes (conflict at one site)
Royal Botanic Gardens, Melbourne, Vic	G	30,000	NS	no	no	6.5 km	Yes (2)	6 mths	$3 million	Yes	Yes, ongoing management required
Royal Botanic Gardens, Sydney,	G	3,000	LNPOW	no	no	various	no	ongoing daily actions for 12	>$1 million and	yes	yes

[9] Ecosure updated information for Bundall as managers of that dispersal.

Location	Species	FF population estimate at time of dispersal	Method	Did the animals leave the local area?	Did the local population reduce in size?	How far did they move?	Were new camps formed (number of new camps if known)?	Number of separate actions	Cost (if known)	Was conflict resolved at the original site?	Was conflict resolved for the community?
NSW								mths+	ongoing		
Singleton, NSW	GR	500	LNUW	no	no	<900 m	no (returned to original site	>3	$117,000 and ongoing	no	no
Townsville, Qld	BR	35,000	BNS	no	no	400 m	no (returned to original site)	5		no	no
Warwick, Qld	GRB (dispersal targeted R)	200,000	NLBP	no	no	≈1 km	no (site known to be previously occupied by GB)	5 days	$28,000	yes	uk (complaints persisted until migration)
Young, NSW	L	<5000	VN	no	no	<600m	yes (1)	Uk		Yes	No

* G = grey-headed flying-fox; B = black flying-fox; R = little red flying-fox # B = “birdfrite”; F = fog; H = helicopter; L = lights; N = noise; P = physical deterrent; O = odour; S = smoke; U = ultrasonic sound; V = extensive vegetation removal; W = water.

+ 1 Storm Stanford (Wildlife carer, pers comm. 2013); 2 Louise Saunders (Bats Qld, pers comm. 2013); 3 Phillips et al. (2007) Displacement of Black flying-foxes Pteropus alecto at Batchelor, Northern Territory Australian Zoologist 34: 119-124; 4 John McCarthy (Northern Territory Government, pers comm. 2010); 5 Roberts (2006) Management of Urban Flying-fox Camps: Issues of Relevance to Camps in the Lower Clarence, NSW. Valley Watch Inc., Maclean; 6 Information from Gladstone Regional Council in 2010 and 2013; 7 Joe Adair (formerly DEHP, pers. comm. 2010); 8 Trish Wimberly (Australia Bat Clinic pers. comm. 2013); 9 Information obtained from Department of Environment and Heritage Protection (DEHP) in 2013; 10 Billie Roberts unpublished data; 11 Scott Sullivan (DEHP, pers. comm. 2010); 12 Information from Charters Towers Regional Council in 2010 and 2013; 13 Roberts et al. (2012b) and additional references within; 14 Perry Deeds (Central Highlands Regional Council, pers. comm 2013); 15 Jarmaine (2010) Species Management Plan, Mackay Regional Council; 16 Heidi Jarmaine (Mackay Regional Council, pers. comm. 2013); 17 Daryl Barnes (Walkerston resident, per comm. 2013) 18 Peggy Eby (Ecologist, pers comm. 2013) 19 John Martin (RBG, pers comm. 2013); 20 Singleton Council Meeting Minutes; 21 Information from the Southern Downs Regional Council in 2013; 22 Tim Low (pers. comm. 2013); 23 Young Shire Council.

Appendix 7 Example flying-fox rescue protocol

Reference documents:

OEH 2012, NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes, Office of Environment and Heritage, Sydney.

OEH 2011, NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna, Office of Environment and Heritage, Sydney.

Purpose

These work instructions are intended for Australian bat lyssavirus (ABLV)-vaccinated fauna spotter catchers (FSCs) or wildlife rescue personnel on site during dispersal activities to monitor, capture or provide first aid treatment for sick or injured flying-foxes that may require human intervention for their survival. Flying-fox rescue must only be attempted by personnel trained and experienced in flying-fox rescue and handling.

This work instruction provides rescuers with information regarding capture and first aid until a flying-fox is in the specialist care of a veterinarian or person qualified in wildlife rehabilitation.

Requirements

FSC and wildlife rescue personnel involved in flying-fox rescue must:

- be trained and experienced in rescue and handling
- be vaccinated against ABLV (titre levels checked at least once every two years)
- be aware of the hazards and risks of coming into contact with all bats
- utilise appropriate PPE and equipment for capture, transport and treatment of flying-foxes
- undertake a risk assessment before carrying out a rescue – do not endanger yourself or others during a rescue
- have the contact details for a local veterinarian or bat carer who will accept the sick or injured flying-fox.

Human first aid

All bats in Australia should be viewed as potentially infected with ABLV. If bitten or scratched by a bat, immediately wash the wound with soap and water (do not scrub) and continue for at least five minutes, followed by application of an antiseptic with anti-viral action (e.g. Betadine), and immediate medical attention (post-exposure vaccinations may be required). Similarly medical attention should be immediately sought if exposed to an animal's saliva or excreta through the eyes, nose or mouth.

Equipment

- lidded plastic carry basket or 'pet-pack' with bedding (juveniles) / transport container with hanging perch, tall enough for bat to hang without hitting its head (in accordance with Section 5.1 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012))
- warm water bottle / cold brick
- wraps /towels
- teats for small bottle
- extension pole or broom
- bat first aid kit – juice drink/glucose powder, syringes, cloths for wounds, Betadine/saline, dummy for baby bats. FFs only to be offered liquids under advice from a licensed wildlife carer.

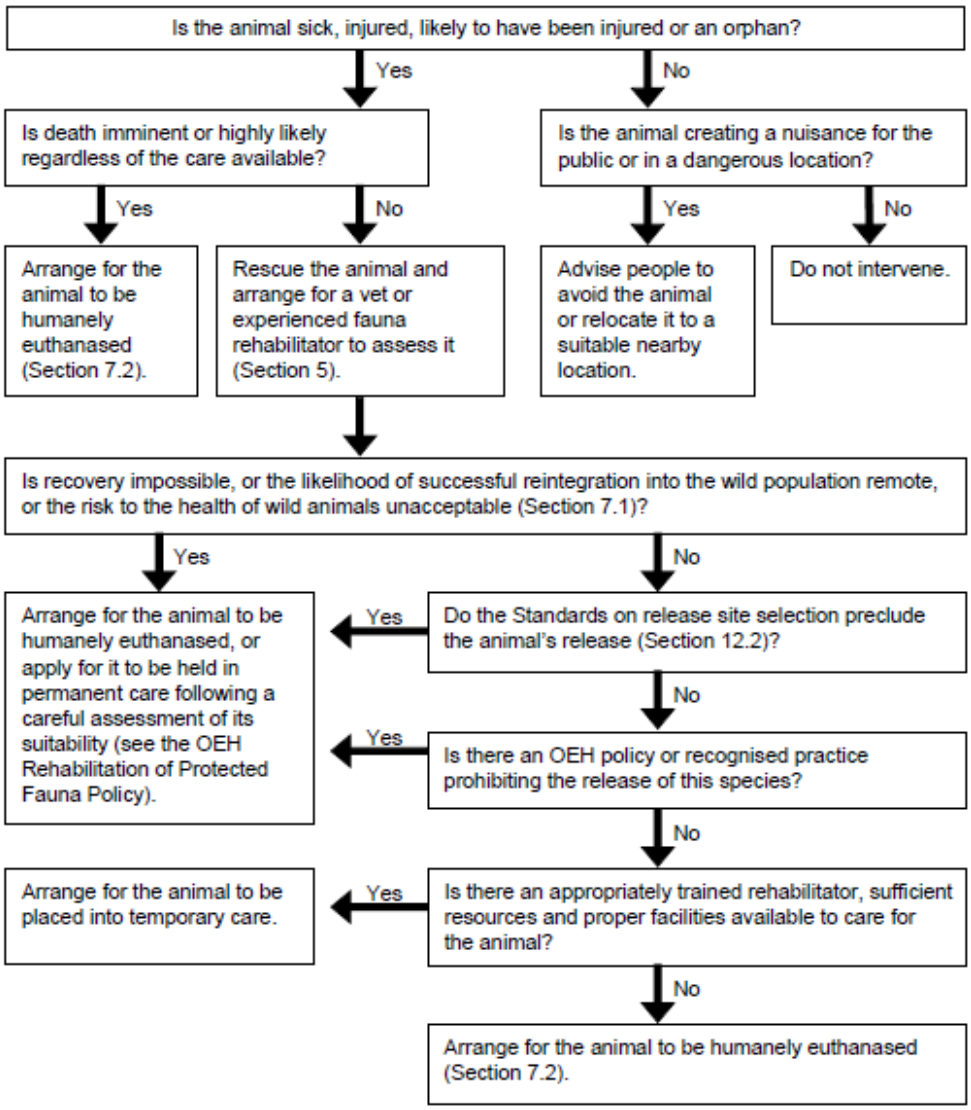
Work instructions

Case assessment

Observe, assess and then determine if/what intervention is required using the decision tree in the NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna (OEH 2011), included below.

Personnel should approach stressed flying-foxes cautiously. If flying-foxes panic or fly this will waste energy; retreat and continue to monitor behaviour.

1. Dehydration: Eyes dull or depressed in skull, change to skin elasticity, skin stays pinched, animal cold, wing membranes dry, mouth dry.
2. Heat stress: wing fanning, shade seeking, clustering/clumping, salivating, panting, roosting at the base of trees, on the ground, falling from tree.
3. Obvious injury: bleeding, broken bones.



Rescue instructions

As per Section 4 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012):

i. The objective is to rescue a flying-fox while minimising further stress and injury to the animal.

ii. Before a rescue attempt, rescuers must assess the risks to the flying-fox from environmental hazards and from capture.

iii. Rescuers must employ the correct rescue equipment for the condition and location of the flying-fox, and be trained in its use.

Example scenarios

1. Bat low in tree:
   - quickly place towel around bat before it can move away
   - grab hold of feet, toes may curl over rescuers fingers
   - place in carry basket / transport container.

2. Bat high in tree:
    - place pole wrapped in towel in front of bat
    - coax bat onto towel
    - once on towel, quickly move away from branches and lower to ground
    - once on ground, cover with towel and place into carry basket / transport container.
3. A bat caught on barbed wire fence:
    - two people only – one to restrain with towel, while the other untangles
    - put towels on the wire strands under or around to avoid further entanglement
    - if the membrane has dried onto wire, syringe or spray water onto wing
    - use pliers or wire cutter if necessary.

Animal first aid

Physical assessment: Keep animal wrapped and head covered, only expose one part at a time. Examine head. Unwrap one wing and extend. Wrap and extend other wing. Check legs. Examine front and back of body.

Dehydration: Offer water/juice (low acid juice only, e.g. apple/mango) orally with syringe (under supervision/advice from licensed wildlife carer ONLY).

Heat stress: Reduce temperature in heat exhausted bats by spraying wings with tepid water.

Hypothermia: May be seen in pups separated from mother – keep head covered and warm core body temperature slowly by placing near (not on) warm water bottle covered by towel.

Bleeding: Clean wounds with room temperature saline or diluted Betadine.

Transport to veterinarian / wildlife carer

See Section 5 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012) summarised below.

Objective

To transport a flying-fox so as to minimise further stress and injury to the animal.

Standards

a. The transport container must be tall enough for the flying-fox to hang by its feet without hitting its head on the floor.
b. The container must be designed, set up and secured to prevent injuries to the flying-fox. The sides of the container must prevent the flying-fox from poking its head or wings out.
c. The container must be designed to prevent the flying-fox from escaping.

d. The flying-fox must be allowed to hang by its feet from the top of the container or if it is unable to hang, wrapped in material (e.g. sheet or flannel) and placed in a sling so its feet are higher than its head.

e. The container must be kept at a temperature which is appropriate for the age and condition of the flying-fox. A range of 25–27°C is appropriate for an adult. A temperature of 28°C is appropriate for an orphan. A cool or warm water bottle may be required.

f. The container must be ventilated so air can circulate around the flying-fox.

g. The container must minimise light, noise and vibrations and prevent contact with young children and pets.

h. During transport, a container holding a flying-fox must have a clearly visible warning label that says 'Warning – live bat'.

i. A flying-fox must not be transported in the back of an uncovered utility vehicle or a car boot that is separate from the main cabin.

Guidelines

- Flying-fox transport should be the sole purpose of the trip and undertaken in the shortest possible time.
- The fauna rehabilitation group's contact details should be written on the transport container in case of an emergency.

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	14/06/2017	Rudder Park Flying-fox Management Plan - Draft	Jess Bracks, Principal Wildlife Biologist	Beth Kramer, SEQ Regional Manager	Beth Kramer, SEQ Regional Manager
01	20/06/2017	Rudder Park Flying-fox Management Plan – Draft R1		Kempsey Shire Council	Jess Bracks, Principal Wildlife Biologist
02	27/09/2017	Rudder Park Flying-fox Management Plan		Kempsey Shire Council, OEH, community	Jess Bracks, Principal Wildlife Biologist

Distribution List

Copy #	Date	Type	Issued to	Name
1	27/06/2017	Electronic	Kempsey Shire Council	Bill Larkin
2	27/09/2017	Electronic	Kempsey Shire Council	Georgia Rayner
3	27/06/2017	Electronic	Ecosure	Administration

Citation: Ecosure (2017), Rudder Park Flying-fox Camp Management Plan Report to Kempsey Shire Council, Burleigh Heads

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